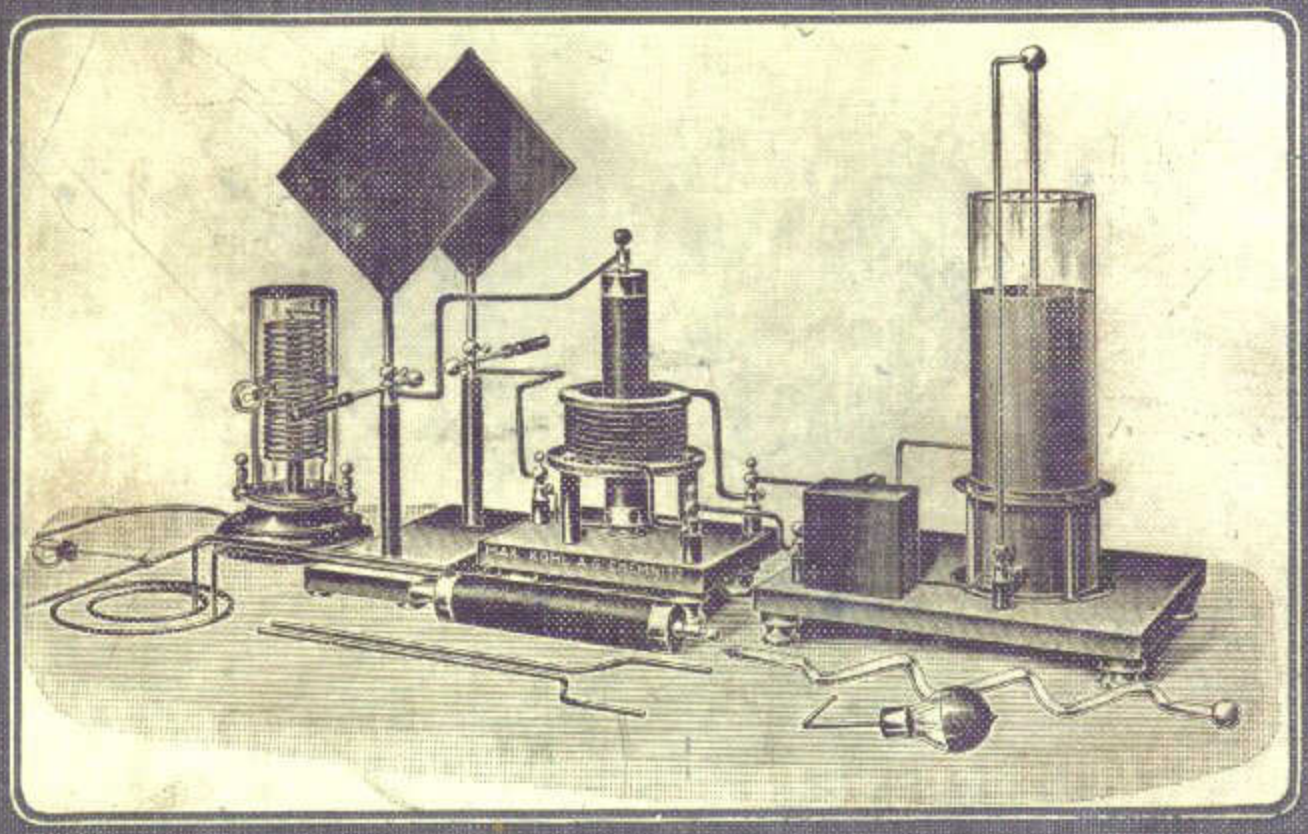
MAX KOHL A.G.

CHEMNITZ (Germany).

Price List No. **50**, Vols. II and III.



Physical Apparatus.

The prices given in this list are not subject to any advance.

D. 16 c.

Max Kohl, Aktiengesellschaft, Chemnitz (Germany)

Telegraphic Address: Physix, Chemnitz.

Scientific Instrument Manufacturers.

Telephones: 3104, 3105 and 3106.

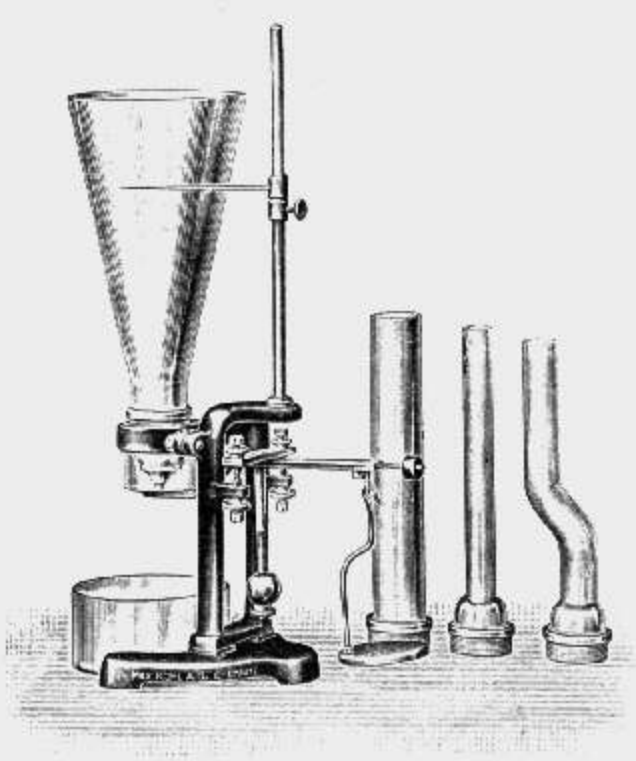
Adorferstrasse 20.

Max Kohl, Aktiengesellschaft, Chemnitz.

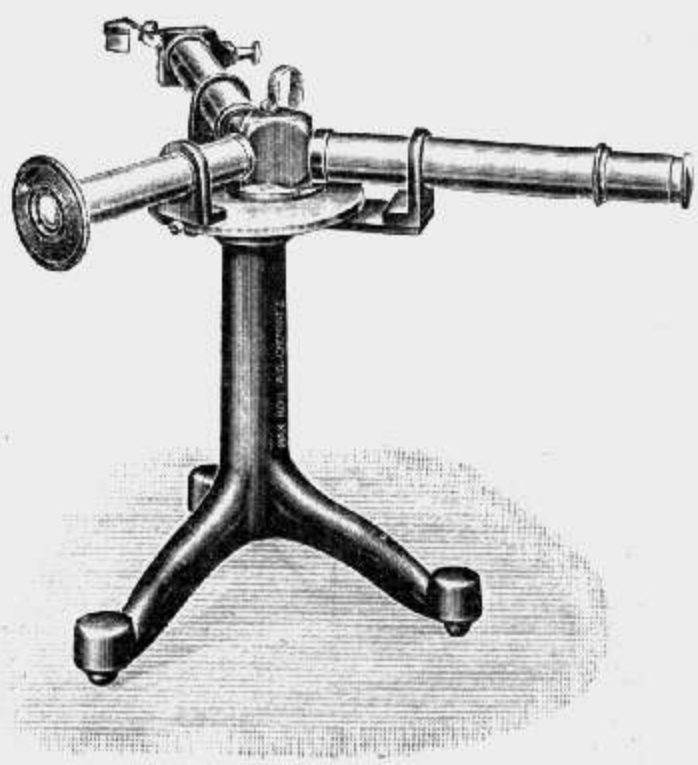
Price Sheet No. 1.

Simple Physical Apparatus.

There has been a demand recently for simple but well constructed apparatus for teaching and demonstrating Physics. It is our intention to meet this demand, and we are making a start by bringing out new and simplified models of the apparatus in most general use. In this, we are paying very careful attention to pleasing forms and cheap prices. The following Price Sheet No. 1 includes a small selection of simplified apparatus and instruments such as we have in mind. It is our intention to issue further similar Price Sheets at regular intervals, and we therefore ask that the lists may be filed for ready reference, and later on bound together into a complete list.

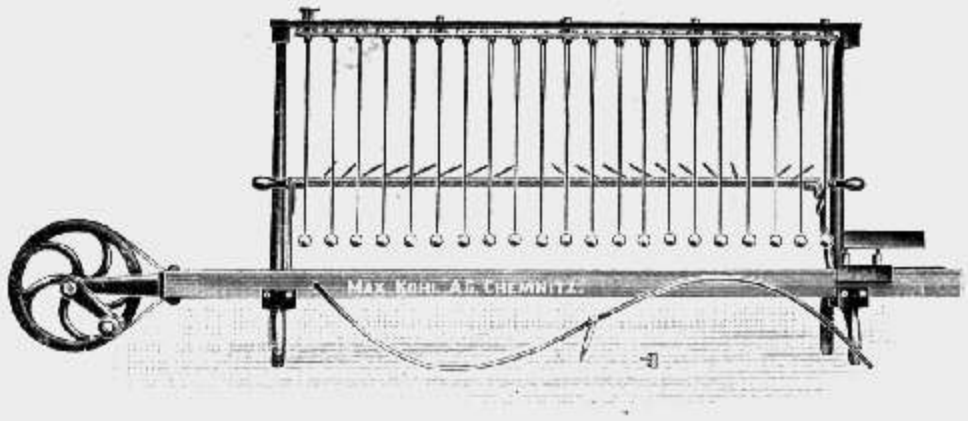


70 231. 1 : 5.



70 401. 1 : 4.

	Reichsmark
70 231. **Pascal's Apparatus,** Figure, with 4 attachments	60.—
This base-pessure apparatus has a lever resting on two tips, with movable cover-plate.	
70 401. **Spectrum Apparatus** (Bunsen's), Figure	100.—
On an iron tripod and column is fixed a brass plate carrying the observing telescope, the gap-tube and scale-tube. The observing telescope and gap-tube have objectives of 20 mm aperture, 150 mm focal length, and a magnification of 5. The 60° prism has a dispersion of 4°. The gap-tube is fitted with one gap having a micrometer screw and a comparison prism capable of being slipped to one side when not in use.	



70301. 1 : 14.

70301. **Wave Machine** (Mach's), Figure, for demonstrating progressive and stationary **Longitudinal and Transverse Waves,** and the conversion of transverse into longitudinal waves, and vice versa . . . . . Reichsmark 100.

The wave machine is 140 cm long and 52 cm high. It has 21 balls suspended on fixed wire rods. The wave demonstrating by the swinging balls is visible from all parts of the lecture room. The devices employed for generating the waves have been further improved, thus considerably simplifying the manipulation of the apparatus. The wire rods on which the balls are suspended are supported at the top in such a way that the balls can only swing in **one** plane, governed by the suspension. The suspensions of the pendulums are arranged so as to be capable of rotation, and consequently the plane of oscillation of the pendulums may be shifted 90°. By this means the pendulums swing now parallel and now perpendicularly to the slider frame.

1. Demonstration of Progressive Transverse Waves.

The plane of oscillation of the pendulums is set perpendicular to the slide-bar, and the flat strip of sheet metal is fixed to the slider by means of the pins fitted. By turning the crank-wheel, the slider is moved to the other end of the slider-bar. The sheet metal strip, set askew, thus shifts the balls in succession to one side, and suddenly releases them in the same order. In this way, a progressive transverse wave is set up, the length of which may be selected by turning the crank-wheel more slowly or more quickly.

By turning to and fro a few times the discs on which the pendulums are suspended, the latter may easily be returned to the position of rest.

2. Demonstration of Stationary Transverse Waves.

The plane of swing of the pendulums is set perpendicular to the slider-bar, and the slider placed on the end of the wood fillet. The bent wire, with its pin, is then inserted in the appropriate hole of the slider-bar, the pendulums then lying behind the bent wire. With the apparatus arranged thus, the wire is turned horizontally around the fixing peg, causing the pendulums to swing free and demonstrate a stationary transverse wave.

3. Demonstration of Progressive Longitudinal Waves.

The plane of swing of the pendulums is set parallel to the slider-bar, the slider fixed to one end, and the smaller inclined plane fixed to it. By turning the crank-wheel, the slide is moved fairly quickly to the opposite end of the slider-bar: the inclined plane carrying off the balls, one at a time, and releasing them again. A progressive longitudinal wave results, the principal features of which, viz., the progressive thickenings and thinnings, are plainly visible.

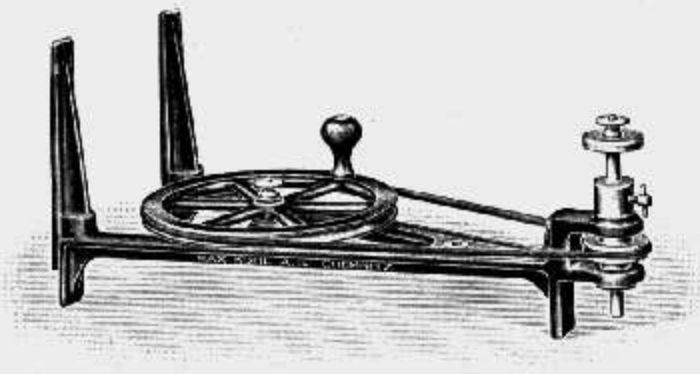
4. Demonstration of Stationary Longitudinal Waves.

The plane of swing of the pendulums is set parallel to the slider-bar, the slider remaining at one end. The divice fitted rotationally on the frame is turned so that the angular wires come between the pendulum wires. The pendulums will now be found to be behind the angular wires, and the balls themselves form a wave. If the device is brought back to the original position, the pendulums are freed, and a stationary longitudinal wave is seen. Three pendulum balls remain at rest and form the knodal points.

5. Conversion of a Transverse Wave into a Longitudinal Wave, and vice versa.

If during an experiment the discs from which the pendulums hang are rotated moderately quickly through 90°, a transverse wave becomes a longitudinal wave, and vice versa.

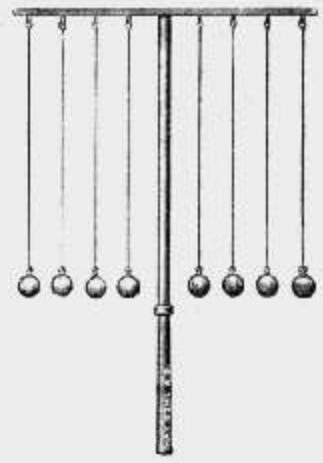
Max Kohl, Aktiengesellschaft, Chemnitz.



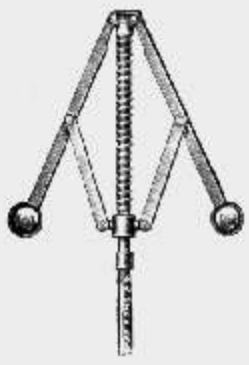
70 201. 1 : 8.



70 202. 1 : 7.



70 203. 1 : 7.



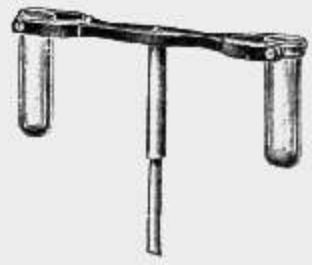
70 204. 1 : 6.



70 205. 1 : 6.



70 207. 1 : 5.



70 206. 1 : 7.

	Reichsmark
70 201. **Hand-driven Whirling Table,** Figure, fitted with special feet enabling the machine to be used both horizontally and vertically	40.—
70 202. **Ball Whirling Apparatus** (August's), with semicircular trough, with two balls of the same diameter but different weights, Figure	8.—
70 203. **Centrifugal Apparatus with 8 Pendulums,** Figure, for proving that centrifugal force increases with the speed of rotation, and, with the same period of rotation, is greater with a wide radius of rotation than with a small radius	11.—
70 204. **Watt's Pendulum,** Figure, for explaining the manner in which the rising and falling motion of the pendulum is transmitted to another device, e. g., throttle valve and the like	10.—
70 205. **Angle with 2 Tubes,** Figure, for mercury and coloured water (Fr. phys. Techn. 6th. Edn., I., Fig. 545. — M. T., p. 70)	7.—
70 206. **Clarifying Device,** Figure, for clarifying cloudy liquids	6.—
70 207. **Bohnenberger's Machine,** Figure, for proving the law of conservation of the plane of oscillation	28.—

When the top is spun, the axis of the top (which is properly balanced and suspended in a gimbal) remains parallel, even where the entire apparatus is rotated on the whirling table.



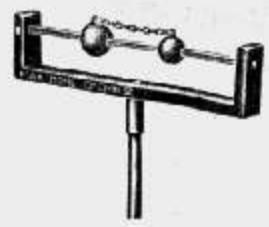
70 208. 1 : 6.



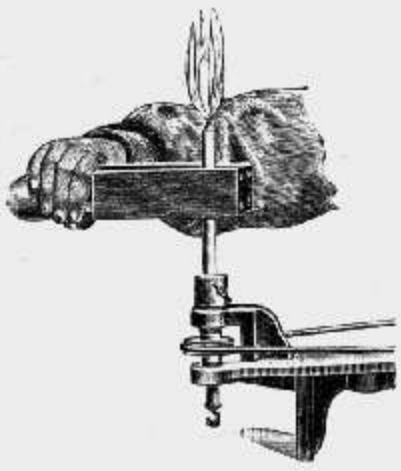
70 209. 1 : 8.



70 210. 1 : 8.



70 211. 1 : 10.



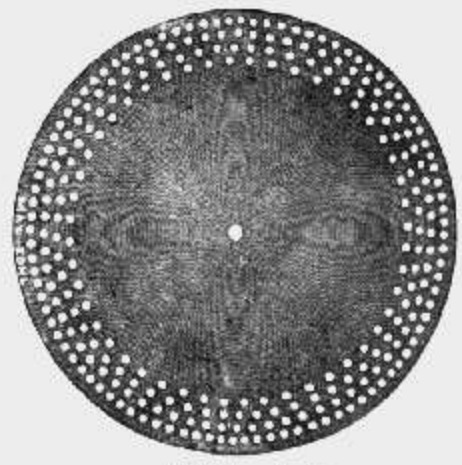
70 212. 1 : 8.



70 213. 1 : 6.



70 214. 1 : 10.



70 215. 1 : 5.

	Reichsmark
70208. **Glass Bottle,** for the parabolic form of liquids when rotated, Figure	3.50
70209. **Glass Vessel** for Mercury and coloured water, Figure	4.50
When the vessel is rapidly rotated, the liquids form rings in the widened-out parts.	
70210. **Savart's Toothed Wheels,** Figure: 4 wheels on one axis, producing a chord. The wheels are made of zinc	10.—
70211. **2 Brass Balls,** Figure, whose masses are as 1 : 2; in iron frame	8.—
70212. **Apparatus for boiling Water, Alcohol or Ether by Friction;** with device for enabling combustible vapours to be ignited, Figure	5.—
70213. **Model of a Draining and Drying Apparatus** on the Separator principle, Figure; consisting of glass globe with wire gauze	10.—
70214. **Flattening Ring,** Figure, for showing the flattening of a rotating body by centrifugal force	5.—
70215. **Siren Disc,** of metal, with four rows of holes; gives a major chord when blown on, Figure	5.—

Max Kohl, Aktiengesellschaft, Chemnitz (Germany)

Telegraphic Address: Physik, Chemnitz.

Scientific Instrument Manufacturers.

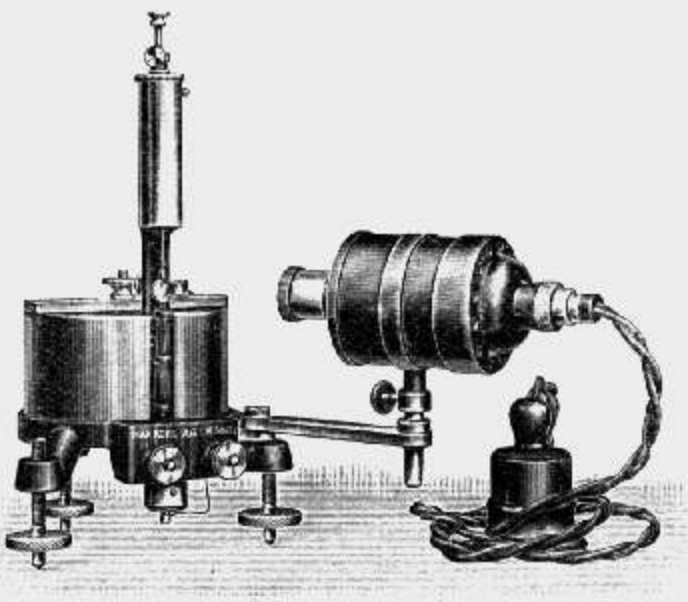
Telephones: 3104, 3105 and 3106.

Adorferstrasse 20.

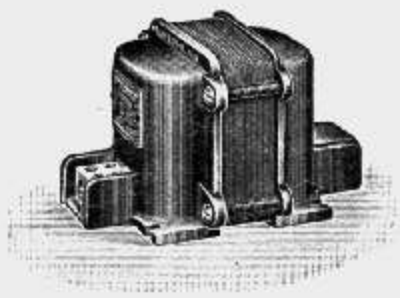
Price Sheet No. 2.

Simple Physical Apparatus.

There has recently been a demand for simple but well constructed physical apparatus. This demand it is our intention to satisfy and we are commencing with the production of new and simplified models of the apparatus in most general use, in which special care will be taken to ensure neatness of design combined with cheapness. The present Price Sheet No. 2 is a continuation of Price Sheet No. 1 recently issued, and embraces a small selection of these simplified instruments and apparatus. Further Price Sheets will be issued at regular intervals, and we ask that the lists be filed away for easy references and later on bound up into one general catalogue.



70 640. 1 : 4.



70 641. 1 : 2.

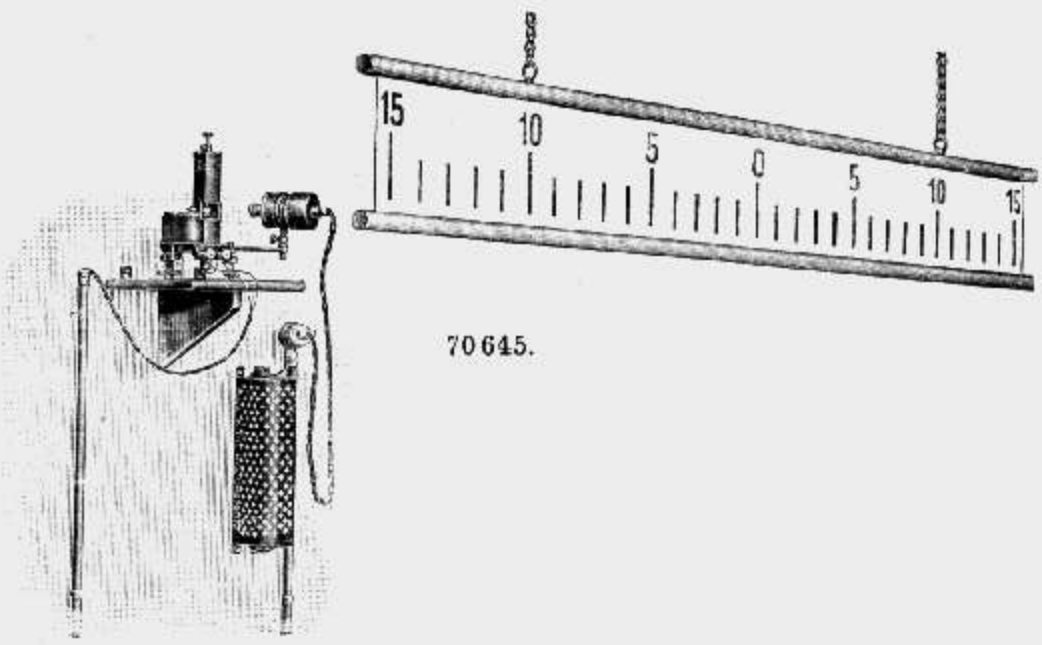


70 643. 1 : 3

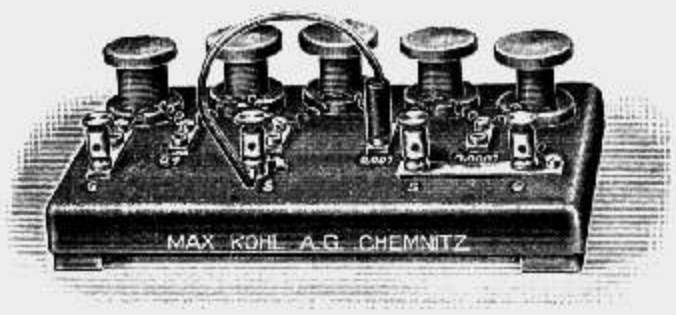
	Reichsmark
70 640. **Reflex Moving Coil Galvanometer,** Figure, with swivelling arm for the lamp, with cord, plug and plug-box for connecting the lamp to the supply	**120.—**

The new galvanometer is highly sensitive (1 mm deflection at 1 m distance = approx. 1.73×10^{-9} Amps.). The resistance of the coil is 50 Ohms **without** the suspension band, and about 60 Ohms with the band. **The deflections are aperiodic.** The coil is fitted with damping windings. The galvanometer is equally suitable for thermal currents and induction currents.

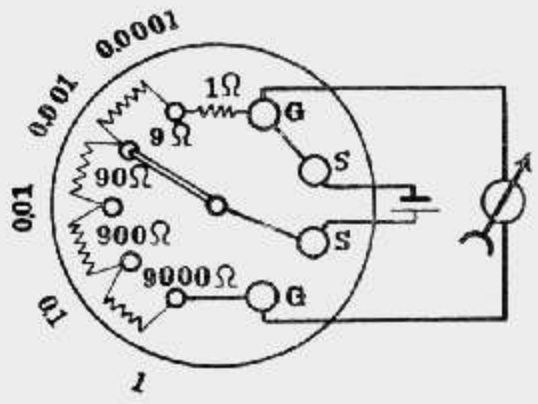
Max Kohl, Aktiengesellschaft, Chemnitz.



70 645.



70 646 A. 1 : 3.



70 646 B.

A 6-Volt Nitra lamp is used for illumination. The luminous pointer is so bright as to be slightly visible even in an undarkened room. With the blinds or curtains half drawn, the scale, pointer and experiment may be observed well at the same time.

Where the 6-Volt lighting lamp is connected to a 110 or 220 Volt supply, a series resistance must be added in the case of direct current and a small transformer in the case of alternating current.

The galvanometer can be conveniently set up on a wall bracket: the scale being suspended from the roof at a distance of 2 metres from the galvanometer, as shown in above illustration.

Reichsmark

70 641. **Series Resistance for the Galvanometer Lamp,** when latter is connected to 110 Volts direct current, Figure . . . . . 15.—

70 642. — idem, for 220 Volts direct current . . . . . 35.—

70 643. **Transformer for the Galvanometer Lamp,** when latter is connected to 110 to 220 Volts alternating current, Figure . . . . . 20.—

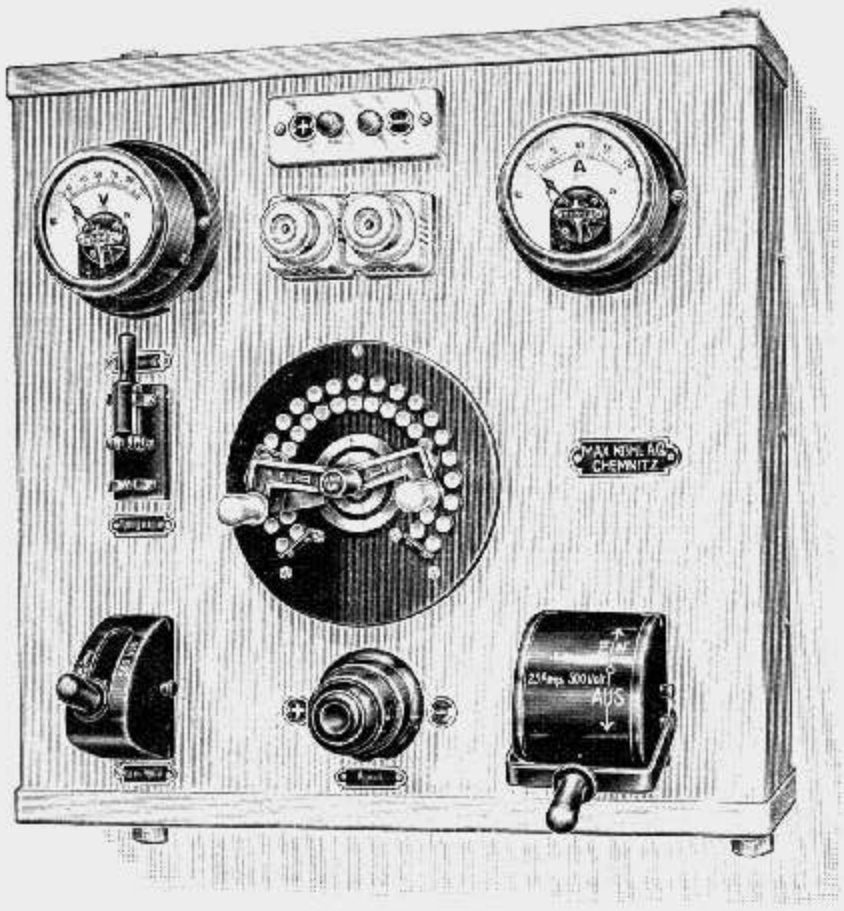
70 644. — idem, for 220 Volts alternating current . . . . . 20.—

70 645. **Transparent Scale of Tracing Cloth,** on bars, divided every 5 cm, with lugs for suspending from the ceiling, Figure . . . . . 12.—

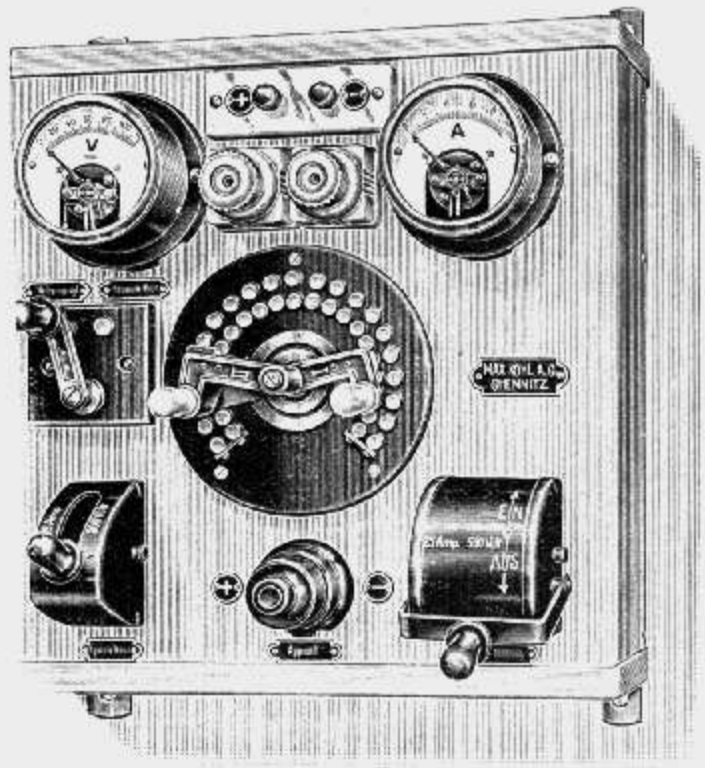
70 646. **Shunt** for reducing the sensitivity in 4 stages: 0,1; 0,01; 0,001; 0,0001. Figure A 25.—

The shunt is connected by Ayrton's method, Fig. B. The terminals G are connected with the galvanometer and the terminals S with the voltage to be tested.

70 647. **Wall Bracket** for setting up the galvanometer, Figure . . . . . 6.—



70 101. 1 : 6.

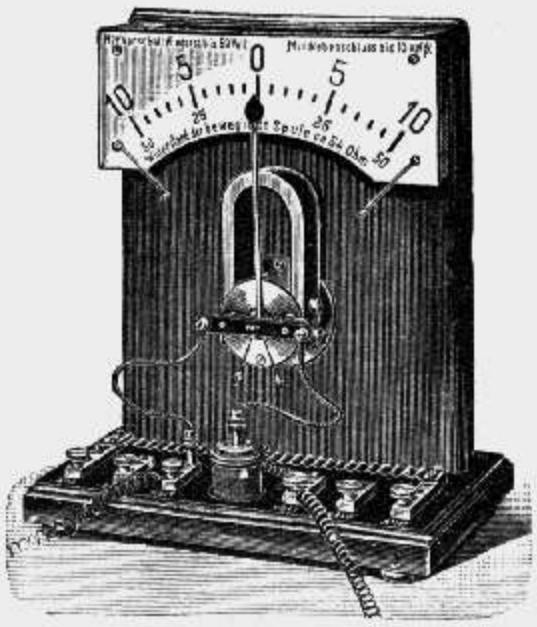


70 102. 1 : 6.

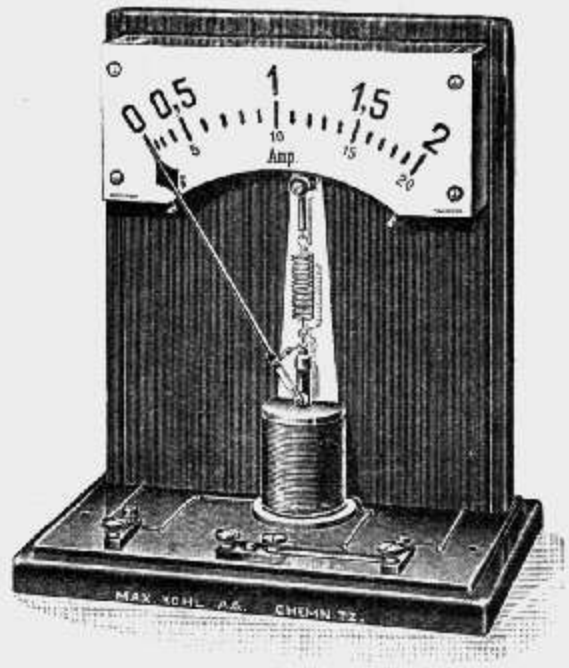
	Reichsmark
70 101. **Experimental Switchboard,** Model K 1, Figure, for fitting to the wall. For connecting up to **110 Volts Direct Current;** for dealing with **from 0,04—20 Ampères** and **0,4—110 Volts** from the supply main. With **double-crank current regulator** and **precision meter instruments.** Figure	320.—

The switchboard is fitted with: 1 rheostat of 24 Ohms resistance variable in 21 stages and for a max. load of 5—20 Amps., with double-crank regulator having 21 contacts; 2 terminals for the supply line; 2 fuses; 1 main switch; 1 dead-beat precision ammeter; 1 dead-beat precision voltmeter; 1 voltmeter switch; 1 switch for the potential-dividing shunt; 1 plug-box with plug.

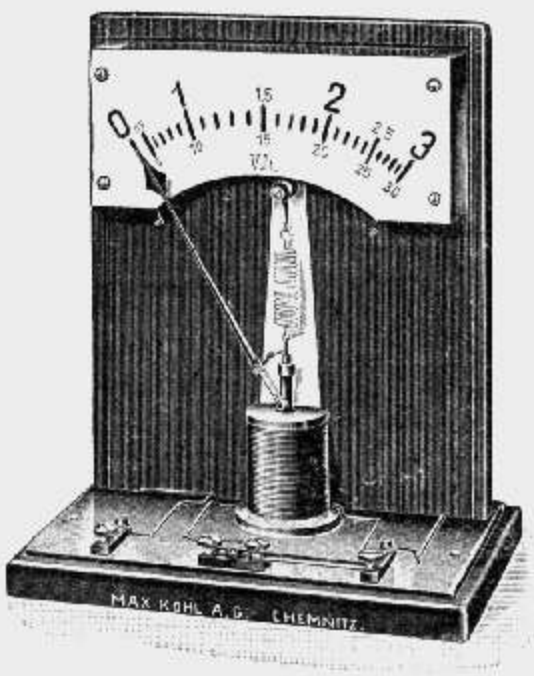
70 102. **Experimental Switchboard,** Model K 2, equipped as above; for connecting up to **110 Volts Direct Current;** for dealing with voltages of **0,4—110 Volts** and currents from **0,04—10 Ampères,** Figure	280.—
70 103. **Experimental Switchboard, Model K 3,** cf. Figure 70 101; for fitting to the wall. For connecting up to **220 Volts Direct Current;** for dealing with network inputs of **0,04—10 Ampères** and pressures of **0,4—220 Volts.** With **double-crank current regulator** and with **precision meter instruments.**	330.—



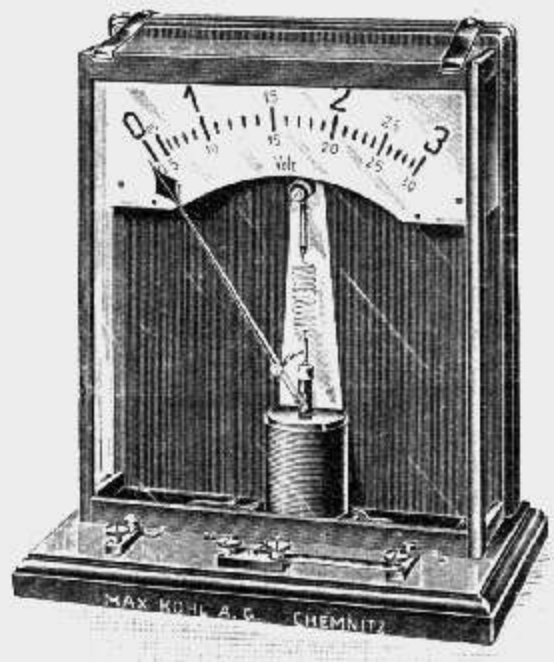
70 652. 1 : 6.



70 650. 1 : 6.



70 651. 1 : 6.



70 651 and 70 653. 1 : 6.

	Reichsmark
70 650. **Direct Current Demonstration Ammeter,** Kohlrausch system, Figure; range 0,2—2 Amps., with shunt to 20 Amps.	**60.—**
The instrument is fitted with a scale visible at a distance, and explains very clearly the construction of the ammeter, as all parts are arranged open. **The scale can be read from both sides.**	
70 651. **Direct Current Demonstration Voltmeter,** Kohlrausch system, Figure; range 0,5 to 3 volts, with additional resistance for increasing the range ten times	**60.**
The voltmeter is similar in construction to ammeter No. 70650, and only differs from it by the winding and calibration. **The scale can be read from both sides.**	
70 652. **Universal Dead-beat Moving Coil Measuring Instrument,** Deprez-d'Arsonval system, Figure, for **Direct Current,** with detachable moving system. Can be used: (1) as an **Ammeter,** range 10–0–10 Ampères; (2) as a **Voltmeter,** range 50–0–50 Volts; (3) as a **Vertical Galvanometer,** range 2–0–2 Milliampères and 200–0–200 Millivolts. Scale can be read from both sides	**96.—**
70 653. **Glass Cases** for Nos. 70 650, 70 651 and 70 652, Figure . . . . . Each	**10.—**

Max Kohl, Aktiengesellschaft, Chemnitz (Germany)
Telegraphic Address: Physik, Chemnitz.
Scientific Instrument Manufacturers.
Telephones: 3104, 3105 and 3106.
Adorferstrasse 20.

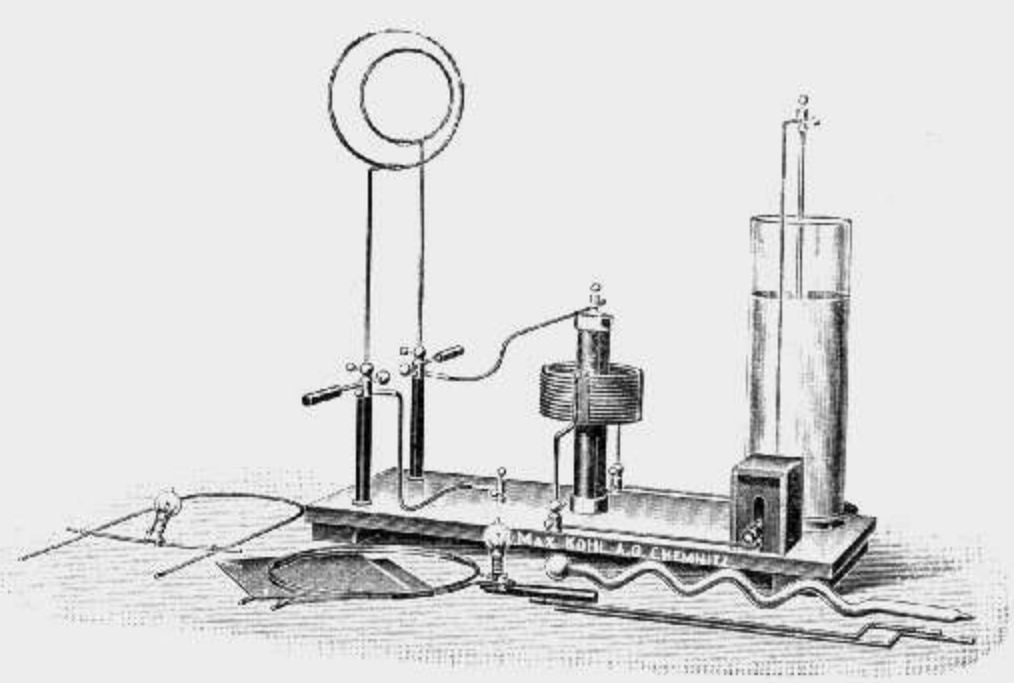
December 1926.

Price Sheet No. 3.

Simple Physical Apparatus.

There has been a steadily increasing demand recently for simple but well constructed physical apparatus. It is our intention to meet this demand, and we are now commencing the manufacture of new and simplified designs of the apparatus in most frequent use, our aim being to secure neatness of appearance combined with cheapness. The present Price Sheet, a continuation of Sheets Nos. 1 and 2, includes a small selection of simplified apparatus. Further Price Sheets will be issued from time to time, and we should be glad if the lists could be kept for handy reference and bound up into one list when completed.

Max Kohl, Aktiengesellschaft, Chemnitz.



95 905. 1 : 12.

95 905. **Complete Apparatus for Experiments with Currents of High Frequency and Voltage** (Tesla's experiments), with **High Tension Transformer** (Elster and Geitel type), Figure. Description. (Cf. also Zeitschrift f. d. phys. u. chem. U., **9**, 1896, p. 139) . . . . . | Reichsmark **96.—**

The apparatus consists of: 1 Leyden Jar, 40 mm high; 1 spark micrometer with zinc points; 1 Elster and Geitel High-Tension Transformer and 1 sparking pillar, mounted together on one board; 1 wide copper wire spiral with incandescent lamp attached and with handle; 1 copper bow with incandescent lamp for the impedance phenomenon; 2 brass plates as conductors; 2 thick, circular copper wires for concentrating the brush discharges; 2 parallel wires for the same experiment; and 1 electrodeless Tesla tube 50 cm in length.



70104. 1:10. 800×800 mm.

70104. **Experimental Switchboard, Type L 1,** Figure, for fixing to the wall; for connecting up to **110 Volts** Direct Current; for taking currents of from **0,03—30 Ampères** and pressures of **0,3—110 Volts** from the supply; with **Precision Instruments** and **Double-crank Rheostat with 30 stages.** A full description and instructions for use will be supplied on request . . . . . Reichsmark 640.—

Weight: Approx. 70 kg net; approx. 105 kg gross.

The switchboard is mounted with the following: one 36-Ohm regulating resistance, variable in 30 stages, for a maximum load of 5—30 Ampères, with 30-contact double-crank switch; two terminals for connecting up to the supply; 2 fuses; 1 mainswitch (quick-break type); 1 aperiodic precision ammeter; 2 measuring resistances; 1 ammeter switch; 1 aperiodic precision voltmeter; 1 voltmeter switch; 1 switch for the potential-dividing shunt; 1 plug-box with plug and 4 metres of flexible; 3 fuses for protecting the rheostat from overloading; 1 red indicator lamp for showing when the current is on.

70105. **Fine Regulating Resistance,** fitted to the switchboard; can be used for currents up to 20 Ampères; with an approximate resistance of **0,9 Ohm** . . . . . **Extra Price:** 30.—

70106. **Double-range Meters** fitted, enabling small currents and voltages to be measured accurately. **Extra Price:** 50.—

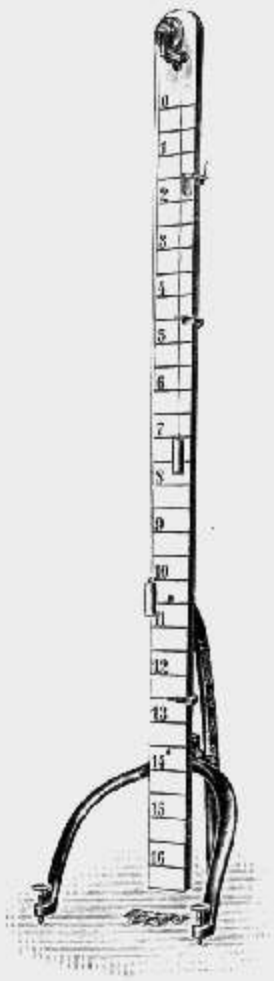
The ranges are 0—30 and 0—3 Ampères, and 0—120 and 0—12 Volts.

Like our switchboard Type A 1, the board above listed is capable of a wide variety of uses. The price has been reduced by cutting down all unnecessary material. Although the marble panel has been dispensed with, this new board is just as fine in appearance as the older type.

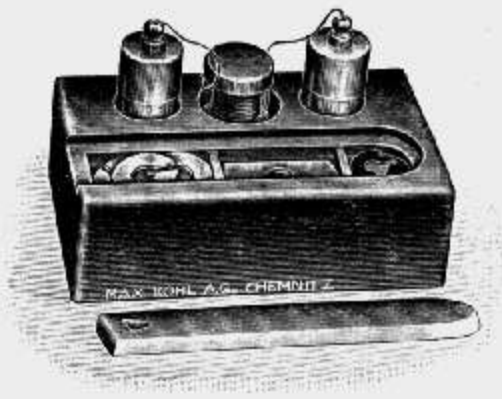
70107. **Experimental Switchboard Type M 1,** cf. Figure 70104, for fixing to the wall; for connecting up to **220 Volts** Direct Current; for dealing with supply currents of **0,04—20 Ampères** and pressures of **0,4—220 Volts;** with **Precision Instruments** and **Double-crank Rheostat** with 30 stages of regulation . . . . . 650.—

Weight: Approx. 70 kg net; approx. 105 kg gross.

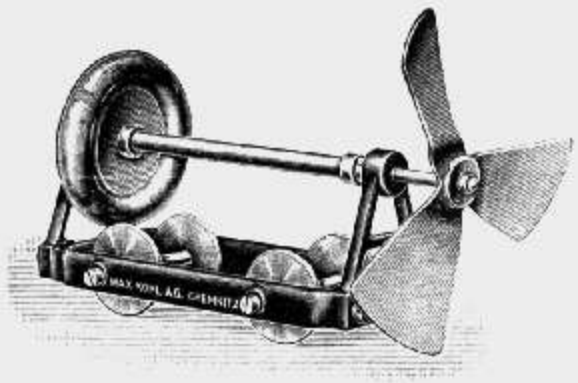
The switchboard is mounted with the following: one 48 Ohm regulating resistance variable in 30 stages, for a maximum load of 5—20 Ampères, with 30 contact double-crank switch; 2 supply terminals; 2 fuses; 1 main switch (quick-break type); 1 aperiodic precision ammeter; 2 measuring resistances; 1 ammeter switch; 1 aperiodic precision voltmeter; 1 voltmeter switch; 1 switch for the potential-dividing shunt; 1 plug-box with plug and 4 metres flexible; 3 fuses for protecting the rheostat against overloading; 1 red indicator lamp for showing when the current is on.



70216 A. 1 : 20.



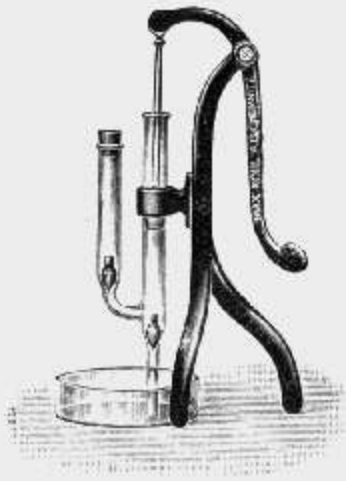
70216 B. 1 : 3.



70219. 1 : 4.

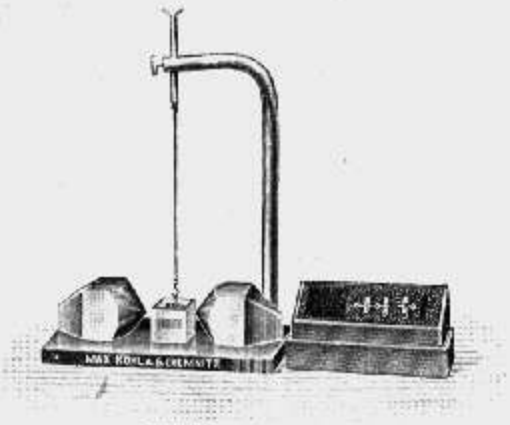


70217. 1 : 6.

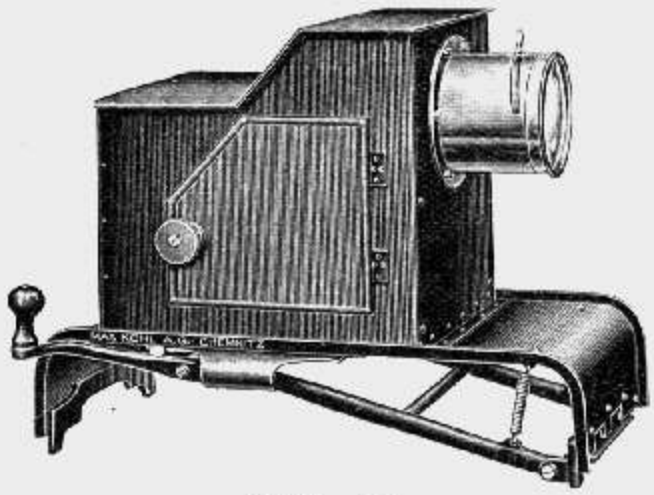


70218. 1 : 6.

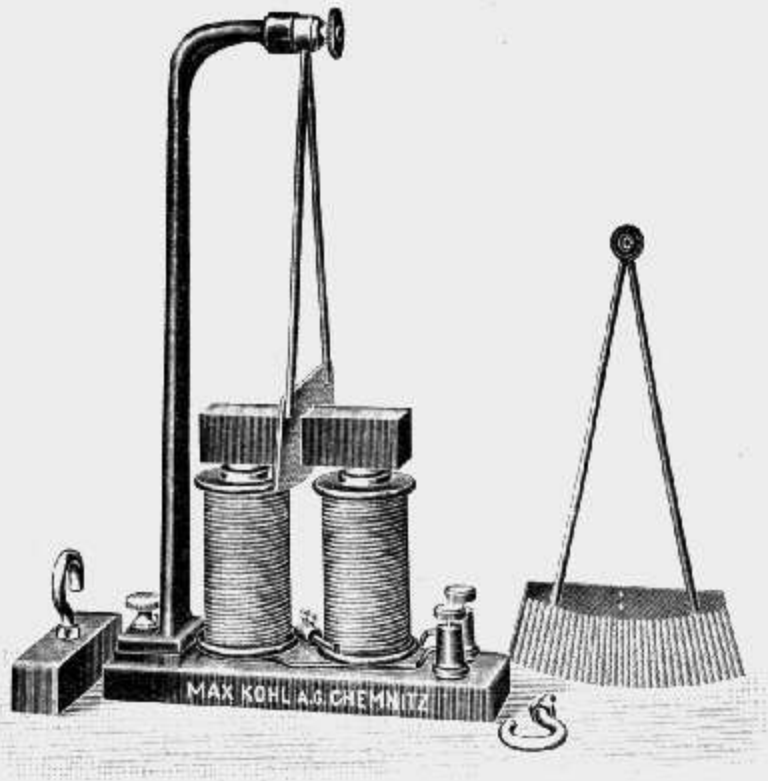
	Reichsmark
70108. **For currents to 30 Ampères** . . . . . **Extra Price:**	40.—
70109. **Fine-Regulating Rheostat**, fitted to the switchboard; can be used to **10 Ampères**, with a resistance of 1,8 Ohm . . . . . **Extra Price:**	30.—
70110. **Double-range Meters**, for enabling small currents and voltages to be measured accurately . **Extra Price:** The ranges are 0—30 and 0—3 Ampères, and 0—250 and 0—25 Volts.	50.—
70216. **Atwood's Fall Machine,** Figures A and B, (Weinhold type) (W. D. Fig. 64 [59]), with white-lacquered scale-board on firm iron support with levelling screws, device for releasing the weight, catchment tray for the excess weights, receiving tray with two drop-weights consisting of three single weights of 70, 98 and 98 grams, screwed together, cord pulley of 50 grams moment of inertia, with 4 ordinary weights, 3 excess and 3 friction weights. In addition to demonstrating the actual laws of fall, the machine enables all of Weinhold's experiments on **force, mass** and **acceleration** to be proved. A metronome may conveniently be used as a seconds indicator . . . . . The fall weights, ordinary, excess and frictional weights are fitted in a container block (see illustration) to prevent their getting lost. **Detailed Description gladly forwarded on request.**	72.—
70217. **Model of a Suction Pump,** Figure, of glass, with iron stand	11.—
70218. **Model of a Force Pump,** Figure, of glass, with iron stand	12.—
70219. **Model of a Ship's Propeller** and of an **Aeroplane Propeller,** Figure, consisting of a small four-wheeled trolley which is set into motion by the propeller, the latter being actuated by passing a piece of string quickly over it	26.—



95 120. 1 : 4.



70 220. 1 : 8.



95 118 and 95 119. 1 : 5.

	Reichsmark
70 220. **Episcope,** Figure, for use in conjunction with school projection apparatus Nos. 50 730, 50 735 and 50 740, for distances of 4–6 metres between object-glass and screen . . .	240.—
Of recent times, it has been found very desirable to be able to project opaque pictures and objects. We have therefore constructed the apparatus illustrated above, which it is only necessary to set up on the optical bench of our school lanterns after removing the condenser of the projection apparatus. By using a large, luminous projector objective, considerable brilliance is attained, especially where an arc-light regulator is used as the source of light. The pictures, and especially coloured post cards, appear on the screen with surprising beauty. The frame for holding the pictures, etc. is arranged so that it can be folded down to enable the pictures and so forth to be inserted easily.	
95 118. **Electro-magnet** after Weinhold, simple pattern, without accessories, Figure	34.—
The electro-magnet is used for experiments on the carrying capacity of electro-magnets, for demonstrating v. Waltenhofen's pendulum in conjunction with No. 95 119, and for experiments on paramagnetism and diamagnetism in conjunction with No. 95 120.	
95 119. **v. Waltenhofen's Pendulum,** suitable for No. 95 118, with one plain and one solid piece of copper, Figure	20.—
95 120. **Accessories for Experiments on Para- and Diamagnetism,** Figure, 2 half-armatures with conical poles, 1 ebonite plate with arm for suspending the bismuth and nickel rods, and a small glass tube (which should be filled with iron chloride), 1 glass cube. Description	14.—

Max Kohl, Aktiengesellschaft, Chemnitz (Germany)

Telegraphic Address: Physik, Chemnitz.

Scientific Instrument Manufacturers.

Telephones: 3104, 3105 and 3106.

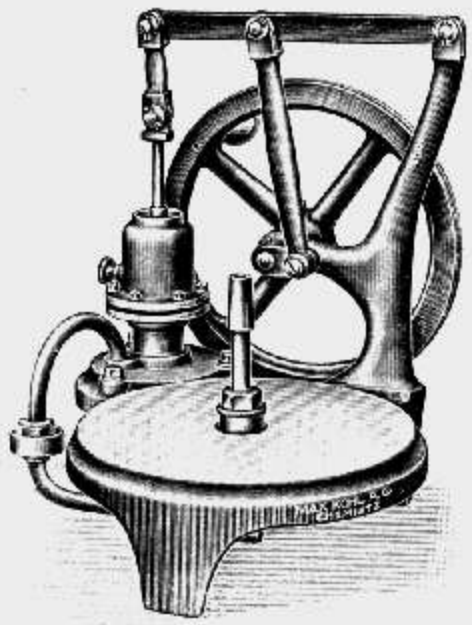
Adorferstrasse 20.

Price Sheet No. 4.

Simple Physical Apparatus.

This Price Sheet No. 4 is a continuation of the lists Nos. 1—3 previously issued; and we trust it will meet with the same approval as the earlier lists.

Max Kohl, Aktiengesellschaft, Chemnitz.



70 251. and **70 252.** 1 : 7.

New Oil Air-pump with Flywheel and Plate.

Considerable progress has been achieved in recent years in the design of air-pumps; but hitherto no small, efficient and reasonably cheap pump has been manufactured, especially for school use.

The present pump fulfils every requirement of an air-pump for school use. It is compact, having a width of 32 cm, a length of 36 cm, and a height of 38 cm. It weighs 16½ kilos.

The pump is very smooth in action. After the first few revolutions, during which the running is a little heavier, the action becomes gradually easier, requiring but little power to work it when the maximum degree of rarefaction has been reached. A child can easily manipulate the pump at that stage.

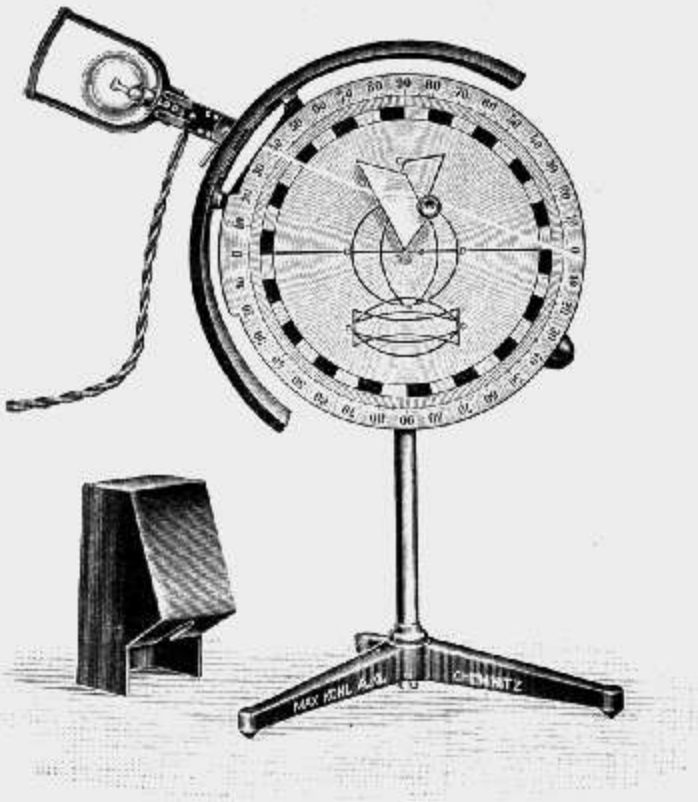
The pump is surprisingly efficient; as, although only fitted with a single barrel, it gives in a short space of time a sufficient degree of exhaustion to produce stratified light in a vacuum tube. By continuing the pumping operation a stage further, the commencements of the Tesla light are produced in the tube.

The following results were obtained from measurements on a Mac Leod vacuum gauge:			
After 100 r. p. m.	1 mm Mercury	After 400 r. p. m.	0,03 mm Mercury
After 200 r. p. m.	0,2 mm Mercury	After 500 r. p. m.	0,02 mm Mercury
After 300 r. p. m.	0,05 mm Mercury	After 700 r. p. m.	0,018 mm Mercury

The special design of pump-barrel adopted entirely eliminates the return of the oil.

The base-plate is specially shaped out in the form of a pump-plate, and into the centre of this may be screwed a standard threaded attachment, to which may be attached vacuum tubes and other apparatus, fitted with corresponding unions.

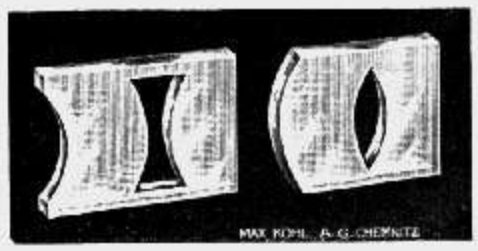
	Reichsmark
70 251. **Single-Barrel Oil Air-pump with Flywheel and Plate,** Figure, vacuum attainable 0,02 mm mercury pressure	**180.—**
64 015. **Vacuum Tube** for directly connecting to the ground part of screwed union No. 70 252; with glass stopcock for the re-introduction of air	**10.—**
70 252. **Screwed Adaptor** for screwing into the plate of the air-pump and with standard ground attachment for connecting up to the vacuum tube No. 64 015	**10.—**
70 253. **Screwed Adaptor** for screwing into the air-pump plate, with fluted attachment for making connections, by rubber tubing, with any space to be evacuated	**10.—**



70 402. 1 : 7.5.



70 402. 1 : 7



70 407. 1 : 5. 70 408. 1 : 5.

	Reichsmark
70 402. **Hartl Optical Disc,** with illuminating attachment fitted, Figure (Nos. 1—17), for demonstrating the laws of elementary optics; for experiments with single rays and pencils of ray (Ztschr. f. d. phys. u. chem. U., **9**, pag. 113; M. T. Fig. 134)	140.—

The following are included in the apparatus: 2 gap-plates with 3 and 7 gaps; coloured glass plates and brass plate; **1** glass plane mirror; 1 glass concave and convex mirror; 1 each semi-circular and trapezoidal crystal-glass plate; 1 bi-convex and 1 bi-concave cylindrical lens (crystal glass), also an equilateral triangular prism.

The many possible ways of using the Hartl optical disc have gained many adherents for this apparatus. Hitherto, direct sunlight was necessary for conducting the experiments or a polarisation apparatus. Both these methods made the experiments rather a trouble, as the lecturer was restricted to one definite spot at which the apparatus had to be set up. By fitting a special illuminating device to the apparatus, this inconvenience is obviated. The experiments can also be made quite well in an undarkened room.

The illuminating device consists of a glow-lamp for a tension of 16 volts, placed at half the focal length of a concave mirror. The concave mirror projects a parallel pencil of rays on to the optical disc. The lighting device is fixed to the rotary diaphragm screen and moves with it, thus greatly facilitating the experiments.

The lighting device can be placed so that the pencil of rays encounters the optical disc at an angle, or runs parallel to the disc. The latter method is used for polarisation apparatus No. 70 410.

For running the glow-lamp from a 110, 120 or 220 volt circuit, a small transformer is required in the case of three-phase or alternating current, or a series resistance in the case of direct current.

Accurate directions for use are supplied with each apparatus.

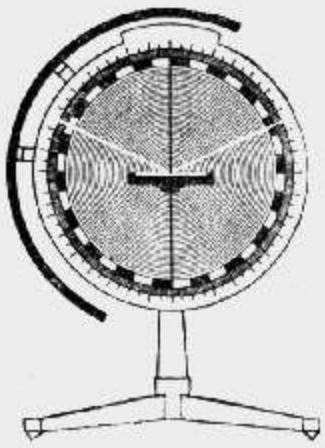
70 403. **Illuminating Device alone,** for fitting to existing optical discs	48.—
70 404. **Hartl Optical Disc, without Illuminating Device**	100.—
70 405 a. **Alternating Current Transformer** for connecting the glow-lamp up to a 110 or 220 Volt A. C. supply	20.—
70 405 b. — idem, for connecting to a 220 Volt A. C. supply	20.—
70 406 a. **Series Resistance** for connecting the glow-lamp to a 110—125 Volt D. C. supply . .	15.—
70 406 b. — idem, for connecting to a 220 Volt D. C. supply	35.—
70 407. **Device for Reversing the Action of a Lens;** consisting of a glass plate with bi-concave section cut out; for screwing to the optical disc, Figure	10.—

A parallel pencil of light falling on the bi-concave air-lens, is combined to a focus as it would be by a glass condenser lens.

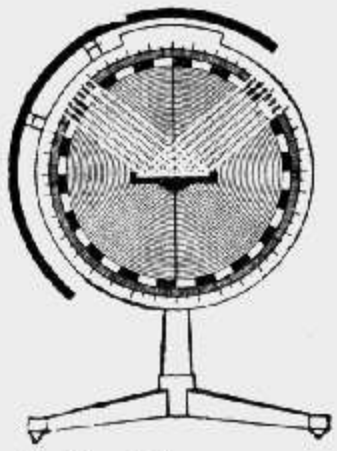
70 408. — idem, with bi-convex section cut out; acting as a dispersing lens, Figure . .	10.—
70 409. **Circular Disc** with semi-cylindrical liquid trough and degree graduation; for fixing to the optical disc	24.—

The liquid trough is used for showing the refraction of light in liquids.

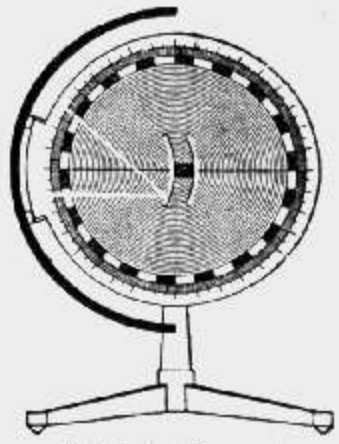
Max Kohl, Aktiengesellschaft, Chemnitz.



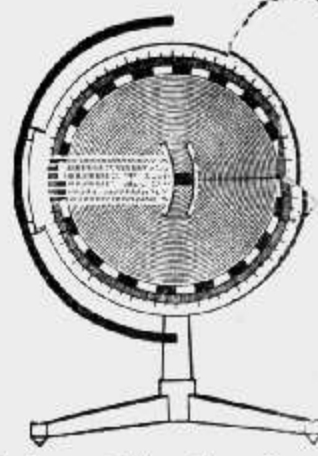
1. Reflection at plane surfaces.



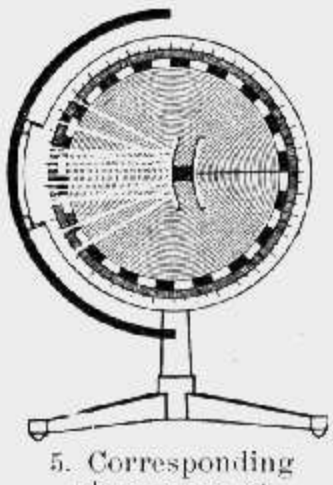
2. Parallel rays are reflected parallel.



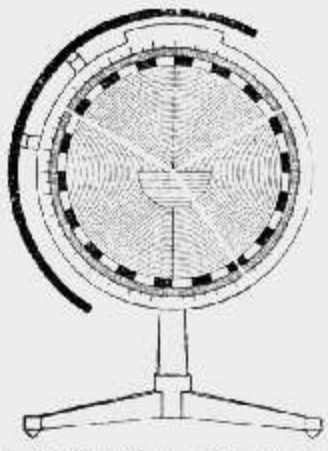
3. Reflection at concave mirror.



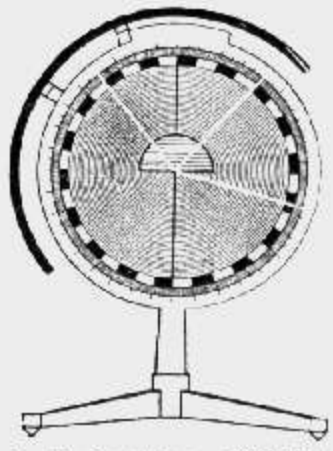
4. Rays striking the surface parallel are reflected towards the focus (Catacaustics).



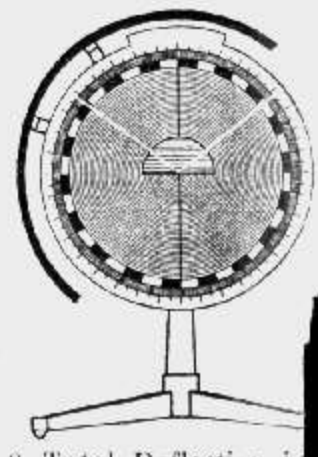
5. Corresponding phenomena at Convex Mirror.



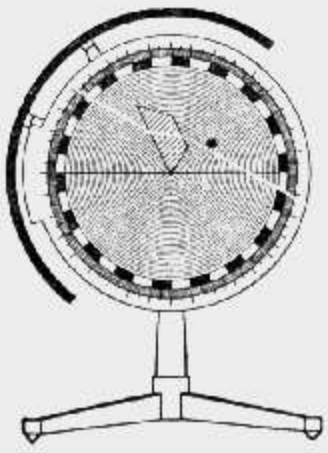
6. Refraction of light and reflection between air and glass; determination of refractive indices



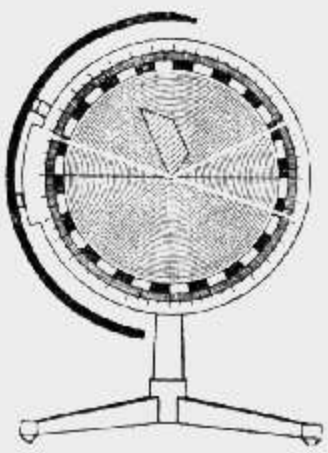
7. Refraction of light between glass and air.



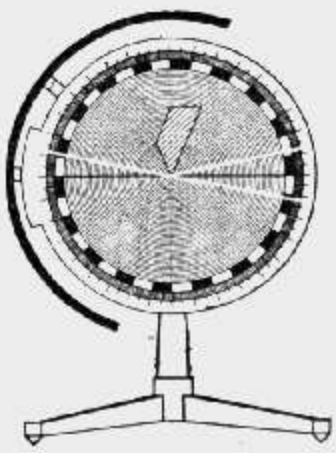
8. Total Reflection in glass.



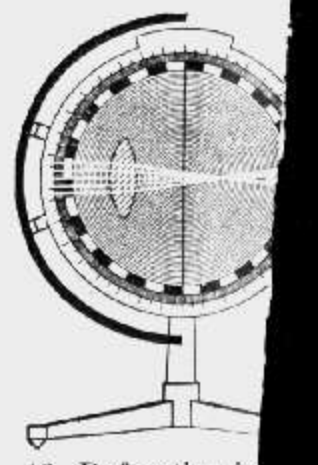
9. Refraction in a plane plate.



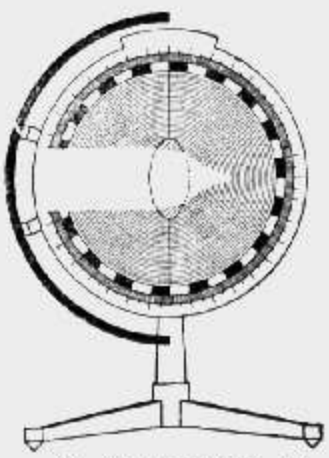
10. Refraction at a 45° prism; colour dispersion.



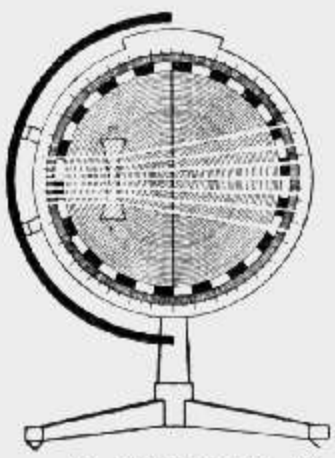
11. Minimum deflection with symmetrical ray.



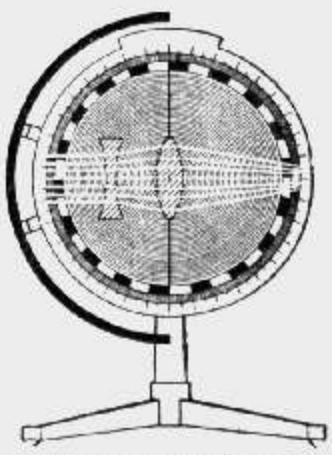
12. Refraction in condensing lens. F



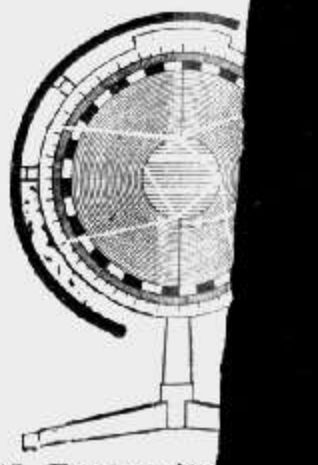
13. Converging of parallel rays at the focus.



15. Divergence of parallel rays.

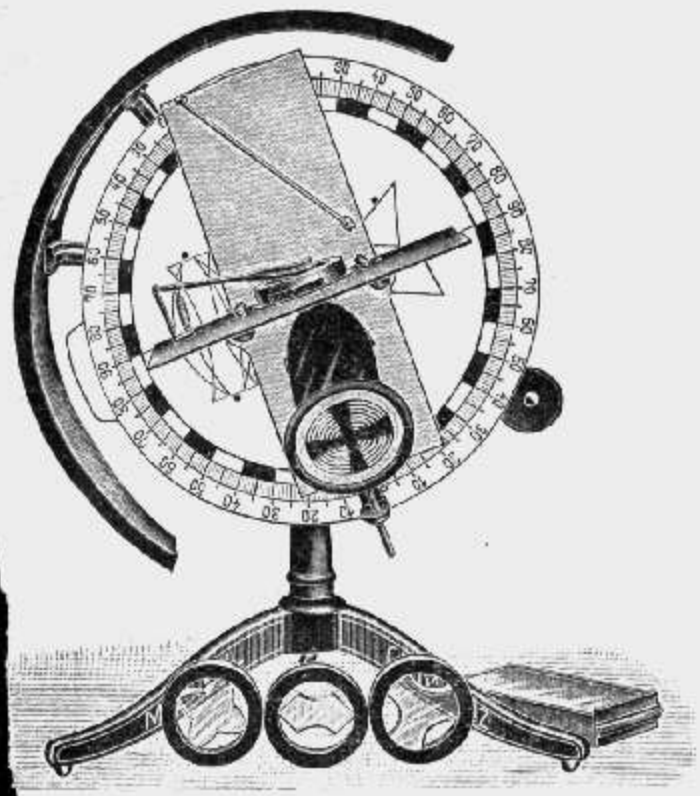


16. Combination of lenses.

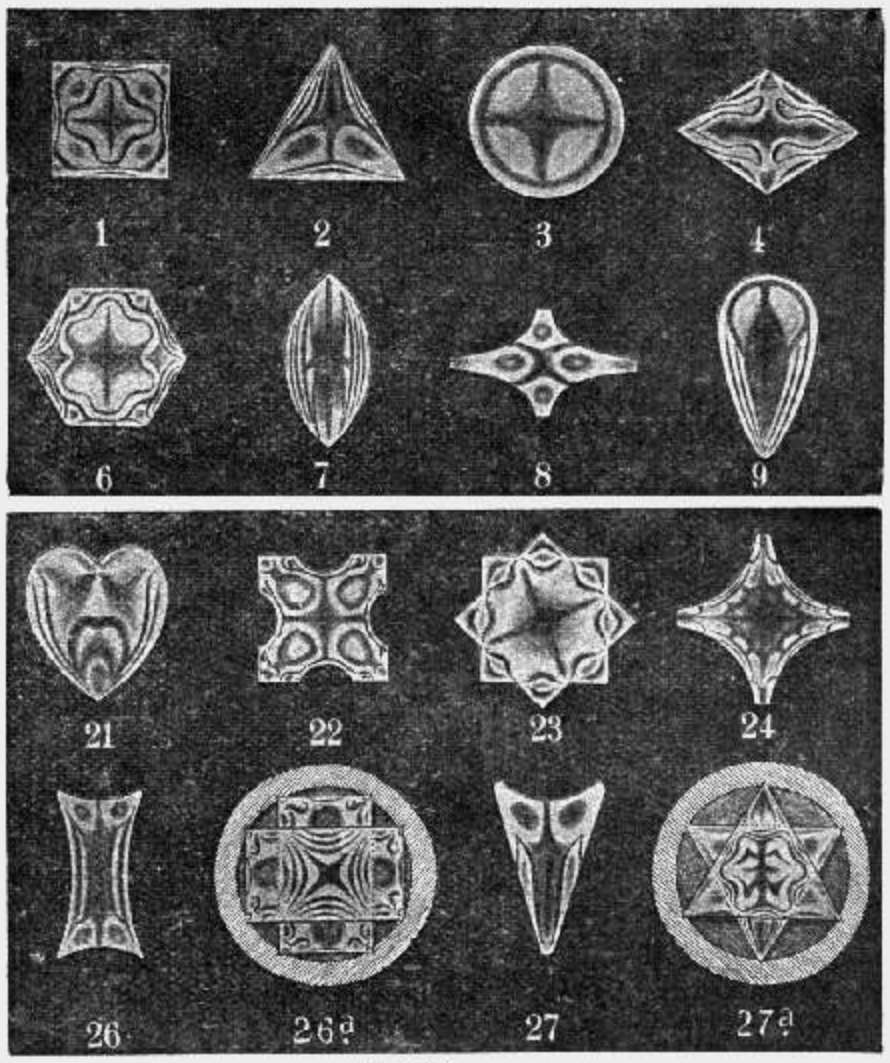


17. Explanation rainbow.

A few Experiments with the Hartl Optical Disc.



70410, 70404, 70411. 1:6.



70411. 1:4.

	Reichsmark
70410. **Polarisation Apparatus** for attaching to the Hartl Optical Disc, Figure (Ztschr. f. d. phys. u. chem. U. **19**, 1906, pag. 105); without glass preparations	66.—

The following may be demonstrated: Uniform reflection of ordinary, unpolarised light; polarisation by reflection: polarisation by repeated refraction; chromatic polarisation; the phenomena in converging, polarised light.

The apparatus consists of 1 rectangular sheet metal plate, which is fixed to the optical disc; 1 special glass plate and 1 set of glass plates as interchangeable polarisers; 1 rotary black mirror-glass plate as analyser; 1 small stage inserted between the former; 1 small projection screen; 1 condensing lens for producing converging rays; and 1 sheet metal screen for completely covering the projecting screen.

Fig. 70410 shows the illustration when using a uniaxial crystal of sodium nitrate.

1. **Rapidly annealed Glasses,** Figure, for the Hartl polarisation apparatus, in wood mount, for producing interference images . . . . . Each, as selected	3.—

The glasses show, in polarised light, the interference images obtained in Fig. 70411. Two crossed glasses may also be used (see Nos. 26a and 27a, Fig. 70411); but it is advisable, in that case, to use the special base-plate listed under No. 70412, this being fitted with a special mount, so that the top plates can easily be interchanged.

. **Base Plate for Crossed Glasses,** for producing **Interference Images**; consisting of a apidly-annealed glass with special wood mount; for use in conjunction with the apidly annealed glasses listed under the previous number. . . . . Each	4.—

The glasses of the shapes shown in Nos. 1, 2 and 7, Fig. 70411 are specially suitable as base-plates. aless otherwise requested, the triangular base-plate No. 2 is supplied. The mount of the base-plate fitted with special clamps, one of which may easily be released, enabling the upper plates to be ickly interchanged.

Projection Lens, to enable the interference figures to be projected in a size of cm diameter on a screen. This lens is fixed to the Polarisation Apparatus No. 70 410 place of the small screen	7.—

Max Kohl, Aktiengesellschaft, Chemnitz.

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No. 50, v. 2+3
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Price List No. 50, Vols. II and III.

Physical Apparatus.

VOL. II.

Apparatus and Supplies for general use. Introduction to Physics. Mechanics. Wave Theory. Acoustics. Optics. Heat. Meteorology. Cosmology.

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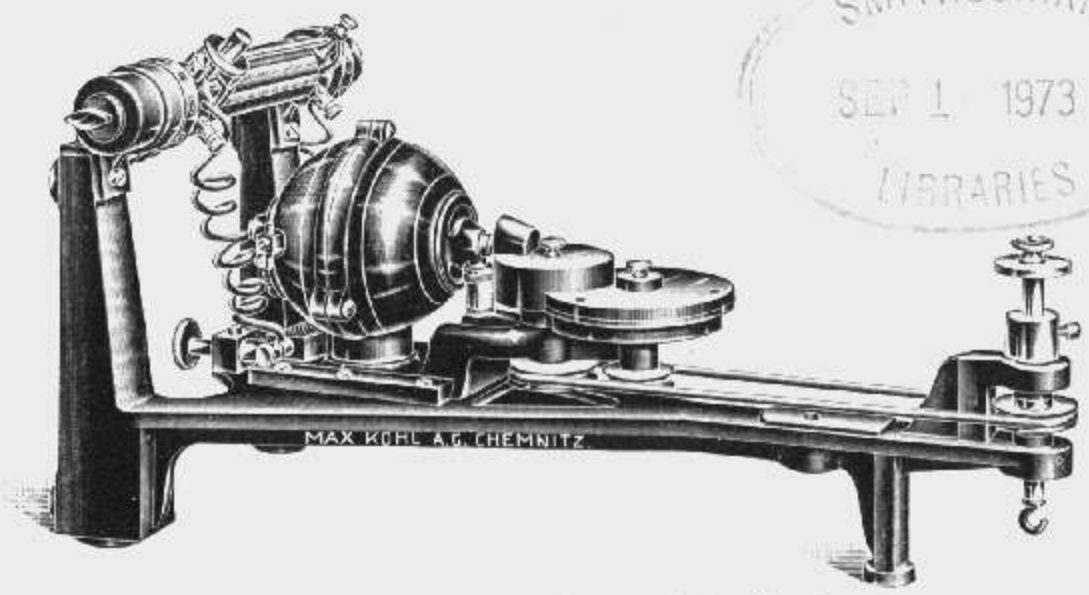

Electrically driven Whirling Table with double Gearing.

MAX KOHL A. G.

CHEMNITZ (GERMANY)

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Fully paid-up Share Capital:
£ 80,000.

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Printed by Hugo Wilisch, Chemnitz

The present list forms the second portion of our Price List No. 50 published in the autumn of 1909. The list here presented contains descriptions and prices of Physical Apparatus brought up to date in accordance with the present state of instruction in Physics.

We have spared neither cost nor trouble to render the arrangement of the list as comprehensive as possible and to facilitate the selection of apparatus by means of suitable illustrations. The latter are reproduced from photographs almost without exception and therefore give an exact idea of the apparatus, as in making illustrations from drawings a certain amount of discretion is generally left to the draughtsman.

A carefully compiled index at the end of the list facilitates the selection of apparatus.

In presenting this Price List to physicists and others interested, we would ask that frequent use might be made of it and that the list itself might be kept for reference.

It is always our endeavour to improve upon our apparatus and to make a thorough test of all goods before despatch, with a view to giving complete satisfaction to our customers. The steady increase in the output of our apparatus is proof that we are working in the right direction.

In order to fill orders as rapidly as possible we hold a large stock of Physical Apparatus to the value of £ 20 000—£ 25 000, while the completeness and modern character of the equipment of our works renders it possible for us to execute even the largest orders in the minimum of time.

In order to shew the development of our works we append the following table shewing some of the important points in its progress:

Year	Area	Working Space	Available Power	Number of Officials	Number of Workmen	Total Staff
		sq. m.	H. P.			
1888	—	195	—	3	16	19
1892	—	400	3	5	29	34
1896	1600	1750	13	11	68	79
1900	7000	7000	75	27	148	175
1905	10000	7000	150	35	270	305
1911	10600	10000	260	45	360	405

We shall be glad to send a complete description of our factory and its equipment, in the form of a pamphlet richly illustrated, gratis and post free to our clients.

Conditions of Sale.

The prices in this list are for nett cash payment without discount.

In the case of Educational Institutions, time will be granted for payment where orders representing large sums are concerned, should this be necessary.

The prices given are for delivery and payment at Chemnitz.

In the case of deliveries not on account of German officials or German State or Municipal Educational Institutions, we reserve to ourselves the right to request the value of the account before despatching the goods or to require payment on delivery, unless we are convinced from previous dealings, or by obtaining references, as to solvency of customers.

Stamp Duties, payable in certain countries on accounts, should be met by the buyer. We neither concern ourselves with stamping nor assume any responsibility for any omission in this respect.

Time of delivery is given where possible and is strictly adhered to, though we can take no responsibility for the consequences of unavoidable delays.

In the case of foreign orders it is necessary to send us any special instructions as to consignment or the payment of Customs Duty.

Cases and packing are in all cases charged for separately at cost price. The prices quoted for packing in the case of the individual articles only apply to simple packing for land transit; packing suitable for marine transit being as a rule charged double. We pack oversea consignments in zinc-lined cases or in cases with oil-cloth lining, unless otherwise requested. Oversea consignments to European Ports are sent in ordinary cases, unless marine packing is specially asked for.

Packing is carried out with great care by skilled packers; but we protect our clients from loss by insuring consignments against breakage and loss, the lowest possible premium being charged. If damage is reported we therefore replace articles free of cost.

Complaints are not considered unless made immediately on receipt of the goods.

The illustrations appended to the Price List do not always agree perfectly in all particulars with the apparatus supplied, since in many cases alterations to and improvements in apparatus often shew themselves practicable.

In the case of many of the illustrations, Auxiliary Apparatus, etc. are included in the illustration in order to facilitate the construction and use of the apparatus (e. g., Fig. 51,151, the experimental apparatus); these articles are not included in the price of the object, being supplied only when ordered separately.

The scale of sizes given under the illustrations is intended to give a practical idea of the size of the apparatus, but is not binding as regards the exact size of the article. In the case of perspective drawings the scale usually applies to one dimension only.

In connection with larger articles we have in many cases appended the nett and gross weights. All data as to weight are, however, only approximate and not binding. Marine packing as a rule weighs about half as much again as packing for land transit.



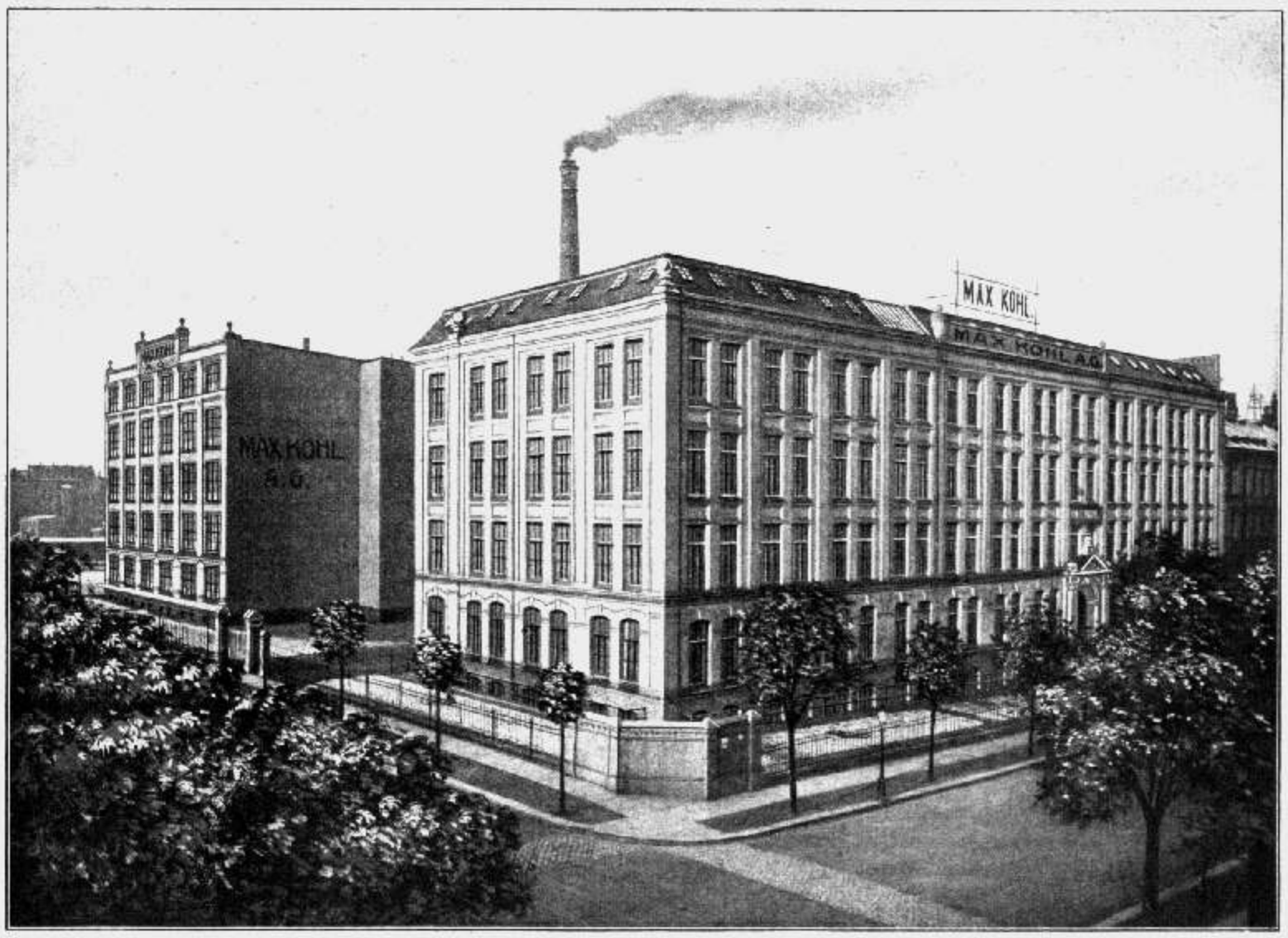
Chicago 1893.



Gold Medal. Leipzig 1897.



Chicago 1893.



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of Messrs **Max Kohl A. G. Chemnitz.**



Grand Prix.



Gold Medal. International Exhibition. Paris 1900.



St. Louis 1904.

Cl. 4780, 4790, 4781, 5664,
4785, 4786, 4787, 4784.



3 Grands Prix.
International Exhibition
Brussels 1910.



We have obtained the following awards at exhibitions:

International Exhibition, Brussels, 1910. 3 Grands Prix.

International Exhibition, St. Louis, 1904. { Grand Prix. Gold Medal.
International Exhibition, Paris, 1900. Gold Medal.
International Exhibition, Chicago, 1893. Two Prizes.
Buenos Aires, 1910. Grand Prix.
Allahabad (India), **1911. Gold Medal.**
Lemberg, 1907. Gold Medal.
Rome, 1907. Large silver Medal.
Liege, 1905. Two Grands Prix.
Athens, 1904. Gold Medal.
Aussig, 1903. Gold Medal.
Düsseldorf, 1898. Two Diplomas.
Leipzig, 1897. Gold Medal.



Gold Medal.
St. Louis 1904.





2 Grands Prix.
Liege 1905.



Cl. 6589, 6590,
4783, 4782,
4788, 7489.

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Literature

with List of Abbreviations.

In compiling this Price List use was made in the first instance of the text-books and periodicals mentioned below — both the older and newer editions of the text-books being considered. Where the edition is not expressly mentioned in the literature, the reference is to the edition mentioned below. As many apparatus are described in a number of text-books, preference is given in quoting the literature to the work giving the most complete details. Text-books and journals mentioned here and there are not included below.

Abbreviations.	Title.
W. D.	Weinhold, Physikalische Demonstrationen, 4. Aufl. Leipzig 1905. Joh. Ambr. Barth (früher bei Quandt & Händel). The references to the 3rd ed. are enclosed in square brackets.
W. V. d. E.	Weinhold, Vorschule der Experimentalphysik, 2. Aufl. Leipzig 1874, Quandt & Händel.
M. P.	Müller-Pouillet-Pfaundler, Lehrbuch der Physik und Meteorologie, 10. Aufl. 1906—1909, Bd. I, II¹, II², III, IV¹. Braunschweig, Friedr. Vieweg & Sohn.
Chwolson, Lehrb.	Chwolson, O. D., Lehrbuch der Physik, Bd. I—IV, Braunschweig 1902—1908. Friedr. Vieweg & Sohn.
Frick, Phys. T.	Dr. J. Fricks, Physikalische Technik von Dr. O. Lehmann. 7. Aufl. 1904—1909. The references to the 6th ed. are enclosed in square brackets.
M. T.	Friedr. C. G. Müller, Technik des physikalischen Unterrichts nebst Einführung in die Chemie. Otto Salle, Berlin 1906.
—	Tyndall, Der Schall, deutsch von H. Helmholtz und C. Wiedemann. Braunschweig 1874. Friedr. Vieweg & Sohn.
—	Tyndall, Die Wärme, deutsch von A. v. Helmholtz und C. Wiedemann, nach der 8. Auflage des Originals, Braunschweig 1894. Friedr. Vieweg & Sohn.
—	Tyndall, Das Licht, deutsch von C. Wiedemann. 2. Aufl. 1895. Braunschweig. Friedr. Vieweg & Sohn.
—	Helmholtz, Die Lehre von den Tonempfindungen, 4. Aufl. 1844. Braunschweig. Friedr. Vieweg & Sohn.
Grimschl.	E. Grimschl, Lehrbuch der Physik, Leipzig 1909.
Höfler-Poske.	Poske, Dr. F., Oberstufe der Naturlehre. Nach A. Höflers Naturlehre für die oberen Klassen der österreichischen Mittelschulen **für höhere Lehranstalten des Deutschen Reichs** bearbeitet. Braunschweig 1907. Friedr. Vieweg & Sohn
—	Höfler, Physik mit Zusätzen aus der angewandten Mathematik, aus der Logik und Psychologie und mit 230 Leitaufgaben. Braunschweig 1904. Friedr. Vieweg & Sohn.
Kolbe, El.-L.	B. Kolbe, Einführung in die Elektrizitätslehre, 1. Aufl. 1893 u. 1895, 2. Aufl. 1904 u. 1905, Berlin, Jul. Springer.
Kolbe-Skellon.	Introduction to Electricity; Kegan, Paul, Trench, Trübner & Co., Ltd. London 1908.
Gan.-Man.	Ganot-Maneuvrier, Traité élémentaire de physique, 23. Aufl. Paris 1905. Librairie Hachette et Cie.
Gan.-Rein.	Ganot-Atkinson-Reinold, Elementary Treatise on Physics experimental and applied; London und Bombay 1906. Longmans, Green & Co.
—	Ganot-Maneuvrier-Brito, Tratado elemental de Física. Paris 1885. Librería de Ch. Bouret und Librería de Hachette y Cia.
—	Ganot-Dr. Weiske, Lehrbuch der Physik und Meteorologie. Leipzig 1858. Leop. Voss.
Kleiber, Lehrb. f. Gymnas.	Kleiber, Joh., Lehrbuch der Physik für humanistische Gymnasien. 3. Aufl. München und Berlin. 1904.
—	Kleiber, Joh., Physik für die Oberstufe. München und Berlin 1905. R. Oldenbourg.
—	Kleiber und Scheffler, Elementar-Physik mit Chemie für die Unterstufe, 4. Aufl., München und Berlin 1908. R. Oldenbourg.
—	Meyer, K., Naturlehre (Physik und Chemie) für höhere Mädchenschulen, Lehrerinnen-Seminare und Mittelschulen. 4. Aufl. Leipzig 1906.
—	Rosenberg, Dr. Karl, Experimentierbuch für den Unterricht in der Naturlehre. 2. Aufl. Wien und Leipzig 1908. Alfred Hölder.
W. u. E., phys. Prakt.	Wiedemann und Ebert, Physikalisches Praktikum, 4. Aufl. 1899. Braunschweig. Friedr. Vieweg & Sohn.
—	Hahn, Herm., Handbuch für physikalische Schülerübungen. Berlin 1909. Julius Springer.
—	Kaiser, W., Physikalische Schülerübungen. Leipzig 1908. Quelle & Meyer.
Ztschr. f. d. phys. u. chem. U.	Zeitschrift für den physikalischen und chemischen Unterricht. Herausgegeben von F. Poske. Jul. Springer, Berlin.
Pogg. Ann.	Poggendorfs Annalen der Physik und Chemie.
Wied. Ann.	Wiedemanns Annalen der Physik und Chemie.
Drudes Ann.	Drudes Annalen der Physik.
Compt. rend.	Comptes rendues hebdomadaires des séances de l'académie des sciences.
Z. d. V. d. J.	Zeitschrift des Vereins deutscher Ingenieure, Berlin.

Some Testimonials as to Physical Apparatus.

Trier, 13th April, 1911.

I beg to express my warmest thanks for the protecting sheet for the Induction Apparatus as well as for the apparatus subsequently supplied. These are very well constructed and work faultlessly.

Oberlehrer **Reimann.**

Vegesack b. Bremen, 13th April, 1911.

I beg to inform you that the consignment of apparatus for teaching purposes, which arrived a few days ago, has met with my entire satisfaction.

Oberlehrer Dr. **H. Kohlmann.**

Berlin-Wilmersdorf, 14th April, 1911.

I am very satisfied with the apparatus with which you have supplied me. They can lay claim to the highest precision and are characterised by thoroughness and neatness of construction, thus affording great pleasure to the eye. As a general rule these excellent qualities are wanting in apparatus made by other firms. And no one who has observed the steady perfection in construction of Kohl's apparatus during the last few years can say that the firm of Kohl has not endeavoured to establish firmly its old and renowned reputation.

Dr. **Lötzbeyer,**
Oberlehrer an der Oberrealschule nebst Reformrealgymnasium.

Gross-Lichterfelde, 11th April, 1911.

You will also be glad to hear that nothing has gone astray or become broken among the 21 cases of apparatus, and that we wonder anew at the beauty and practicability of the apparatus.

Prof. **M. Bienengräber,** Realgymnasium.

Culm, 9th April, 1911.

The apparatus supplied at the beginning of March are to our entire satisfaction.

Dr. **Wissemann,**
Oberlehrer a. d. städt. höh. Mädchenschule.

Jena, 8th April, 1911.

In addition I require a good apparatus for Lissajors's Figures. I ordered one of these from you some years ago from Danzig and was quite satisfied with it.

Prof. **M. Wien,**
Physikal. Institut der Universität Jena.

Késmárk, 1st April, 1911.

We beg to express our fullest satisfaction with the apparatus supplied.

Direkt. der Webschule in Késmárk.

Berlin, 1st April, 1911.

In acknowledging receipt of the Model Theodolite, I beg to inform you that I am quite satisfied with the instrument. It fulfils both as regards size and accuracy all the demands which one can place upon a school instrument.

Oberlehrer **Jost,** 11. Realschule.

Innsbruck, 15th March, 1911.

We have often obtained apparatus from you for our school and are very satisfied with the same.

Direktor **L. Ostheimer,**
Board School for Boys.

Essen, 18th February, 1911.

The apparatus recently supplied have met with our perfect satisfaction and will lead us to consider your firm further when we require fresh equipment.

Walter, Seminary Teacher,
Kgl. Seminar f. ev. Zöglinge.

Halbstadt (Russia), 14th February, 1911.

All apparatus which we have tested up to the present work in an excellent manner and the school will therefore place further orders with you as required.

Kommerzschule der Mennoniten-Gesellschaft.

St. Petersburg, 3rd/16th February, 1911.

The Acoustic Apparatus has met with the entire satisfaction of the Baron.

Leo v. Dabriansky,
Imperial Court Orchestra.

Marburg, 12th February, 1911.

At the same time I feel impelled to express my satisfaction with the Braun Electrometer recently obtained from your esteemed house.

Prof. **Ferdinand Lang,**
an der k. k. Staatsrealschule.

Fiume, 11th February, 1911.

I am perfectly satisfied with the construction and working of the apparatus.

A. Meichsner,
Civica Scuola Generale per Garzoni industriali.

Malines, 11th February, 1911.

I take the opportunity of informing you that I am extremely satisfied with the Coil as well as with the other apparatus purchased from you. I recommend your firm.

Institut Scheppers Malines.
J. Victorin,
professeur de Physique.

Rochlitz, Saxony, 12th February, 1911.

I beg to express my satisfaction with the Generator, Transformer and three-phase Motor obtained from you in Autumn.

Seminaroberlehrer **Rich. Müller.**

Rorschach, 9th February, 1911.

We are very well satisfied indeed with your present consignments and will gladly consider you in future orders.

Prof. **Himmel,** Seminar.

Glarisegg bei Steckborn, 9th February, 1911.

Finally, I must thank you for the good construction of the apparatus.

Dr. **Max Oettli,**
Schweizerisches Landerziehungsheim.

Cuxhaven, 1st February, 1911.

We shall require additional apparatus this year and I have no doubt that your esteemed firm will obtain the order as the goods supplied by you have been found faultless.

V. Worch.

Offenbach a./M., 24th January, 1911.

I must not fail to inform you that the apparatus and equipment supplied to our School last summer satisfy all conditions required of them; especially is this the case for the Projection Apparatus and Switchboard, with which I am very satisfied.

Oberlehrer **Richter,**
höhere Mädchenschule.

Campobasso, Italy, 19th January, 1911.

I have become acquainted with the good qualities of apparatus constructed in your workshops in the Physical Institute of the Royal University of Cattania (Sicily) where I acted as Assistant up to last year, and I desire to obtain apparatus of your construction.

Prof. **C. Bellia,**
R. Liceo-Ginnasio „Mario Pagano".

Montreal, 16th December, 1910.

The cases last received from you have been opened and I must inform you that I am perfectly satisfied with their contents. The packing is perfect, etc.

École des Hautes Études Commerciales de Montreal.

Bozen, 16th December, 1910.

I would remark, in conclusion, that we are perfectly satisfied with the consignment received three years ago.

Convent vom Allerheiligst. Sacrament,
Bozen, South Tyrol.

Sarospatak (County Zemplen), Hungary,
14th December, 1910.

We are very satisfied with the Physical Apparatus ordered from you this year.

Alexander Maller, Obergymn.-Lehrer.

Wilmersdorf, 9th December, 1910.

The quality and practical arrangement of the goods supplied are in perfect accord with our wishes.

Dr. **Meyer,**
Oberlehrer an der Cecilienschule.

Goldap, 6th December, 1910.

The apparatus supplied have arrived without fault and work well.

Oberlehrer **Franz Busch,**
Kgl. Realgymnasium.

Los Angeles, Cal., 22nd November, 1910.

Through local agents we are receiving now a number of pieces of apparatus of your make. We are highly pleased with these.

Manual Arts High School,
Geo. E. Mitchell, Science Dept.

Lucca, 17th November, 1910.

The Andrew Press has arrived in good condition and works very well.

R. Liceo.

Glogau, 17th November, 1910.

Many thanks for sending Price List No. 21 with supplements and for the excellence of construction of the goods to our recent order, etc.

Oberlehrer **G. Koch,** höhere Mädchenschule.

Philadelphia, 12th November, 1910.

Referring to our order Mounted Chromatic Forks ordered of us by the John Hopkins University, Dr. John B. Watson would take this occasion to express Dr. Watson's appreciation of your manner of filling this order and to state that other orders for apparatus will be placed by Dr. Watson in the near future.

Arthur H. Thomas Company.

Rochlitz, 4th November, 1910.

The consignment has met with my complete satisfaction and I beg to thank you for it.

Rich. Müller, Seminaroberlehrer.

Davos Platz, 3rd November, 1910.

I am very pleased with the Coil supplied on 5th February, 1909, as the efficiency is nearly the same as the modern apparatus without interrupter; and I hope that the Induction Coil ordered may turn out as good.

A. Rzewuski.

Djursholm, Sweden, 1st November, 1910.

Since it is only during the last few days that we have been able to deal with our new school buildings we have only now been able to unpack the Physical Apparatus supplied by you. We have found everything very satisfactory and we have great pleasure in giving you this testimonial.

Djursholms Samskola.

Kecskeméti, 27th October, 1910.

Theodolite arrived in perfect condition. Am very satisfied with it.

Dir. **Racsch,** P. D., Oberrealschule.

St. Gallen, 21st October, 1910.

I have great pleasure in repeating to-day my high appreciation of the numerous apparatus supplied last winter for the St. Gallen Industrial and Realschule.

Real- und Gewerbeschullehrer **H. Schmid.**

Vilna, 3rd October, 1910.

I beg herewith to express my thanks at the correct construction of my first order from you. I received both consignments in good condition.

Männliches Gymnasium Pesotsky.

Szaszvaros, Hungary, 8th September, 1910.

We are eminently satisfied with the articles and the work.

Franz Simon, Gymnasialdirektor.

Kieff, 3rd September, 1910.

It is with pleasure that we inform you that the client is very satisfied with the goods supplied and we take this opportunity of expressing our most sincere thanks for the careful manner in which this order has been executed.

Olszevitz and Kern.

Berlin, 16th August, 1910.

We beg to inform you that we have received the goods and are extremely satisfied with the manner of construction.

Mechanics Laboratory of the Royal Mining Academy,
Schmidt, Assistant.

(Translation.) Ufa, 14th August, 1910.

On opening the cases all the pieces of apparatus were found to be in perfect condition, and I beg to express my best thanks for the same.

Männliches Gymnasium, Ufa.

Přibam, 29th July, 1910.

I feel it my duty to express my most sincere thanks for the apparatus supplied during the school year 1908/9 through Messrs. J. & J. Fric, Prague, for our Electrotechnical Collection. The working of all apparatus is perfect.

Ing. **W. Kazel.**

Görlitz, 21st July, 1910.

Everything with which you have supplied us is constructed in the best possible manner.

Dr. **Graetzer.**

Aquila, Italy, 15th June, 1910.

I must inform you that everything has been received in good condition and that I am perfectly satisfied with the fine and accurate construction of the apparatus supplied to our Institute.

Ottaviano Longo,
Professor of Physics.

Berlin-Wilmersdorf, 11th May, 1910.

The apparatus supplied are to my entire satisfaction.

Oberlehrer Dr. **Lötzbeyer,**
Oberrealschule.

Pola, 8th May, 1910.

I am also perfectly satisfied with the two pieces of apparatus last supplied.

Ginnasio reale
Prof. **A. Gregoretti.**

Esktergonn, 3rd April, 1910.

During the last four to five years in which I have had dealings with you, partly through Messrs. Calderoni & Company, I have been able to convince myself of the soundness and excellence of your firm.

Molakovszky László,
Bottyán János u. 11.

Astrachan, 1st April, 1910.

We have received the apparatus supplied. All the apparatus has arrived safely and is of excellent quality, for which we thank you

Realschule.

St. Gallen, 28th March, 1910.

The large consignment of Physical Apparatus intended for the St. Gallen Industrial School, which are specially intended for teaching Electricity, has arrived in good condition. All apparatus work faultlessly and their sound and exact construction eminently satisfactory. The apparatus are a real ornament to the instructional collection of the Municipal Industrial School.

H. Schmid, Reallehrer.

Holzminden, 26th March, 1910.

It gives me great pleasure to inform you that I am very pleased with the precise manner in which our order has been executed.

Th. Lehmann, Oberlehrer,
Landschulheim.

Jaroslav, 23rd March, 1910.

The apparatus supplied in January last were all in order and work well. We thank you for same.

Lehrer-Institut.

Prague, 10th March, 1910.

The Monochord is very nicely constructed and is in accordance with my wishes.

Mathematico-Physical Institute of the German University.

Auburn, Ala., 5th March, 1910.

The lot of apparatus which I ordered in November was received a few days ago and is entirely satisfactory in every way. I wish to thank you for your efficient and prompt execution of my order in every detail.

Alabama Polytechnic Institute, Dept. of Physics.

Essen (Ruhr), 22nd February, 1910.

I acknowledge receipt of your consignment of 19th ult. and after testing the apparatus beg to express my satisfaction with the goods.

Prof. **Mathée,**
Direktor der Kgl. Maschinenbauschule.

Komotau, 19th February, 1910.

I am again very satisfied with the reliable and substantial construction of the apparatus.

Prof. Dr. **Franz Wolden,**
K. K. Staats-Gymnasium.

Hartford, Conn., 12th February, 1910.

The apparatus you shipped to me arrived some time ago and is entirely satisfactory.

Trinity College,
Jarois Physical Lab.

Leysin, Canton de Vaud, 12th February, 1910.

The apparatus for studying Radioactivity are especially characterised by their construction, and the mixture of Radium and Zinc Sulphite is excellent from the phosphorescence point of view, for which I am very much obliged to Messrs. Max Kohl.

W. Stefko, Moscow.

Pabianice, 1st February, 1910.

All articles received in good condition and undamaged.

Directors of the Commercial Academy.

Bruck a. d. Mur, 27th January, 1910.

I am very pleased with the consignment just received.

Dr. **Paul Gaulhoser,**
Physikalisches Kabinett der K. K. Staatsrealschule.

Hernösand, 27th January, 1910.

I am very pleased with the apparatus supplied.

K. Tham,
Technische Elementarschule.

Salzburg, 25th January, 1910.

Many thanks for the goods with which, as in previous instances, I am very satisfied.

Karl Schnizer,
Teacher at the Public Commercial School.

Sarospatak, 24th January, 1910.

The Physical Apparatus ordered have arrived and the packing is perfect. I am very well satisfied with the get-up of the articles.

Alex. Maller,
Teacher of Physics, Obergymnasium.

Pozsony, 10th January, 1910.

The instruments have evoked all-round approval and are faultless in every particular.

Mäther Oszwald & Társa.

Leipzig, 3rd January, 1910.

At the commencement of the present year I obtained from you for the new Schiller-Realgymnasium here a double-crank Rheostat after Brüsch for a D. C. supply of 220 volts. I am very pleased with the apparatus.

Professor Dr. **Starke,**
Oberlehrer am Schiller-Realgymnasium.

Droyssig b. Zeitz, 27th December, 1909.

The apparatus which your firm has supplied are to my entire satisfaction; they work very well.

Seminarlehrer **Jäntzsch.**

Ettenheim, 22nd December, 1909.

The transformer works well and economically when connected up as stated.

J. Ziegler,
Prof. am Realgymnasium.

Riga, 19th December, 1909.

The last consignment duly to hand in good condition. The precise and substantial manner of construction of the apparatus leaves nothing to be desired. The apparatus which you supplied a year ago also have been found excellent for teaching purposes.

C. Krause,
Höhere Töchterschule von O. v. Hasford.

Hermannstadt, 15th December, 1909.

The consignment for the Realschule received yesterday. The apparatus are constructed in the excellent manner generally reputed to your firm and we are very pleased with them.

Direktion d. ev. Gymnasium A. B.
(sd.) **C. Albrich.**

Czernowitz, 25th November, 1909.

I wish before all to emphasize the fact that every piece of apparatus is nicely and accurately constructed and that tests have shewn the same to work faultlessly. I therefore consider it my duty to express to you in the name of the Institution for which I work many thanks for the care and precision with which you have filled this order.

Professor **Alexander Buga,**
Kustos d. physkal. Kabinetts am III. Staatsgymnasium.

Tarnow, 21st November, 1909.

The Physical Apparatus supplied to our Gymnasium by your esteemed house have been received and we are perfectly satisfied with the construction of the same.

I. Staatsgymnasium,
Physikalisches Kabinett.

Wologda, 9th October, 1909.
The Physical Apparatus supplied by you to my order have been received in good condition and well packed, and have been found to justify themselves in use, for which please accept my best thanks.
II. Weibl. Gymnasium.

Rotterdam, 24th October, 1909.
I have obtained from you for my School (II. Höhere Knabenschule) apparatus to the value of £ 100. The entire consignment I find to be perfectly satisfactory.
Dr. **D. de Lange.**

Leobschütz, 23rd October, 1909.
The apparatus are excellent.
Kgl. Seminar.

Tiflis, 11th October, 1909.
I beg to express my thanks for the faultless and accurate manner in which the apparatus are constructed.
Commercial Academy.

Gebweiler, 25th September, 1909.
We must say that taking everything into consideration we are very pleased with the objects supplied. In particular the nice lecture table and the electrical plant have given us great pleasure, while the Projection Apparatus fulfils all demands that can be placed on a cheap instrument.
Dr. **Weill,** Gymnasium.

Bologna, 17th September, 1909.
We are quite satisfied with the Pump supplied.
Societa Italiana Fabbriche Lampade Phoebus.

Hermannstadt, 8th September, 1909.
I received your consignment a week ago and thank you for prompt despatch. It is quite a festival to me when I receive new apparatus from you of your wonderful construction. Everything has arrived in good condition.
Direktor **C. Albrich junior,**
Evang. Gymnasium A. B.

Utrecht, 23rd July, 1909.
It gives me great pleasure to inform you that the instruments manufactured by you, supplied to the Ludgers Teachers Seminary, Hilversum, have met with the entire satisfaction of the users. Thanking you for the consignment, etc.
Fr. Andreas,
St. Gregoriushuis.

Graz, 10th July, 1909.
I was very pleased with the apparatus (Spark Coil, Tesla Apparatus, etc.) supplied to the Marine Institute.
E. Weber, K. K. Professor.

Wotkinsk, 6th July, 1909.
Kindly accept my best thanks for filling in such a complete manner my order for Physical Apparatus which you supplied last year for the Physics Dept. of the Technical School, Votkinsk.
Direktion der mittleren technischen Schule.

Ratibor, 26th June, 1909.
I beg to inform you that I am pleased with the Air Pump as with all apparatus supplied by you.
Oberlehrer **Langner,**
Realgymnasium.

Villingen, 25th June, 1909.
In conclusion, I feel compelled to express my best thanks for the careful manner in which you have filled the order and — so far as I have been able to test — for the substantial and tasty manner in which the individual pieces of apparatus have been constructed.
Prof. **E. Hensel,**
Realgymnasium.

Orscha, Gouv. Mohileff, 30th May, 1909.
I now find time to express my best thanks, for all apparatus have been received in excellent condition.
M. Vastschinski,
Teacher of Mathematics at the Girls' Gymnasium.

Vallejo, Cal., 14th May, 1909.
The goods arrived in fine condition. They were remarkably well made, and each piece of apparatus works to perfection. I congratulate you upon the possession of such skilled workmen.
Carl H. Nielsen, Principal,
Vallejo High School.

Odense, 11th May, 1909.
I beg herewith to confirm that the apparatus ordered have been received in good condition and to express to you my best thanks for same.
Technische Schule.

Wilmersdorf-Berlin, 1st May, 1911.
The entire equipment of the class rooms and museums for Physics and Chemistry at the Cecilienschule, and the equipment of the Chemical Laboratory, have met with entire approval. Everything is constructed in a very practical manner and of faultless material and works with ease and certainty. The apparatus of our collection also, which almost without exception came from your factory, have shewn themselves in use to be thoroughly well and precisely constructed, work well, and are thoroughly substantial.
Dietrich Meyer,
Ordinary Teacher at the Cecilienschule.

Steglitz, near Berlin, 5th May, 1911.
During the last three years you have supplied the internal equipment of our five Physics rooms, and supplied the greatest part of our apparatus for demonstrations and students' use. It is with pleasure that I inform you that we are quite pleased with everything and that we all of us — teachers and students — like to work with your goods since they are reliable and always nice in appearance.
Oberlehrer **C. Roebling,**
Paulsen-Realgymnasium.

Some Testimonials
as to Mechanical Models after Prof. Eugen Meyer, Charlottenburg.

Royal Technical High School.

Hanover, 23rd April, 1910.

In reply to your enquiry, I beg to say that from previous experience I am perfectly satisfied with the construction and action of the Models after Prof. Meyer.

Prof. Dr. Ing. **Michel.**

Royal Mining Academy.

Berlin, 7th April, 1910.

In reply to your enquiry of 5th April, I have to say that I am quite satisfied with the Meyer Models sent.

Prof. Dr. **E. Jahnke.**

Direction of the Technical State Institutions.

Chemnitz, 10th May, 1910.

In reply to your favour of 5th April, 1910, I have to inform you that the Models designed by Prof. Eugen Meyer and supplied by you for instruction in Technical Mechanics, intended for the Mechanics and Electrotechnical Departments of the Academy of Crafts and for the School of Mechanics, and for instruction in Building in the Architectural Department of the Academy of Crafts, have been found satisfactory.

Die Direktion der Technischen Staatslehranstalten.
Mühlmann.

Direktion des Thüringischen Technikums.

Ilmenau, 28th April, 1910.

The construction of the model is very well thought out and is very rigid in spite of the numerous movable sections. The use of this model greatly facilitates demonstrations so that it can be employed with advantage for teaching purposes.

Direktion des Thüring. Technikums Ilmenau.
Prof. **G. Schmidt.**

Königl. Sächs. Bauschule.

Plauen i. V., 7th April, 1910.

In regard to your enquiry of the 5th inst., we have pleasure in informing you that the Models Nos. 3 and 5 for technical Mechanics, after Prof. Dr. Meyer of Charlottenburg, obtained from you, are considered as models very well adapted from their mode of construction and capability of demonstration for explaining the principles of Bending Phenomena. The Models mentioned can be warmly recommended to all technical schools.

Die Direktion der Königlichen Bauschule.
Baurat Prof. **Albert.**

The following institutions have already obtained from us Mechanical Models as suggested by Prof. Eugen Meyer, Charlottenburg:

Staatliches Technikum,	Hamburg.
Königliche Bergakademie,	Berlin.
Technische Staatslehranstalten,	Chemnitz.
Artillerie-Akademie Mechanisches Laboratorium,	St. Petersburg.
Bergskolan,	Falun (Sweden).
Königl. Techn. Hochschule,	Hanover.
Königl. Sächs. Bauschule,	Plauen (Vogtl.).
Thüringisches Technikum,	Ilmenau (Thür.).
University of Sydney,	Sydney.
Technikum,	Winterthur.
Technische Hochschule,	Danzig-Langfuhr.
Technische Mittelschule	Berlin.
Königl. Preußische höhere Schiffs- und Maschinenbauschule,	Kiel.
Königl. Fachschule,	Schmalkalden.
Königl. Fachschule,	Leipzig.
Maschinen-Bauschule,	Barmen-Elberfeld.
Grossherzogliche Baugewerk- und Maschinenbauschule,	Varel.
Ingenieur- und Deckoffizierschule	Wilhelmshaven.
Militärtechnische Akademie,	Charlottenburg.
Technische Hochschule,	Braunschweig.
Eidgen. Polytechnikum,	Zürich.

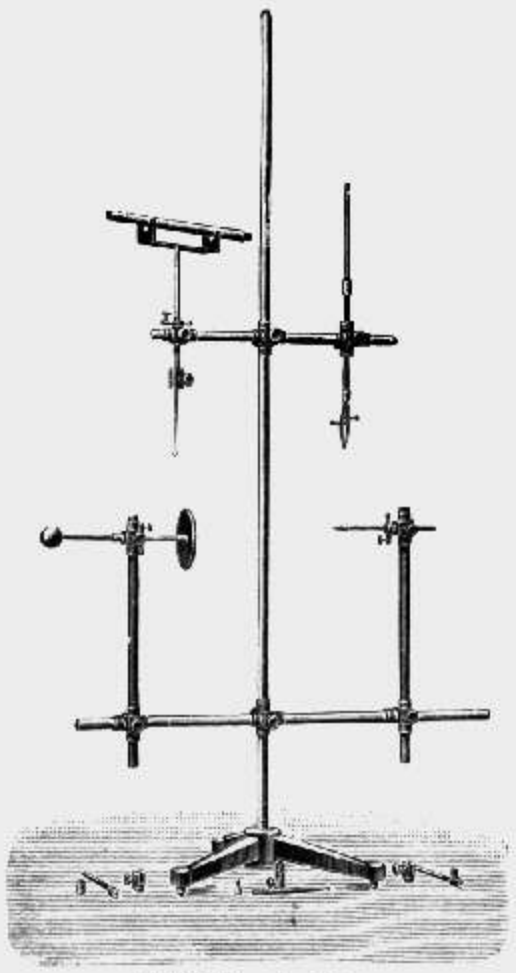
Corrigenda to Vol. I.

Page 32, Fig. 50,199 B. A design is not registered.
„ 120, No. 50,494. The Figure refers to **No. 50,500**, not 50,490.
„ 121, No. 50,502. The **voltage limits** for one circuit are **0 3**—110 and 160 volts respectively, not 0.03.
„ 127, No. 50,534. This Sliding resistance is shown in fig. 50,534.
„ 133, No. 50,565. The price of the Gas Generator **does not include motor drive.**
„ 139, Par. 1, „ 140, line 6, „ 142, line 5 and 6 } The remarks re the **switching out** of the compound winding are not valid and should be deleted.
„ 144, last par. but one, „ 146, first par., „ 146, last par. but three } The final remark should read: „In this manner the given speed at full load can be **increased by about 15** % at full load." The speed cannot be decreased.
„ 186, No. 51,074. The reference to W. D. relates to the 3rd Edition [and the 2nd Edition], for the fourth [and third] editions the following hold: W. D. 323 [305].
„ 190—192. **Physical Apparatus for Projection.** Pages 190—192 no longer hold and should be replaced by pp. 1094—1096.
„ 1221. **Special optical outfit** with Steinheil Group antiplanet. Read = 1 : **6**,5, not 1 : 4,5.
„ 1224, No. 9568. **Biconcave lens** costs £ 1. **0**. 0, not £ 1. 5. 0.
„ 1228, No. 9656. **Projection screen with electric device** and with tilting device costs £ **31.15.0**, not £ 25. 10. 0.

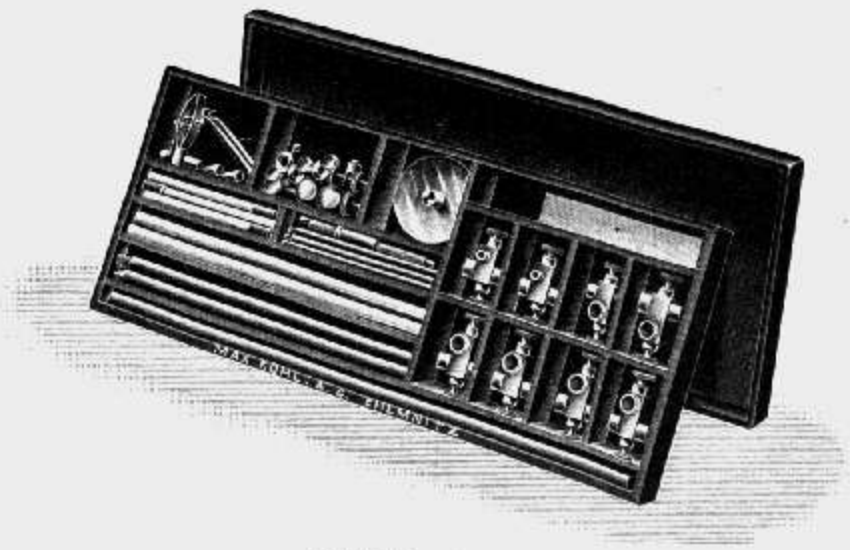
Corrigenda to Vols. II and III.

Page 218, No. 51,361. **Carbon Capsule** costs £ **0. 1. 6**, not £ **0. 1. 0.**
„ 220, No. 51,413. **Mohr's Burette** with pinch cock, 100 cem, costs **3 s. 6 d**, not **4 s. 6 d.**
„ 236, Nos. 51,569 and 51,570. The load which this **balance** may carry is expressed **in kg.**
„ 259, No. 51,819. Engelmeyer's **Kinegraph** costs, constructed as stated, £ **5. 10. 0** and not £ 3. 0. 0. A simple pattern for demonstrating the parallelogram of forces can be obtained for £ 3. 0. 0.
„ 261, No. 51,830. **3 Balance Pans** of 50 g each and **1 Set of Weights** with one 100 g weight, two 50 g, and twelve 10 g, suitable for the apparatus, cost £ 0. 15. 0 extra.
„ 273, No. 51,904. **27 Double Hook Weights** are supplied instead of 26.
„ 279, No. 51,959. **The large Whirling Table** has a width of **32** cm, not 37 cm.
„ 279, Nos. 51,951—51,958. „ 279, Nos. 51,961—51,968. **Whirling Tables.** These numbers and prices no longer apply, being replaced by the data given which is inserted between pp. 278 and 279.
„ 337, Nos. 52,465 and 52,466. **The Hydraulic Press** is equipped with a safety-valve for **20** atm., **not** 25.
„ 340, No. 52,485. The last note above Pellat's apparatus: "The piston is packed with mercury" is belonging to No. 52,483.
„ 363, Fig. 52,589. This figure refers to No. 52 **689**, not 52,589.
„ 404, No. 53,058. **Air reaction wheel.** The figure of Fr. phys. Techn. is read: **3689**, and not 2689.
„ 415, No. 53,171. **The Wave Machine** after Steindel is priced at £ **9. 0. 0** and not £ 6. 0. 0.
„ 439, No. 53,417. **Tuning Forks with Electromagnetic Drive.** The words: "By reducing the size of the orifice" should only come in after "pitch".
„ 488, No. 53,860. **The addition to the optical disc** gives only **five** cones of rays, not eight.
„ 532, Fig. 53,385. Read **54**,385, not 53,385.
„ 545, No. 54,529. The price of Classen's interference apparatus is to be understood **without glass plates.** The **plates** cost £ 1. 5. 0.
„ 809, No. 60,261. **Sheet Iron Cube,** and not Tube, is intended.
„ 809, No. 60,266. **2 fixed Sounders,** 2 solid and 2 **hollow Spheres** are supplied, not hollow cylinders.
„ 860, Nos. 61,023—61,047. **Thermopiles.** "Heil's Dynaphors" are no longer supplied.
„ 865, Section 2. **Leads and wires** see vol. II, not vol. I.
„ 968, No. 62,400 e. **Universal Stand** after Kolbe The words "with two glass walls" should be deleted.
„ 980, Table. **Induction Coils.** The Figure No. 62,533 cited in type C applies only to the larger Induction Coils from size 8 upwards. The smaller coils have instead of the pachytrope a simple reversing switch for double commutation
„ 982, No. 62,666. The **Wehnelt Interrupter** now costs £ **3. 15. 0,** and not £ 3. 10. 0.
„ 1009, Fig. 62.078 II. Read 62.**9**78 II, not 62,078 II.
„ 1010, No. 50,521. **The Series Resistance** can be used for **2**—25 amps., not 5—24 amps.

Max Kohl A. G. Chemnitz, Germany.



51 100 A. 1 : 10.



51 100 B. 1 : 9.

Apparatus, Supplies and Materials for General Use.

51,100. **Physical Work Stand** (Edelmann's), Figs. A and B, with case. Regarding the employment of the work stand, see Fig. 51,103. Price, exclusive of the auxiliary parts shown in Fig. 51,103 (see No. 51,103), of iron . . . . . £ 4. 0. 0

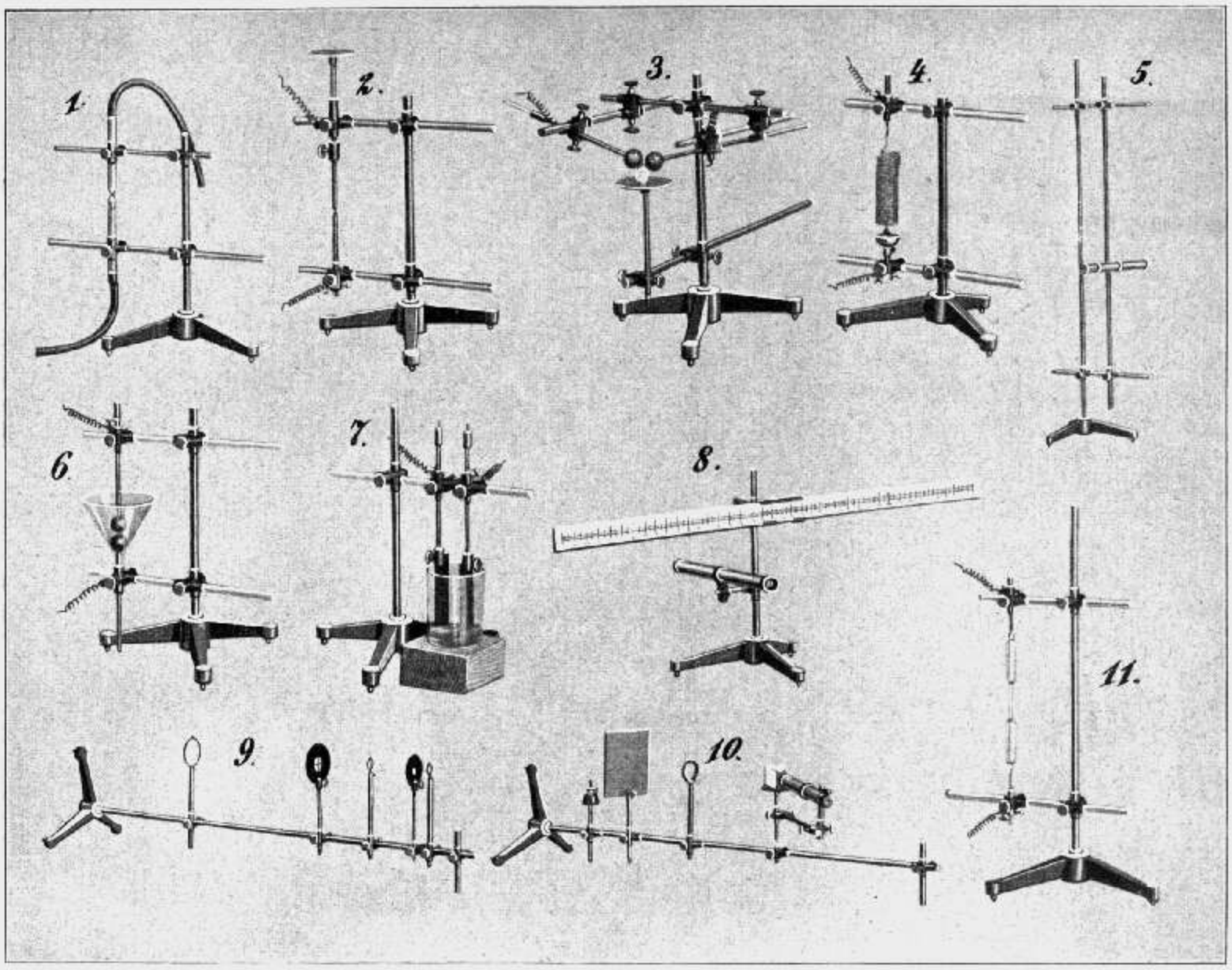
The stand consists of a tripod with pillar, 8 brass cross clamps which can be firmly clamped to the pillar, and some ebonite, glass, iron and brass rods on to which electrodes, terminals, supports, tongs and insulating handles may be screwed. The stand can be placed either vertically or horizontally, and is widely used in physical experiments, e. g., for setting up lenses and prisms and spectrum tubes and for experiments with Leyden jars, induction coils, etc.

51,101. — The preceding, of **Brass,** tripod of zinc 4. 10. 0

51,102. — The preceding, of **Brass,** with half as many clamps, holders and accessories again as in foregoing 6. 0. 0

51,103. **Auxiliary Parts for Edelmann Work Stand,** in accordance with Fig. 51,103, p. 202

1.	2 Glass Tubes for impact pressure of water	0.	1. 0
2.	6 Carbon Rods for demonstrating the electric arc	0.	1. 0
3.	The stand, assembled as a Henley discharger serves for the ignition of gun-cotton	0.	0. 0
4.	Roget's Spiral and Bowl	0.	6. 0
5.	Reading Telescope (see also Fig. 51,103, No. 8)	1.	12. 0
6.	Glass Funnel with metal rod for igniting ether	0.	2. 0
7.	Glass Vessel with 1 carbon plate, 1 zinc plate and 1 copper plate for making up a cell	0.	4. 0
8.	Scale for galvanometer readings (Telescope, see No. 5), with holder	0.	8. 0
9.	4 Lenses, 2 diaphragms, 1 preparation holder for making up a Galilean, a terrestrial and an astronomical telescope as well as a microscope	1.	2. 0
10.	Lamp, slit diaphragm, lens and prism for demonstrating the spectroscope (telescope, see No. 5)	0.	10. 0
11.	2 Spectrum Tubes, with hydrogen and oxygen	0.	7. 0



51100 and **51103.** 1 : 9 and 1 : 14.

51,104. **Universal Stand** (Bunsen's), massive construction, on iron foot, Figure (W. D., Fig. 35. — M. T., p. 10), with the single parts Nos. 1—9 listed underneath . . . . £ 1. s. 2. d. 0

1. Iron Stand (**1 s. 8 d.**); 2. 2 Clamps, 1 small, without double socket (**2 s. 6 d.**); 3. Clamps, k 2, large, without double socket (**3 s.**); 4. Retort Holder, d, without double socket (**3 s. 7 d.**); 5. Double Sockets, m, 3 in number, together (**6 s.**); 6. Ring, r 1, with socket, 7 cm diameter (**1 s. 3 d.**); 7. Ring, r 2, with socket, 10 cm diameter (**1 s. 5 d.**); 8. Ring, r 3, with socket, 13 cm diameter (**1 s. 7 d.**); 9. Fork, h, for carrying Bunsen burner or Berzelius lamp, with socket (**1 s. 7 d.**).

51,104 a. **Bunsen Burner** for above, with air neck-piece, star, chimney, forked piece and soldering tube device 0. 3. 6

51,105. **Universal Double Socket,** for the universal stand (W. D., Fig. 36. — M. T., p. 10) 0. 3. 6

51,105 a. **Westien Universal Clamp** (W. D., Fig. 37. — M. T., p. 10) 0. 3. 6

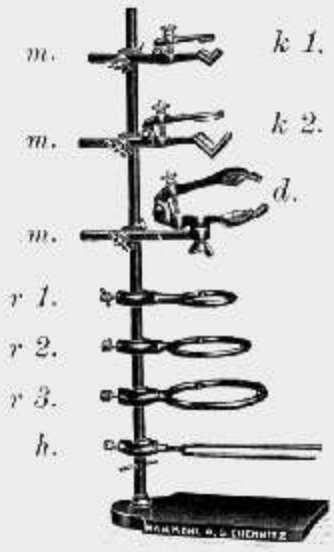
51,106. **Heavy Iron Tripod,** with iron rod, 1 m long, suitable for the clamps listed under Nos. 51,104, 2—9, 51,105, 51,105 a, for clamping long tubes, etc. 0. 3. 0

51,107. **Bunsen Universal Stand,** light construction. 0. 15. 0

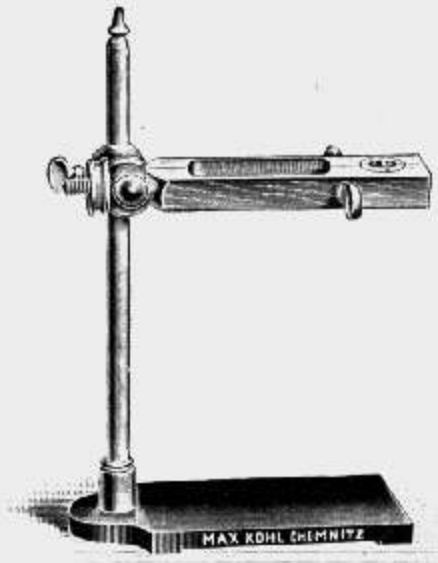
51,108. **Precision Work Stand** (Weinhold's) (W. D., pp. 37 and 38, Figs. 38—40), carefully constructed, thus ensuring the accessory parts being accurately and firmly clamped . 3. 10. 0

The stand consists of 1 iron tripod with rod, 2 brass sockets with pressure screws, 1 small clamp with socket, 1 large clamp with socket, 1 retort holder, 1 clamp for cylindrical or prismatic objects (Fig. 39), 1 clamp for conical, wedge-shaped or pyramidal objects (Fig. 40), 3 iron rods of 10, 30 and 50 cm length, 1 box for taking the accessories, 1 ring for funnels, 1 ebonite-rod for Geissler's tubes, 1 rod for suspending thermometers, 1 support to allow of using the stand in horizontal position, 1 clamp for holding tubes and rods, 1 clamp with tongs, 1 retort holder.

Max Kohl A. G. Chemnitz, Germany.



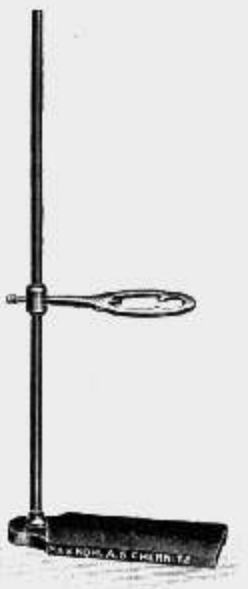
51104. 1 : 9.



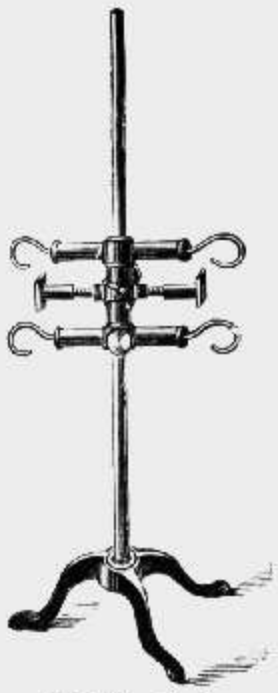
51110. 1 : 5.



51111. 1 : 8.



51112. 1 : 10.



51114. 1 : 6.

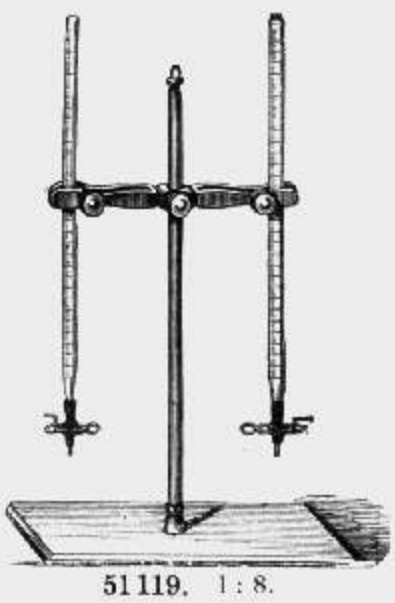


51116. 1 : 3.

51115. 1 : 3.



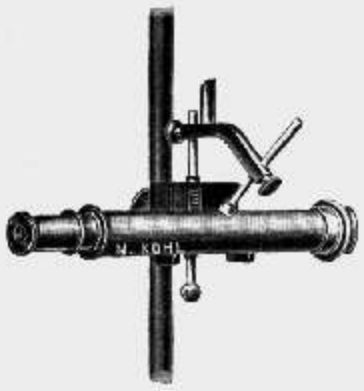
51117. 1 : 3.



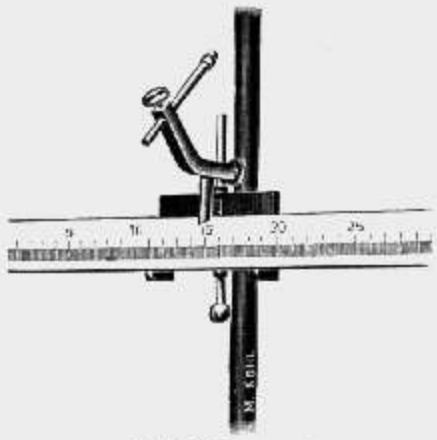
51119. 1 : 8.

	£	s.	d.
51,109. **Stand** with stays (Weinhold's) (W. D., Fig. 41), without weight	1.	16.	0
51,110. **Retort Holder,** Figure, with wood clamp and iron foot (W. D., Fig. 32) . . .	0.	5.	0
51,111. **Filter Stand, iron,** Figure, with two different size rings (W. D., Fig. 33) . . .	0.	5.	6
51,112. **Boiling Stand, iron,** Figure (W. D., Fig. 34)	0.	3.	6
51,113. **Cooler Stand,** iron, Fig. 51,241, p. 211 (W. D., Fig. 44 [40])	0.	5.	0
51,114. **Burette Stand** (Kaehler's), with universal holder for 2 burettes, with brass rod, Figure	0.	9.	0
51,115. **Burette Holder,** brass, double-arm, with fixed arms, Figure	0.	3.	6
51,116. **Burette Holder,** brass, two-arm, with movable arms, Figure (Hofmann's) . . .	0.	4.	0
51,117. — idem, brass, single-arm, with semi-circular arms, Figure	0.	3.	0
51,118. **Stand** for preceding **burette holders,** iron tripod with brass rod, 13 mm diameter .	0.	3.	0
51,119. **Burette Stand** for 2 burettes, entirely of wood, Figure, without burettes . . .	0.	4.	0

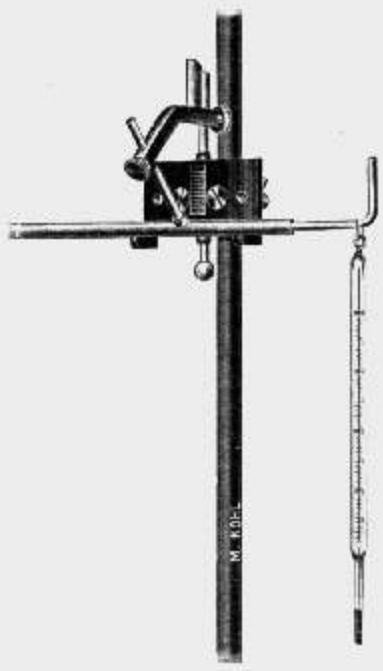
Cl. 5855, 3872, 5513, 102, 5856, 101, 103, 104, 105.



51120 A. 1 : 7.



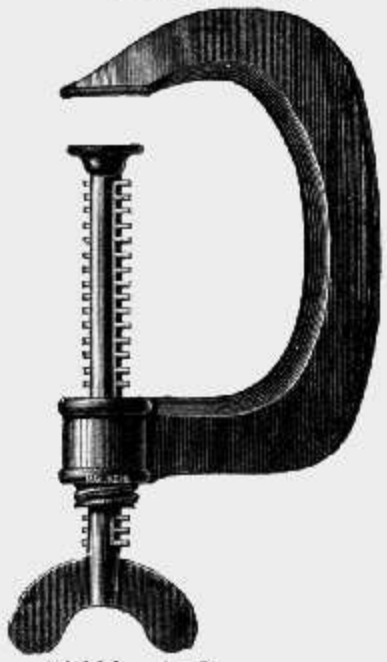
51120 B. 1 : 7.



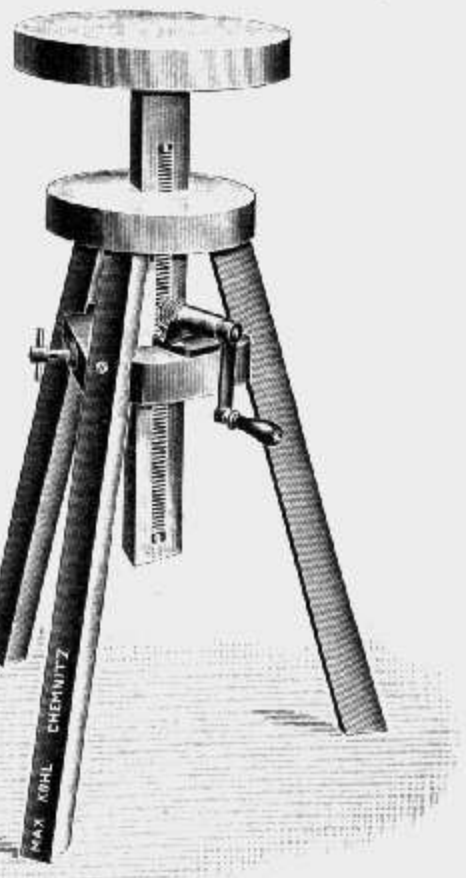
51120 C. 1 : 7.



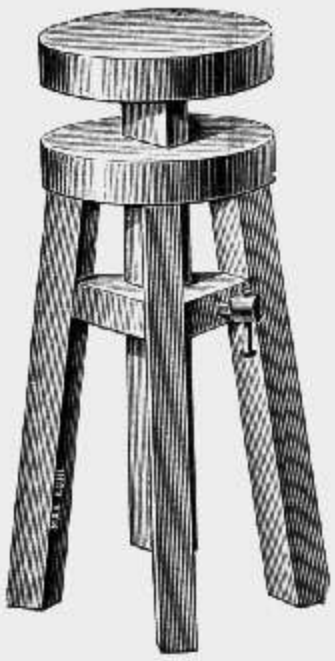
51139. 1 : 8.



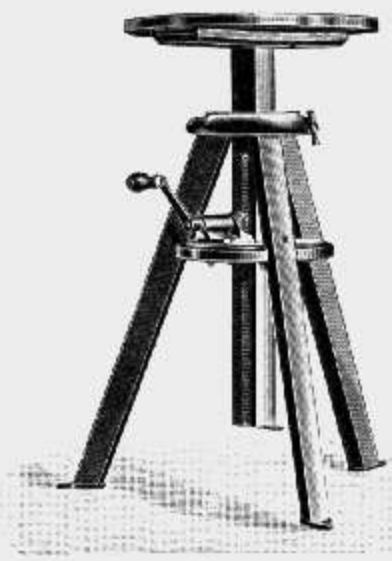
51121. 1 : 3.



51126. 1 : 10.



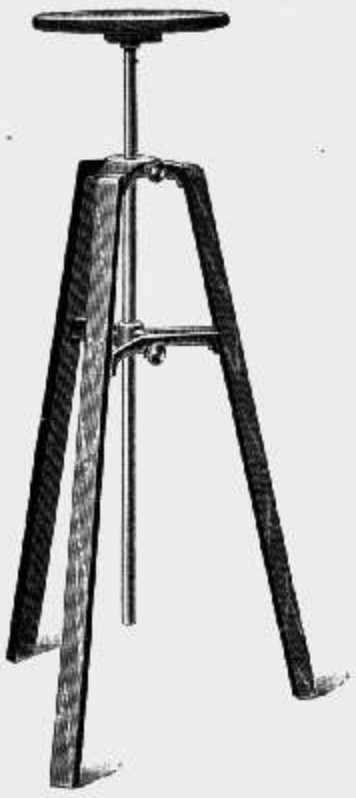
51124. 1 : 15.



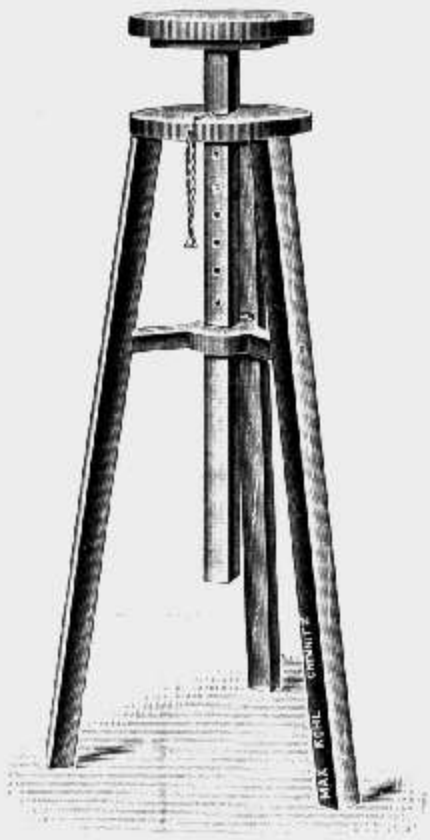
51128. 1 : 18.

	£ s. d.
51,120. **Universal Clamp,** Figs. A, B and C, for clamping reading telescopes as in Fig. A, scales as in Fig. B, and rods, thermometers and the like, as in Fig. C, etc.	0. 9. 0
51,121. **American Clamps,** Figure, of iron (W. D., Fig. 45 [41]), 10 cm span	0. 2. 6
51,122. — idem, span 15 cm	0. 3. 6
51,123. — idem, span 20 cm	0. 4. 6
51,124. **Gauss Stand,** heavy construction, Figure, of oak, metal parts of iron, table with prismatic guide adjustable vertically (W. D., Fig. 30), with table, 40 cm diameter; height, unextended, 88 cm, extended, 140 cm	2. 0. 0

Cl. 5313, 5315, 5314, 110, 153, 106, 107, 3908.



51 130. 1 : 15.



51 131. 1 : 14.



51 132. 1 : 8.

51 133. 1 : 8.

51 134. 1 : 8.



51 142. 1 : 9.

	£ s. d.
51,125. — The preceding, **iron parts** entirely **excluded** from construction	2. 5. 0
51,126. — The preceding, table adjustable by rack and pinion, Figure, metal parts of iron	3. 5. 0
51,127. — idem, **iron-free pattern**	3. 15. 0
51,128. **Laboratory Stand,** lighter pattern, Figure, with table top, 50 cm diameter, adjustable by crank motion, **metal parts of iron**	3. 2. 0
51,129. — The preceding, **free from iron**	3. 12. 0
51,130. **Gauss Stand,** light pattern, Figure, of oak, **free from iron,** without crank motion, table top 30 cm diameter	2. 0 0
51,131. — The preceding, simpler, fixed by pegs, Figure	0. 18. 0

Tables for setting up apparatus, Figures (W. D., Fig. 31), with iron foot, brass pillar and polished wood top 15 cm diameter.

List No.	**51,132**	**51,133**	**51,134**	
Adjustable from	20—30	25—40	35—50	cm height
£	**0. 6. 0**	**0. 7. 0**	**0. 8. 0**	

— The preceding, **iron-free,** with zinc tripod (M. T., p. 9).

List No.	**51,135**	**51,136**	**51,137**	
Adjustable from	20—30	25—40	35—50	cm height
£	**0. 8. 0**	**0. 9. 0**	**0. 10. 0**	

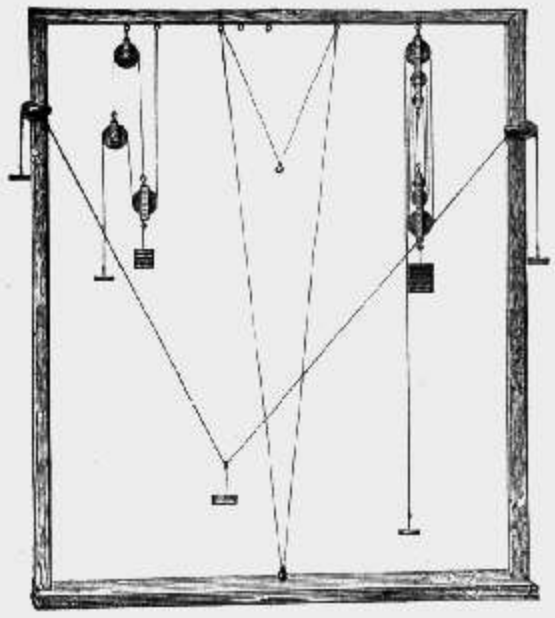
— The preceding, with double extension, thus increasing the range of adjustment, Fig. 51,139, p. 204.

List No.	**51,138**	**51,139**	**51,140**	
Adjustable from	22—50	30—60	35—85	cm height
£	**0. 12. 0**	**0. 14. 0**	**0. 16. 0**	

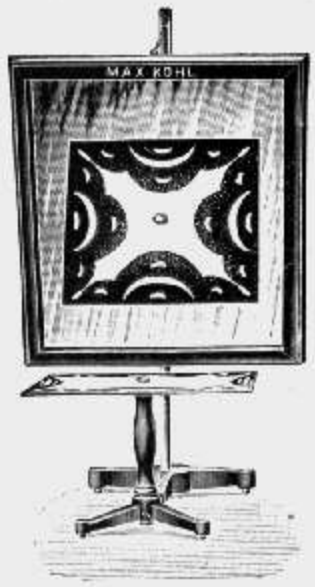
51,141. **Adjustable, rotary Table** for prisms, etc.	0. 15. 0
51,142. **Levelling Board** and Slate Slab, in oak frame, Figure, 50 cm long, 30 cm wide, with 4 levelling screws, quite plane, for erecting apparatus	1. 16. 0
51,143. — The preceding, with cast iron top, 50 cm long, 35 cm wide, planed, with 4 levelling screws	1. 12. 0
51,144. **Levelling Board,** round, 30 cm diameter, with 3 levelling screws.	0. 10. 0



51145. 1 : 10.



51151. 1 : 15.



51153. 1 : 12.

	£ s. d.
51,145. **Levelling Board** with micrometer adjustment, Figure, for accurately setting up apparatus which have no levelling screws fitted, and for adjusting at small angles (M. P., Vol. 1, Fig. 73), with small discs for supporting the levelling screws. Without spirit level	3. 0. 0
The top is of plane glass in a metal frame; the levelling screw, in the form of a micrometer screw, has a disc graduated in degrees.	
51,146. **Parallelepipedic Wood Blocks,** 15 cm square, 1, 2, 2 and 5 cm thick	0. 2. 0
51,147. **Wood Supports,** 15 cm square, 0.5, 1, 2, 2.5 and 10 cm high (M. T., p. 9). . . .	0. 4. 0
51,148. **2 Support Boxes** with hole for gripping (M. T., p. 9), 20×30×40 cm	0. 6. 0
51,149. **1 Set of thin wood wedges** serving as supports, 6 in set	0. 0. 8
51,150. **4 Wide wood wedges,** 5×15 cm, width of back 0.5 and 1 cm (M. T., p. 10) . . .	0. 1. 0
51,151. **Frame Stand,** of oak, Figure (W. D., Fig. 27), 1 m wide, 1 m high, with 8 small and 2 large hooks for suspending pendulums, levers, Magdeburg hemispheres, electromagnets, etc. The frame can be taken apart. Price does not include experimental apparatus	0. 13. 0
51,152. **Portable Gallows** for suspending heavy objects and for tensile tests, as suggested by Friedr. C. G. Müller (M. T., Fig. 3)	3. 0. 0
51,153. **Mirror, on stand,** Figure, for demonstrating phenomena in the horizontal plane, e. g., Chladni's harmonic figures, before a large audience (M. T., p. 9)	1. 8. 0
This mirror is inclined towards the stand at an angle of 45°.	

Flexible Leads, Figure (W. D., Fig. 493 [468]), covered with wool and braided with copper wires at ends.

	Cross-section, sq. mm	1.5	2.5	6
	For currents to amperes	14	20	31
51,154.	— Length 0.60 m, Price	**1 s.**	**1 s. 3 d.**	**1 s. 6 d.**
51,155.	— Length 0.90 m, Price	**1 s. 3 d.**	**1 s. 6 d.**	**2 s.**
51,156.	— Length 1.20 m, Price	**1 s. 6 d.**	**2 s. 3 d.**	**2 s. 6 d.**
51,157.	— Length 1.50 m, Price	**1 s. 9 d.**	**2 s. 2 d.**	**3 s.**

These flexibles can be thoroughly recommended on account of the convenience of manipulation. Thicker leads quoted for on application.

51,158. **1 Set Flexible Leads,** comprising two lengths each of 0.6 and 1.2 m and 1.5, 2.5 and 6 sq. mm cross-section — 12 lengths in all	0. 17. 0

51,159. **Copper Wire,** double silk covered.

Diameter mm	0.2	0.3	0.5	0.7	1.0	1.5	2
Price per kg	**16 s.**	**12 s.**	**8 s.**	**7 s.**	**6 s.**	**5 s. 6 d.**	**5 s.**
Approx. length per kg	3600	1600	560	300	140	65	36 m

Supports and Suspension Devices, for fitting to Lecture Tables: see Nos. 50,096—50,098, **pp. 18 and 19.**

Cl. 5578, 111, 1157.

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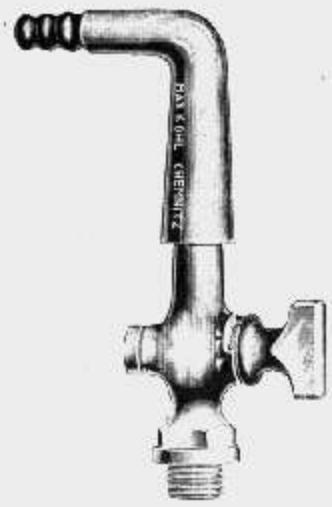
51154—51157. 1 : 1.



51175. 1 : 3.



51176. 1 : 3.



51177. 1 : 4.



51178. 1 : 4.



51180. 1 : 5.

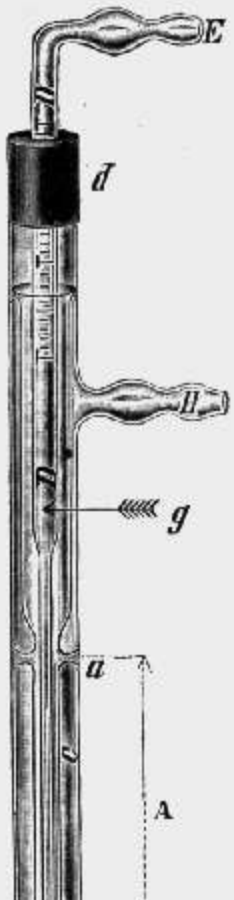
	£ s. d
51,160. — The preceding, 0.9 mm thick, covered with gutta-percha and double cotton taped, for electric bell and telephone leads . . . . . Price per 10 m	0. 0. 8
51,161. — The preceding, bare, 1 mm thick, or thicker . . . . . per kg	0. 3. 6
51,162. **0.5 kg of various copper wire,** bare and insulated	0. 4. 0
51,163. **Rubber Tubing,** of black rubber . . . . . 100 grammes	0. 3. 6

No.	2/0	1/0	2	3	4	6	8
Aperture mm	2	3	4	5	6	8	10
Thickness of Wall	0.6	0.6	0.8	1.2	1.4	1.7	2.0
Price per metre	**3 d.**	**4 d.**	**7 d.**	**1 s. 2 d.**	**1 s. 5 d.**	**1 s. 8 d.**	**3 s.**

51,165. **Rubber Tubing, grey,** 9 mm aperture, 2 mm thickness of wall, for connecting up gas burners . . . . . per metre	0. 1. 0
51,166. **Metal Tubing,** flexible, for gas and water leads, 8 mm internal diameter, 1.25 m long, with rubber annex pieces.	0. 3. 6
51,167. **Bent Brass Tube** for water-lead hose (M. T., p. 4)	0. 2. 0
51,168. **T-Piece for hose unions,** of brass, **three-way piece** (W. D., Fig. 42 [38])	0. 1. 0
51,169. — The preceding, of glass	0. 0. 3
51,170. **+-Piece for hose connections,** of brass (W. D., Fig. 42 [38])	0. 1. 6
51,171. — The preceding, of glass	0. 0. 4
51,172. **Cock,** of pressed glass, outlet about 2 mm in width	0. 1. 0
51,173. **Three-way Cock,** of glass, with 3 union pipes, with rectangular bore.	0. 2. 0
51,174. **Brass Tap,** with 2 undulated hose pieces	0. 2. 6
51,175. **Glass Cock with detachable hose-piece,** Figure	0. 8. 0

This tap is used in particular at times when a tap with a long tube would be a hindrance when not in use. The elbow, which is well ground on, and prevents kinking of the tubing on the tap, can be turned outwards or sideways as desired and the tubing does not require to be taken off the elbow after use. This operation can also be carried out with the utmost ease after removing the elbow from the tap.

51,176. **Double Regulating Cock,** Figure (W. D., Fig. 457 [429]), for rapidly turning down a jet without its being extinguished	0. 9. 0
51,177. **Precision Gass Stopcock,** Figure, for securing fine regulation of the gas current	0. 10. 0
51,178. **Precision Stopcock,** Figure, with micrometer screw, for very high pressure . .	3. 0. 0
51,179. **Precision Water Tap,** conical tap (M. T., p. 107)	0. 15. 0
51,180. **Gas Regulator** (Reichert's), Figure, of glass, for low temperatures, with adjusting screw	0. 6. 6



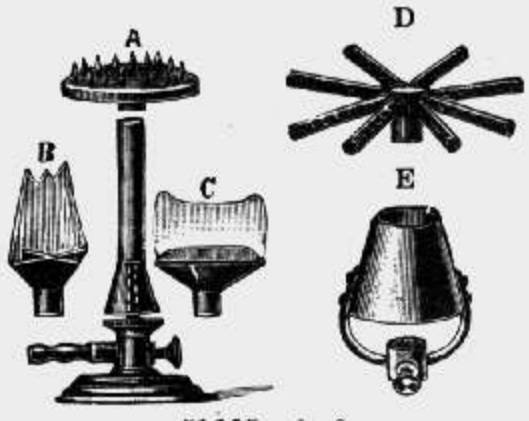
51181. 1 : 2.



51184. 1 : 4.



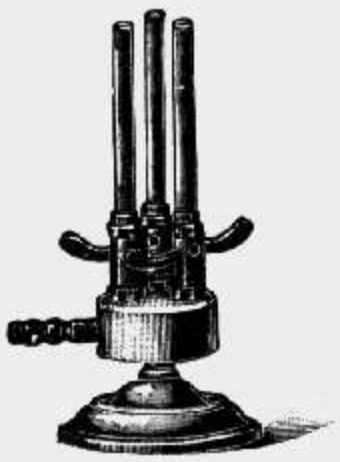
51193. 1 : 3.



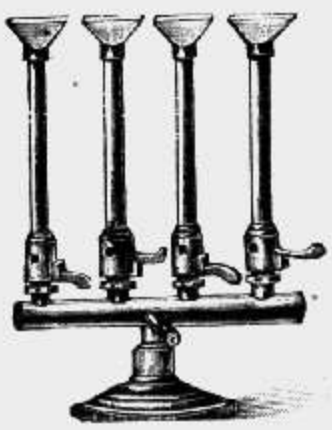
51195. 1 : 6.



51209. 1 : 6.



51199. 1 : 4.



51201. 1 : 4.



51203. 1 : 3.

	£ s. d.
51,181. **Thermo-Regulator,** Figure, for accurately adjusting within limits of + **20** ° to **50** ° **C.**	0. 10. 0
The thermo-regulator is inserted in the apparatus to be heated in such wise that the portion filled with mercury can be completely heated. For transit purposes the tube **D** is packed by itself, its place being taken by a wire with bungs of cotton wool, which closes the ascension pipe at **a**. Before using the regulator this wire is removed and the tube **D** inserted in such manner that the scale etched on the tube, and corresponding to the desired temperature, is covered by the surface of the metal cap **d**.	
51,182. — The preceding, for + **20—100** ° **C.**	0. 11. 0
51,183. — idem, for + **20** °**—150** ° **C.**	0. 12. 0
51,184. **Bunsen Burner,** Figure, can be screwed apart for demonstration purposes, simple pattern, without tap but having air regulator	0. 1. 3
51,186. — The preceding, but with tap and air regulator	0. 2. 6
51,187. **Accessories for the previous gas burners** Nos. 51,184 and 51,186, consisting of Nos. 51,188—51,192	0. 4. 6
51,188. **Chimney,** with holder	0. 0. 10
51,189. **Annex for carrying small dishes, watch glasses,** etc.	0. 1. 0
51,190. **Sieve Annex,** with numerous apertures above	0. 1. 0
51,191. **Crown Piece,** with lateral openings, for obtaining a corona of flame	0. 1. 0
51,192. **Slit Annex,** for obtaining a wide flame	0. 0. 9
51,193. **Iserlohn Burner** (Maste burner), with double draught channel, Figure.	0. 8. 6
51,194. **Rabs Burner,** with 3 movable tubes	0. 9. 0

Cl. 5480, 116, 5481, 5478, 5468, 5477, 1719, 5482, 5483, 112.

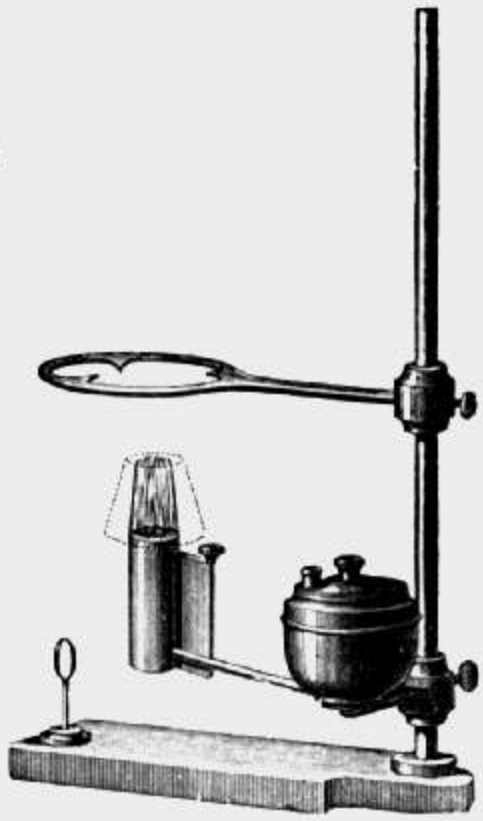
Max Kohl A. G. Chemnitz, Germany.



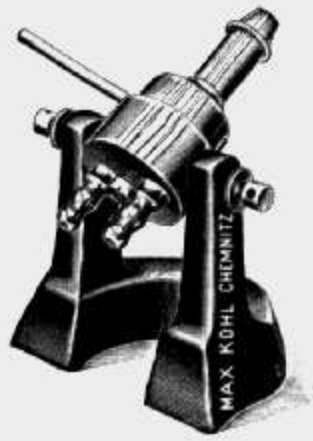
51204. 1 : 5.



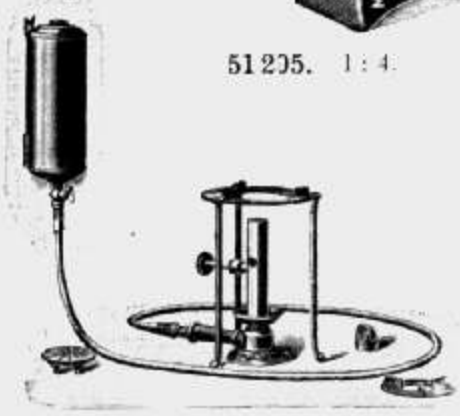
51206. 1 : 6.



51207. 1 : 7.



51205. 1 : 4.



51214. 1 : 10.

51,195. **Universal Gas Burner** (Teclu's), with burner pipe 145 mm in length and 16 mm internal diameter, without the heads A, B, C, D, E . . . . . £ s. d. 0. 4. 6

By the method of air regulation peculiar to this type of burner it can be used either as a Bunsen or an automatic blast burner and it is very efficient in its action. The attachments illustrated above are very suitable for use with this type of burner: (A) mushroom-shaped burner for obtaining a regular distribution of the heat in evaporation work; (B) cross-slot attachment for boiling liquids in beakers, etc.; gives a large amount of heat over a small space; (C) slot attachment for heating and bending tubes, being of great utility for this work. In addition, the following can be supplied: (D) star-shaped attachment, and (E) chimney with holder.

Attachment	A	B	C	D (star-shaped)	E (Chimney with holder)
£	**0. 1. 7**	**0. 1. 7**	**0. 1. 0**	**0. 3. 6**	**0. 1. 0**

51,196. — The preceding, **smaller**, with burner pipe 100 mm in length and 10 mm internal diameter 0. 3. 6

Attachement	A	B	C	D (star-shaped)	E (Chimney with holder)
£	**0. 0. 11**	**0. 1. 3**	**0. 0. 7**	**0. 2. 0**	**0. 0. 10**

51,197. **Gas Burner** (Finkener's), with simultaneous regulation for gas and air, single-jet type 0. 3. 0

51,198. — idem, with star, chimney and air neck 0. 4. 0

51,199. — idem, as No. 51,197, triple-jet. Figure, with separate regulation for each jet 0. 9. 0

51,200. — idem, six-jet 0. 16. 0

51,201. — idem, with 4 burners arranged in a row, with attachments for wide jets . . 0. 17. 0

51,202. **Gas Burner** (Dierbach's), horizontal burner with universal adjustment (M. T., p. 10) 0. 10. 0

51,203. **Blast Burner** for gas. Figure 0. 10. 0

51,204. — idem, with sextuple flame, giving a large and very hot flame. Figure . . 0. 14. 0

51,205. **Blast Burner** for gas. Figure 0. 16. 0

51,206. **Blast Burner** for spirit. Figure, for the blowing table 0. 10. 0

51,207. **Berzelius Lamp** for spirit, with burner stand. Figure 0. 12. 0

Spirit Lamps, constructed of glass, with tube for filling and ground-in stopper. Fig. 51,209.

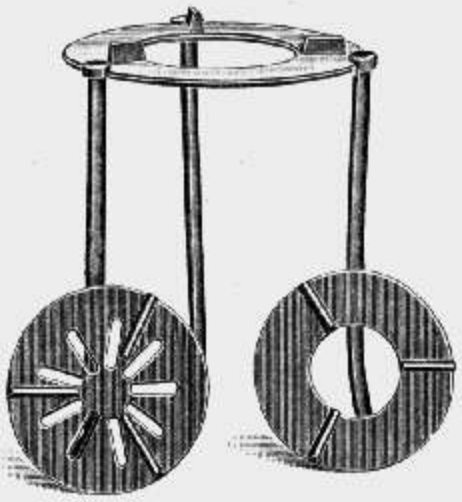
List No.	**51,208**	**51,209**	**51,210**	**51,211**
Capacity	50	100	150	200 ccm
Price £	**0. 0. 8**	**0. 0. 9**	**0. 0. 11**	**0. 1. 1**

51,212. **Spirit Lamp**, of sheet brass, 75 ccm capacity, with wick-regulator 0. 1. 6

51,213. — idem, capacity 150 ccm 0. 2. 0

51,214. **Spirit Bunsen Burner.** Figure, somewhat like a small Bunsen gas burner, with reservoir, 1½ m metal hose and **tripod** 0. 14. 0

51,216. **Spirit Bunsen Burner, larger**, corresponding to 4 Bunsen gas burners, with **tripod** . 1. 2. 6



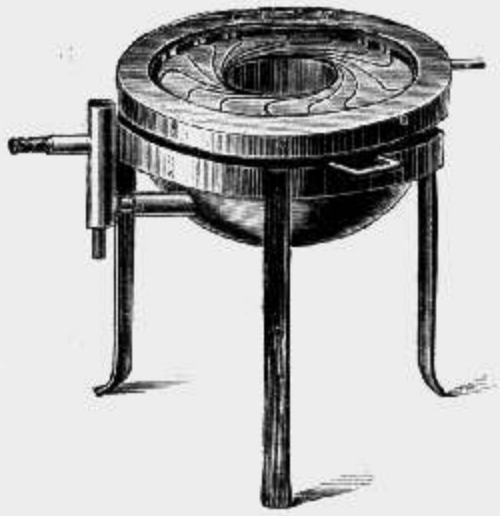
51223. 1 : 4.



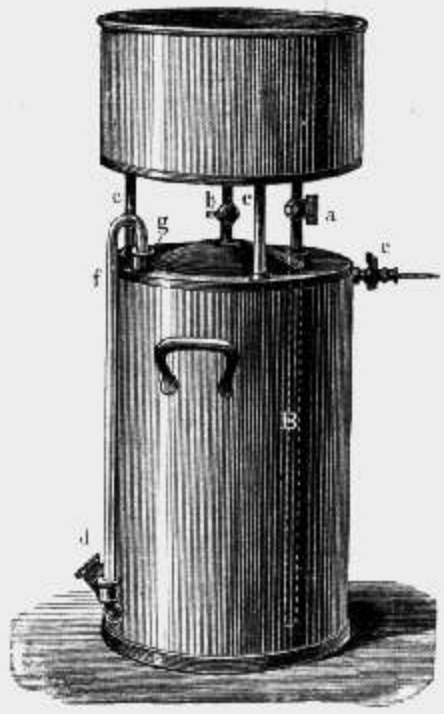
51229. 1 : 8.



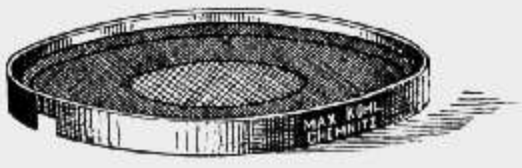
51232. 1 : 10.



51234. 1 : 4.



51252. 1 : 10.



51228.

	£ s. d.
51,217. **Star Burner Attachment** and **Wide Burner Attachment** for No. 51,216	0. 1. 2
51,220. **Tripod,** iron, 100 mm internal diameter of ring	0. 1. 0
51,221. — idem, 120 „ „ „ „ „	0. 1. 1
51,222. — idem, 150 „ „ „ „ „	0. 1. 4
51,223. **Tripod** with 2 inset plates, Figure, of iron	0. 3. 0
51,224. **Wire Triangle**	0. 0. 1
51,225. — idem, covered with **small clay tube:** 50 60 80 mm side of triangle **£ 0. 0. 2 0. 0. 2½ 0. 0. 3**	
51,226. **Wire Net,** of iron, 10 cm square	0. 0. 4
51,227. **Wire Net,** of brass, 10 cm square	0. 0. 5
51,228. **Wire Nets,** of asbestos wire, Figure, cap-shaped, for Bunsen stands; can also be used as supports for beakers, flasks, evaporation dishes, crucibles, etc. which are being heated. **One Set** comprising one each of 7, 10 and 13 cm diameter	0. 3. 0
51,229. **Air Bath,** Figure, Ostwald's, with lighting flames, round type	0. 5. 0
51,230. — idem (Muck's), rectangular, Figure, with arrangement for heating	1. 15. 0
51,231. **Asbestos Dishes** (M. T., p. 11): Diameter cm 10 15 20 **0. 0. 4 0. 0. 7 0. 0. 10**	
51,232. **Water Bath,** of copper, with insertion rings, Figure, 20 cm diameter	0. 8. 0
51,233. — The preceding, with constant level, Figure, with insertion rings, plate with small apertures, cover and tripod	0. 18. 0
51,234. **Evaporation Apparatus** (Water Bath) (Loessner's), without rings, with iris adjustment, constant level, on tripod	1. 1. 0

Electrically-heated Water Baths, Figure, hemispherical, constructed of copper, with copper inset rings, for **100—110 volts,** 4—7 amperes.

List No.	**51,235**	**51,236**	**51,237**	**51,238**
Diameter cm	12	15	18	22
Price £	**1. 18. 0**	**2. 4. 0**	**2. 10. 0**	**2. 16. 0**

The water baths can be supplied for either direct or alternating current voltages up to 250 volts. When ordering, kindly mention voltage available.

Coolers (Liebig's), Fig. 51,241, with funnel pipe and brass jacket, on massive stand.

List No.	**51,239**	**51,240**	**51,241**
Size cm	40	55	65
Price £	**0. 15. 0**	**0. 16. 0**	**0. 18. 0**

Cl. 3245, 5479, 145, 3246, 147, 136.

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51230. 1 : 10.



51233. 1 : 9.



51241. 1 : 8.



51238. 1 : 8.



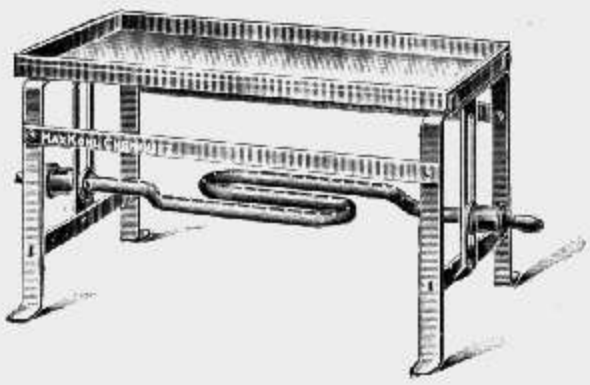
51256. 1 : 12.



51257. 1 : 10.



51250. 1 : 10.



51243. 1 : 8.

Sand Baths, Figure 51,243, comprising: sheet metal dish with iron stand, heating coil adjustable vertically, with gas lead from both sides for obtaining an even flame. £ s. d.

List No.	**51,242**	**51,243**
Size of Dish cm	25×15	40×20
Price £	**0. 12. 0**	**0. 14. 0**

Calibrated Glass Bells for measuring gas volumes (M. T., Fig. 5), with clamping rings.

List No.	**51,244**	**51,245**	**51,246**	**51,247**	**51,248**	**51,249**
Capacity ccm	100	250	500	1000	1500	2000
Size about cm	220×30	280×40	360×55	450×65	470×75	500×80
Price £	**0. 6. 0**	**0. 7. 0**	**0. 8. 0**	**0. 10. 0**	**0. 12. 0**	**0. 14. 0**

51,250. **Mercury Gasometer,** Figure, with double-wall mercury chamber, collecting bell, oak stand, without mercury, for 250 ccm 1. 0. 0

51,251. — idem, for 1000 ccm 1. 5. 0

51,252. **Gasometer** (Pepys'), of stout **lacquered sheet zinc,** Figure, 30 l capacity . . . 2. 5. 0

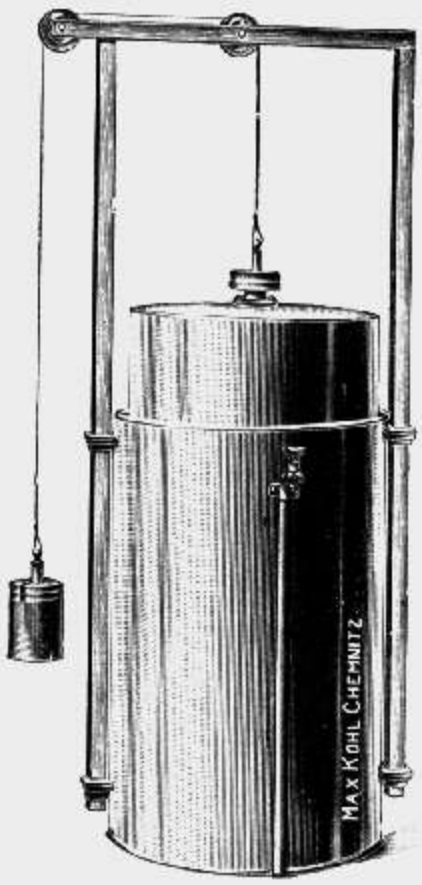
51,253. — idem, 50 l capacity 3. 0. 0

51,254. — idem, of **copper,** 30 l capacity, cf. Fig. 51,252 . . . . . 3. 0. 0

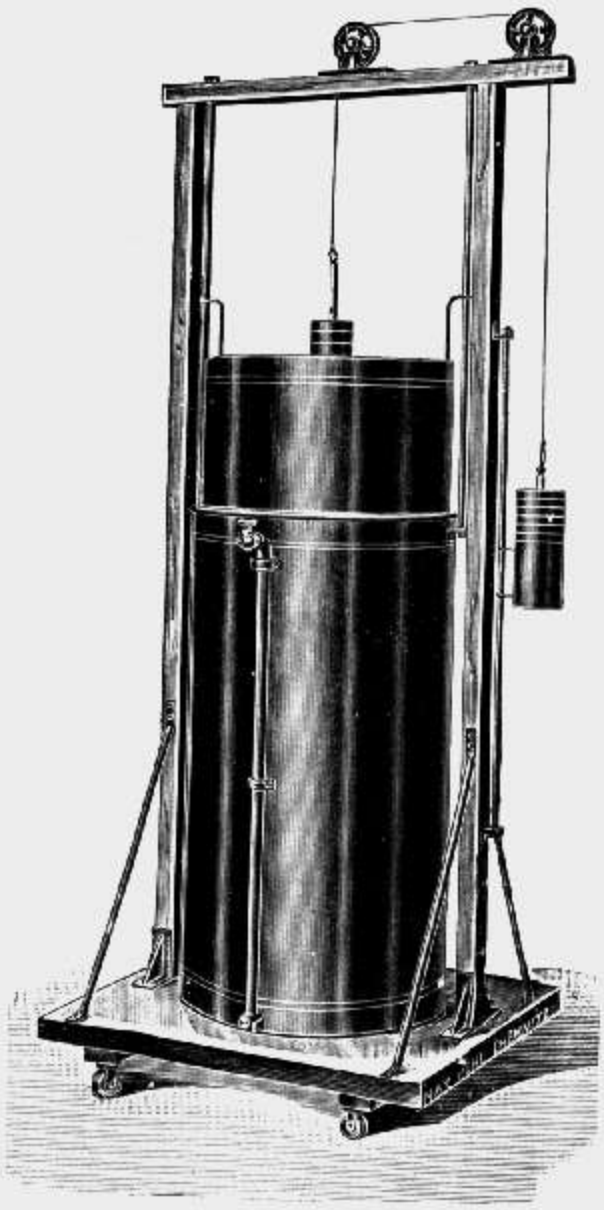
51,255. — idem, 50 l capacity 4. 0. 0

51,256. **Gasometer,** of **glass** (Mitscherlich's), Figure, with metal fittings, 15 l capacity 2. 0. 0

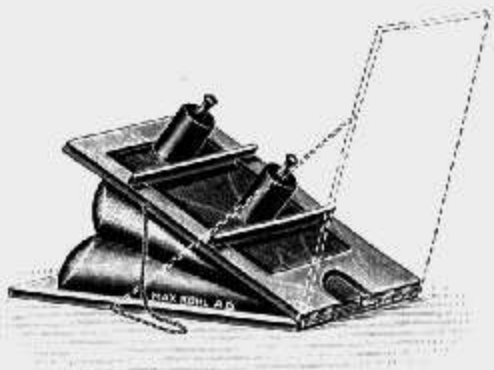
51,257. — idem, 25 l capacity, Figure 3. 0. 0



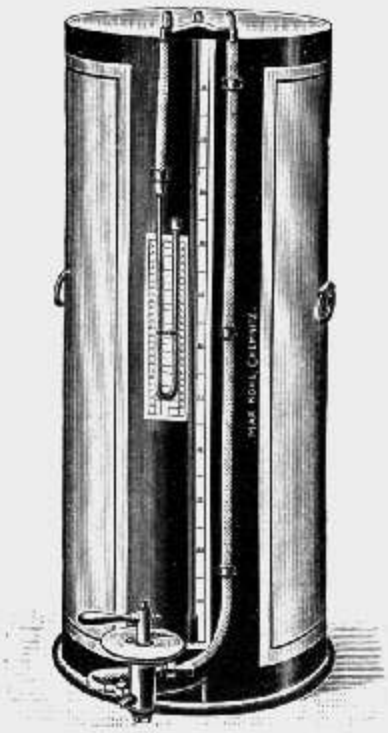
51258. 1 : 11.



51261. 1 : 12.



51267. 1 : 15.



51266. 1 : 13.

Bell Gasometer, Figs. 51,258 and 51,261, with loading and unloading weight, the larger apparatus having guide rods for the weight. £ s. d.

Capacity litres		50	75	100	150
Of stout, lacquered sheet zinc	List No.	**51,258**	**51,259**	**51,260**	**51,261**
	Price £	**3. 10. 0**	**4. 10. 0**	**6. 0. 0**	**8. 0. 0**
Of sheet copper	List No.	**51,262**	**51,263**	**51,264**	**51,265**
	Price £	**5. 0. 0**	**6. 0. 0**	**7. 10. 0**	**11. 10. 0**

51,266. **Universal Gasometer** (Dr. Eichhorn's), Figure, for 120 l volume, with water gauge, pressure gauge and regulating cock (Ztschr. f. d. phys. u. chem. U., **4**, 1891, p. 325) 6. 10. 0

The regulating cock has a pointer moving over a large dial, and has 5 positions marked in plain lettering on same: (a) water and gas cut off, (b) water on, gas off, (c) water on, gas out, (d) water off, gas out or in, (e) water out, gas in. The apparatus can be used (1) as an ordinary **gasometer,** (2) as a **blower,** (3) as a **force pump,** (4) as a **suction apparatus and exhaust pump.**

51,267. **Rubber Bag,** well constructed, Figure, for 110 l oxygen, with tap and clamping board 5. 0. 0

51,268. — idem, for 165 l content 6. 5. 0

51,269. — idem, for 210 l content 7. 10. 0

51,270. — idem, for 280 l content 10. 0. 0

51,271. **Aspirator,** of sheet zinc, with brass stopcock, with 1 vessel, Figure, 5 l content 0. 14. 0

51,272. — idem, 10 l content 1. 0. 0

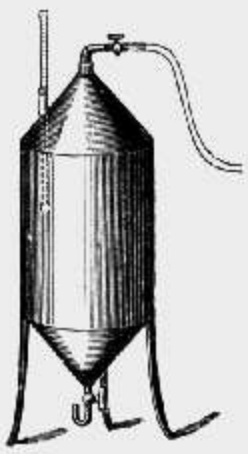
51,273. **Aspirator,** with 2 vessels, Figure, 5 l content 0. 18. 0

51,274. — idem, 10 l content 1. 4. 0

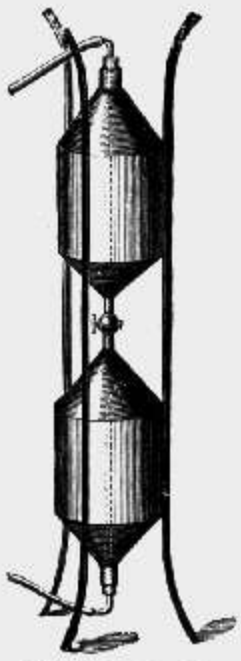
51,275. **Aspirator,** with 2 vessels rotary on a horizontal axis, Figure, 5 l content . . 2. 10. 0

51,276. — idem, 10 l content 3. 5. 0

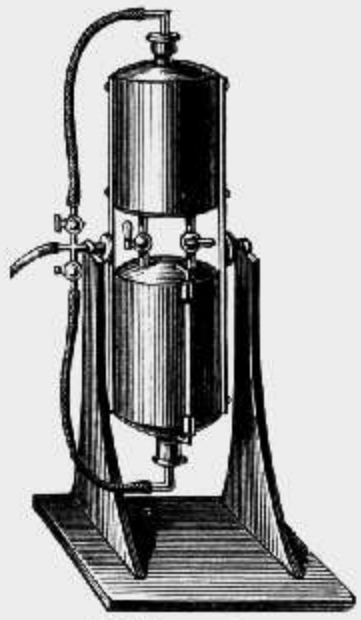
Cl. 5896, 3247, 140, 141.



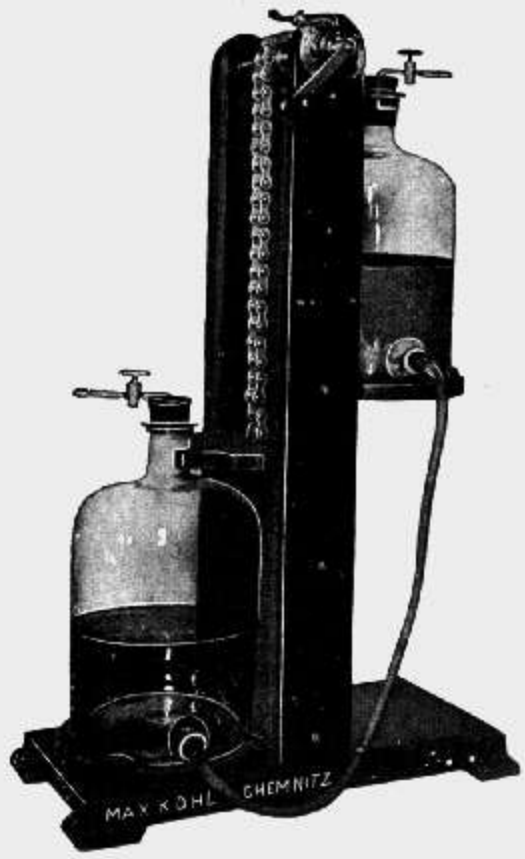
51271. 1 : 7.



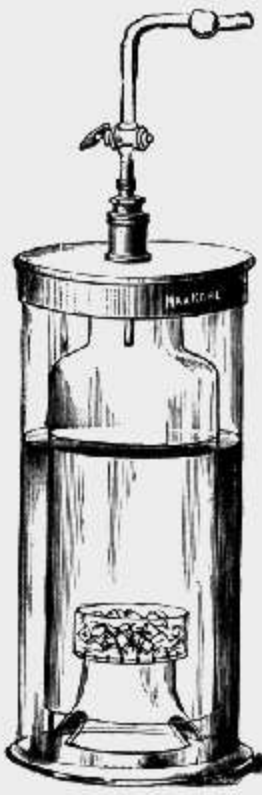
51273. 1 : 11.



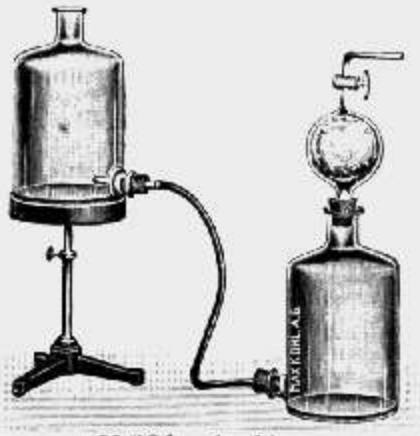
51275. 1 : 11.



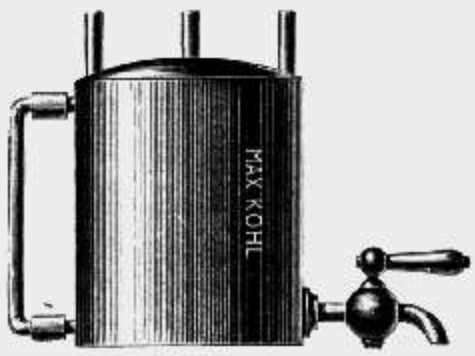
51277. 1 : 10.



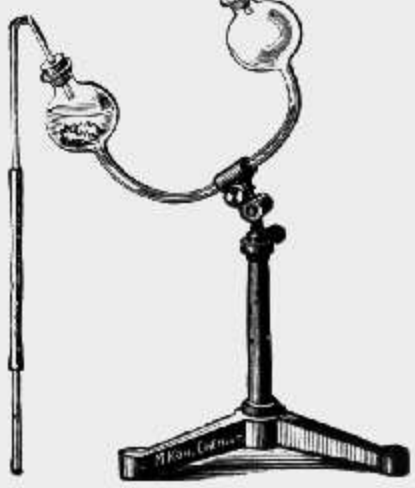
51279. 1 : 7.



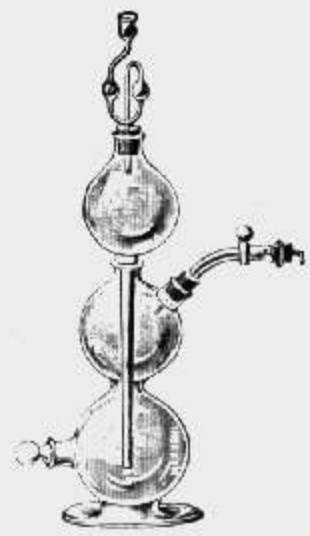
51284. 1 : 11.



51285. 1 : 5.



51278. 1 : 7.



51282. 1 : 10.

51,277. **Aspirator,** Figure, with 2 glass flasks, tubulated, adjustable vertically, and of 12 l content, with oak stand and braided rubber hose . . . . . £ s. d. 6. 5. 0

51,278. **Gas Generating Apparatus** (v. Babo's), Figure, with rubber stoppers and gas conduit pipes 0. 18. 0

51,279. **Gas Generating Apparatus** (Bardeleben's), Figure, consisting of a wide glass cylinder with bell and inset vessel, brass cover, stuffing box and glass stopcock . . 1. 5. 0

Gas Generating Apparatus (Kipp's), Fig. 51,282, with rubber stoppers.

List No.	**51,280**	**51,281**	**51,282**	**51,283**
Capacity ccm	250	500	1000	2000
Price £	**0. 7. 6**	**0. 9. 0**	**0. 10. 0**	**0. 13. 0**

51,284. **Hydrogen Generating Apparatus,** Figure, consisting of 2 tubulated flasks, rubber hose, drying bulb with stopcock and adjustable stage. The apparatus can be connected direct to the burner 0. 18. 0

51,285. **Weinhold's Steam Boiler** (W. D., Fig. 49 [45]), of sheet brass, Figure 0. 16. 0

Cl. 142, 143, 144, 3910, 5875, 133, 149, 132, 3612.



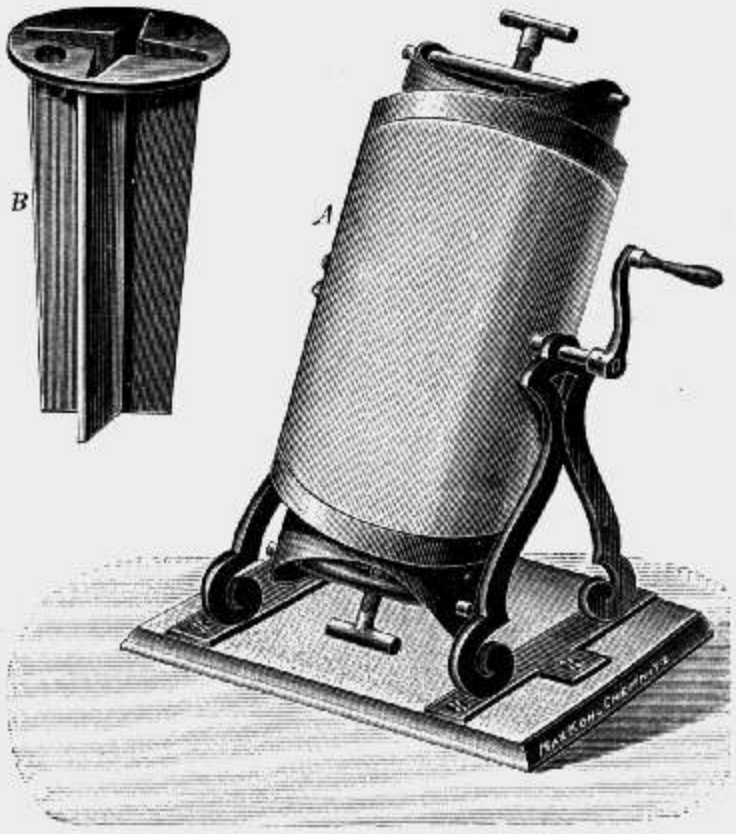
51286. 1 : 8.



51287. 1 : 4.



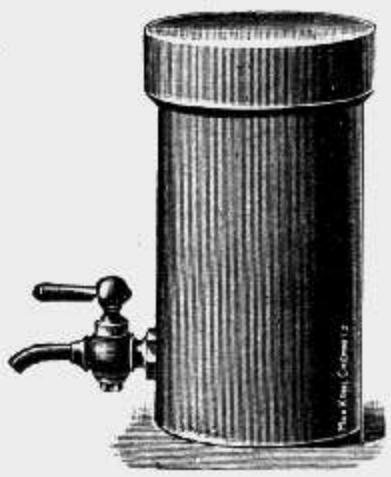
51293. 1 : 5.



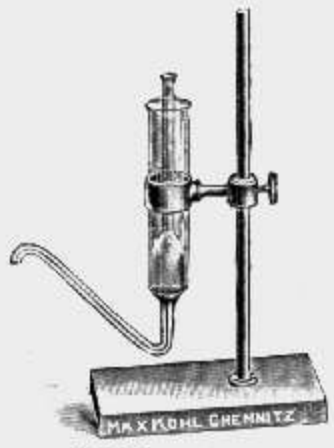
51288. 1 : 7.



51294. 1 : 3.



51297. 1 : 3.

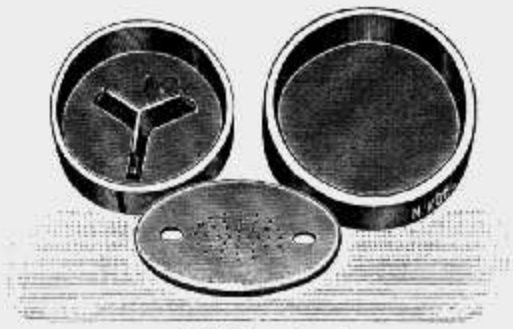


51301. 1 : 5.

		£ s. d.
51,286.	**American Freezer,** Figure, for making pure ice or preserving ice by a cold mixture; freezes $1^1/_2$ l water in 15 minutes, or ice-cream in 8 to 12 minutes. Convenient to handle. With description and recipes	0. 12. 0
	The refrigerating medium in these machines is a mixture of ice or snow with salt.	
51,287.	**Ice Chopper** for above, Figure.	0. 1. 6
51,288.	**Ice Machine** (Liebreich's), Figure, for making small quantities of absolutely pure ice; produces 500—600 g ice in 15 minutes	1. 16. 0
	The action of this machine is based on the fact that ammonium nitrate takes up heat on going into solution so that the temperature falls about 25° C. The ammonium nitrate necessary for making the ice is recovered by evaporation of the solution, and the ice is therefore very conveniently and cheaply produced. — Ice and salt are not used for freezing in this machine.	
51,289.	— The preceding, for making from 1000 to 1200 g in 15 minutes	3. 0. 0
51,290.	**Enamelled kettle** for the volatilisation of the ammonium nitrate	0. 9. 0
51,291.	**Vessel for preserving the ice blocks**	0. 14. 0
51,292.	**Mercury,** chemically pure and dry . . . . . Per kg	0. 8. 0
51,293.	**Mercury Board,** Figure, can be used as a tray, 60×40 cm	0. 7. 0
	The mercury tray is intended for taking the apparatus involving the use of mercury so that any mercury which may be spilled is collected on the board. The board is of oak, and has a raised edge 30 mm in height and, in one of the corners, an escape hole.	

Cl. 184, 185, 155, 186, 156, 157, 3251.

Max Kohl A. G. Chemnitz, Germany.



51302. 1 : 6.



51300. 1 : 5.



51303. 1 : 5.



51304. 1 : 6.



51305. 1 : 2.



51306. 1 : 3.



51307. 1 : 3.



51308. 1 : 3.



51312. 1 : 4.

Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
51,294. **Mercury Box,** Figure, with outlet and screwed cap, constructed of box-wood, with ivory top; capacity 1 kg	0. 5. 0
This box is very convenient to handle, the mercury being kept perfectly clean.	
51,295. — idem, 3 kg capacity	0. 6. 0
51,296. — idem, 5 kg capacity	0. 7. 0
51,297. **Mercury Box,** of box-wood, with steel tap, 1 kg capacity, Figure	0. 9. 0
51,298. — idem, 3 kg capacity	0. 10. 0
51,299. — idem, 5 kg capacity	0. 12. 0
51,300. **Mercury Dropping Vessel** (Grimsehl's), Figure (Ztschr. f. d. phys. u. chem. U., 18, 1905, p. 34). Price without mercury	0. 1. 2
51,301. **Mercury Capillary Dropper,** Figure, for pouring out small quantities of mercury	0. 4. 0
51,302. **Mercury Trap,** Figure	0. 10. 0
This device is let into the floor and takes up the small quantities of mercury which have spurted and collected together. The mercury can easily be removed from the trap by means of the inner chamber.	
51,303. **Mercury Tongs,** Figure, for picking up drops of mercury	0. 2. 6
51,304. **Mercury Press,** Figure, for purifying mercury	0. 12. 0
51,305. **Tweezers,** German silver, double, with platinum tips, Figure	0. 6. 0
51,306. **Tweezers,** brass, simple pattern, with bent ivory tips, Figure	0. 1. 6
51,307. **Tweezers** of brass, simple pattern, Figure	0. 0. 6
51,308. **Crucible Tongs,** iron, lacquered, Figure	0. 0. 10
51,309. — idem, of iron, polished	0. 1. 0
51,310. — idem, of German silver	0. 2. 0

Spatulas, double-sided, of polished steel, Fig. 51,312.

List No.	**51,311**	**51,312**	**51,313**	**51,314**
Length cm	12	21	29	40
Price £	**0. 0. 4**	**0. 0. 6**	**0. 0. 10**	**0. 1. 6**

Spoons, with spatulated handle, of nickel.

List No.	**51,315**	**51,316**	**51,317**
Length cm	12	15	21
Price £	**0. 1. 2**	**0. 1. 6**	**0. 2. 6**

51,318. **Spoon,** of glass, 20 cm long	0. 0. 8
51,319. **Phosphorus Spoons,** of iron	0. 0. 4
51,320. **Mortar,** cast iron, with pestle, hollowed out, 15 cm diameter, 15 cm high	0. 15. 0
51,321. **Agate Mortar,** with pestle, external diameter 65 mm	0. 8. 0

51,322. **Pulverising Dishes** with spout and mortar.

70	100	130 mm diameter
£ **0. 0. 10**	**0. 1. 1**	**0. 1. 6**



51323. 1 : 5.



51325. 1 : 5.



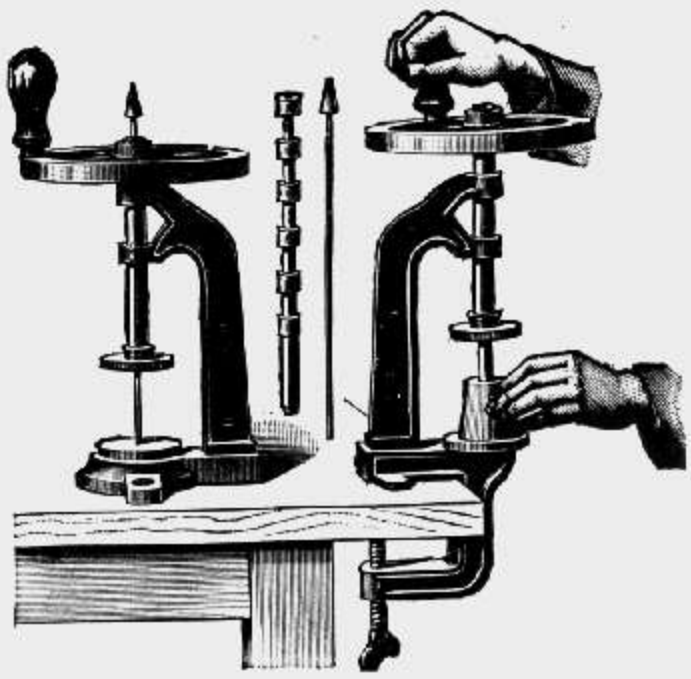
51334. 1 : 2.



51326. 1 : 3.



51328. 1 : 3.



51331. 1 : 5. 51332. 1 : 5.

	£	s.	d.
51,323. **Blowpipe,** collapsible, the tip having platinum discs, Figure	0.	2.	0
51,324. — idem, collapsible, simpler, without platinum tip	0.	1.	6
51,325. — idem, not collapsible, Figure	0.	1.	0
51,326. **Cork Borers,** brass, 12 in set, Figure	0.	5.	0
51,327. **Cork Borers,** brass, 9 in set	0.	3.	6
51,328. **Cork Borers,** brass, 6 in set, Figure	0.	2.	0
51,329. **Cork Borers,** steel, 6 in set	0.	6.	0
51,330. **Cork Borers,** steel, 12 in set	0.	12.	0
51,331. **Cork Boring Apparatus,** Figure, for firmly screwing to table, with 8 nickelled steel piercers of 4 to 15 mm diameter	1.	0.	0
51,332. — idem, Figure, with screw clamps for screwing on to edge of table	1.	2.	0
51,333. — idem, **larger pattern,** with screw clamp and with 15 nickelled steel piercers of 4 to 25 mm diameter	1.	12.	0
51,334. **Sharpener** for cork borers, Figure	0.	1.	6
51,335. **Cork Press,** Figure	0.	3.	6
51,336. **Rubber Stoppers,** various sizes, 16 in set	0.	8.	9

No.	1	2	3	4	5	6	7	8	
Diameter above	10	12	15	16	18	20	23	25	mm
Diameter below	7	9	10	12	14	16	20	22	,,
Length	20	21	20	22	22	20	30	30	,,
Each	½ d.	1 d.	1 d.	1½ d.	2 d.	3 d.	4 d.	6 d.	
No.	9	10	11	12	13	14	15	16	
Diameter above	28	30	31	35	40	42	45	50	mm
Diameter below	22	24	27	30	35	37	40	43	,,
Length	28	30	30	33	33	33	33	35	,,
Each	6 d.	6 d.	6½ d.	8 d.	1 s.	1 s. 1 d.	1 s. 3 d.	1 s. 6 d.	

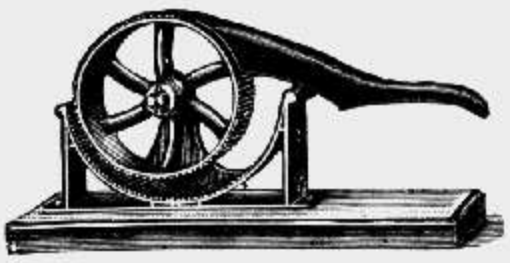
For piercing the stoppers the price for each hole is	0.	0.	½	
51,337. **100 Corks** of various sizes, conical (M. T., p. 10)	0.	2.	6	
51,338. **10 Glass Stoppers** for closing hose and holes in corks (M. T., p. 10)	0.	0.	6	
51,339. **Pneumatic Trough** for Water, of stout double glass, in brass frame, with adjustable bridge of plate glass. Trough is 320 mm long, 160 mm wide, 125 mm high	1.	0.	0	
51,340. **Glass Receiving Cylinder,** Figure, tall form, with unpolished edge, without stoppers and ungraduated. Per set of 5	0.	5.	1	

Size mm	150×40	175×50	200×60	250×60	300×80
£	0. 0. 6	0. 0. 8	0. 1. 0	0. 1. 1	0. 1. 10

51,341. **Measuring Cylinders** with lip, Figure. Per set of 10	1.	1.	9	

10	25	50	100	150	200	250	500	1000	2000 ccm capacity
6 d.	9 d.	11 d.	1 s. 3 d.	1 s. 6 d.	1 s. 7 d.	1 s. 10 d.	2 s. 3 d.	4 s. 1 d.	7 s. 1 d.

Max Kohl A. G. Chemnitz, Germany.



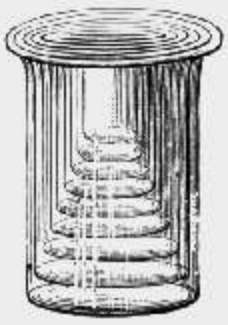
51335. 1 : 5.



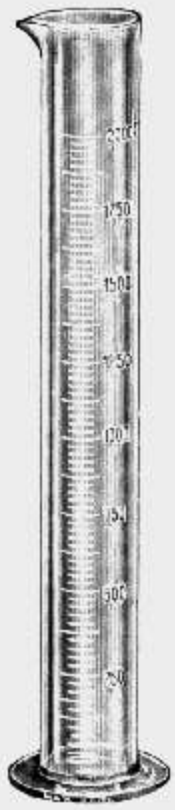
51352.



51340.



51345. 1 : 6.



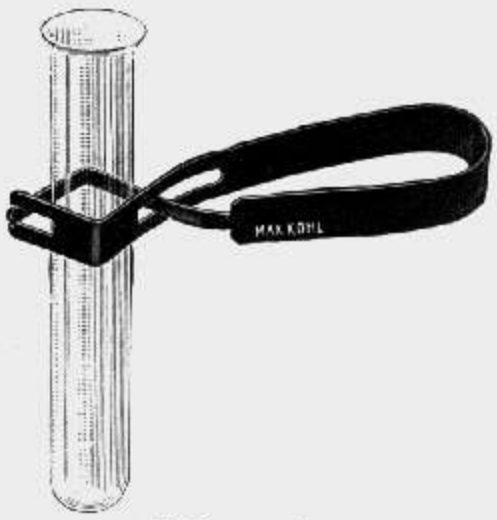
51341.



51351.



51342.



51348. 1 : 2.



51354. 1 : 2.

51,342. **Measuring Glasses** with stopper (mixing cylinders), Figure, graduated in ccm. Per set of 6 . . . . . £ s. d. 0. 16. 1

100	150	200	250	500	1000 ccm capacity
£ **0. 1. 7**	**0. 1. 11**	**0. 2. 1**	**0. 2. 5**	**0. 3. 0**	**0. 5. 1**

51,343. **Preparation Cylinders,** with wide stopper ground in (M. T., p. 11). Price per set of 3 . . . . . 0. 2. 6

100	200	400 ccm capacity
£ **0. 0. 7**	**0. 0. 10**	**0. 1. 1**

51,344. **Base for measuring glasses** (Rebenstorff's), (Chemiker-Ztg., 1908, p. 177) 0. 3. 6

51,345. **Beakers,** Figure.

6	8	10	12 in set
£ **0. 1. 1**	**0. 1. 9**	**0. 2. 7**	**0. 3. 10**

51,346. **Test Glasses.** One set of 30, 3 sorts 0. 1. 7

100	150	180 mm high
16	16	20 mm diameter
£ **0. 0. 5**	**0. 0. 6**	**0. 0. 8** per set of 10.

51,347. **Test Glass Stand,** unpolished, for 12 glasses, with rods for drying the glasses . . . 0. 1. 6

51,348. **Test Glass Holders,** Figure, of nickelled clockspring steel 0. 0. 7

51,349. **Watch Glasses.** Per set of 4 . . . . . 0. 1. 3

50	65	80	100 mm diameter
£ **0. 0. 2½**	**0. 0. 3**	**0. 0. 3½**	**0. 0. 6** each.

51,350. **Watch Glass Clamps,** 1 set, suitable for preceding glasses, of sheet brass 0. 1. 3

51,351. **Crystallising Dishes,** Figure, set of 10, 40—160 mm diameter, with lip 0. 6. 0

51,352. **Porcelain Dishes,** with lip, Figure. Set of 6 . . . . . 0. 2. 0

60	70	85	100	125	155 mm diameter
£ **0. 0. 2½**	**0. 0. 2½**	**0. 0. 3**	**0. 0. 3½**	**0. 0. 5½**	**0. 0. 7** each.

51,353. **Porcelain Crucibles,** with lids. Price per set of 8 . . . . . 0. 4. 4

3	10	18	30	65	90	135	220 ccm capacity
2½ d.	**2½ d.**	**3 d.**	**4 d.**	**6 d.**	**7 d.**	**9 d.**	**1 s. 6 d.** each.

51,354. **Holder for Porcelain Dishes and Crucibles,** Figure, of nickelled clock spring steel 0. 0. 7

51,355. **Iron Dish,** flat, 80 mm diameter 0. 0. 4

51,356. — idem, 100 mm diameter 0. 0. 5

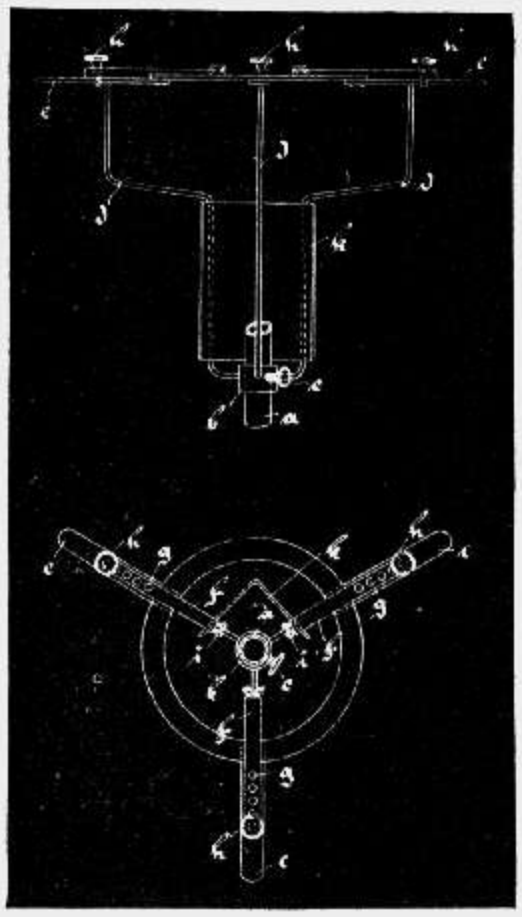
51,357. — idem, 150 mm diameter 0. 0. 7

Deep dishes are charged for at double the above prices.

51,358. **Carbon Crucible,** 50 mm high, 45 mm diameter 0. 1. 0

Cl. 5486, 176, 179, 181, 5467, 162, 164, 5465, 180.

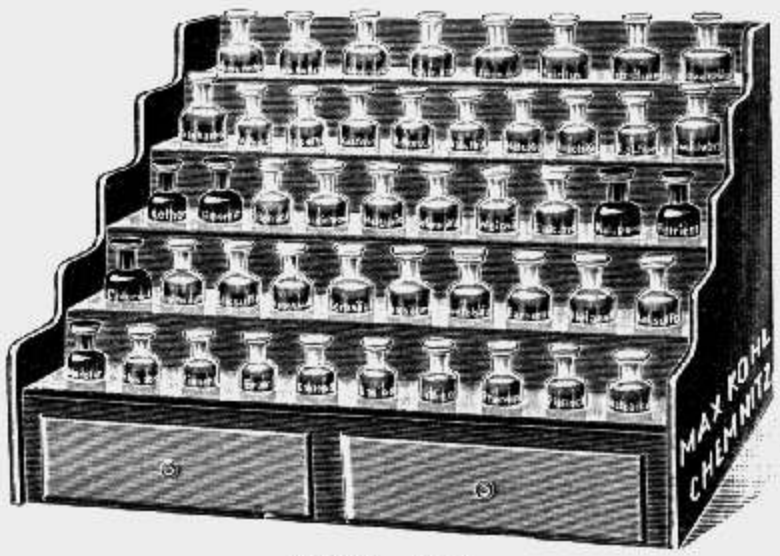
Max Kohl A. G. Chemnitz, Germany.



51367. 1 : 4.



51368. 51369. 51370.



51374. 1 : 7.



51386.

	£	s.	d.
51,359. **Magnesite Crucible,** 50 mm high, 45 mm diameter	0.	1.	0
51,360. **Carbon Dish,** 65 mm diameter	0.	1.	0
51,361. — i d e m, 100 mm diameter	0.	1.	0
51,362. **Graphite Dish,** 150 mm diameter	0.	3.	6
51,363. **10 Smelting Crucibles,** of fire clay, 5 different sizes	0.	3.	6
51,364. **Hessian Crucibles,** of clay, triangular, without lids. Per set of 3, 8 cm high	0.	0.	3
51,365. — i d e m, set of 5, 12 cm high	0.	0.	6
51,366. — i d e m, set of 7, 17 cm high	0.	1.	0

Platinum Crucibles in any desired size and shape. Prices vary according to weight and prevailing price of platinum.

51 367. **Stand for Platinum Crucibles and Dishes,** F i g u r e, for setting on Bunsen burners, adjustable for different sizes, with vertical adjustment and wind screen. Price, subject to alteration without notice 0. 15. 0

This stand is for placing on the burner, and with its aid platinum dishes and crucibles of any size can be firmly fixed without any bulging. The crucibles are hung in platinum slings and they do not, therefore, even at high temperatures, come into contact with other metals.

51,368. **Powder Jars** with wide neck, F i g u r e, with grips or flat stoppers of white glass. Price, unfilled:

	150	200	300	400	500	1000 ccm capacity
(a) With Grips . . .	**3 s. 3 d.**	**3 s. 9 d.**	**5 s.**	**5 s. 6 d.**	**6 s. 6 d.**	**10 s. per 10**
(b) With Flat Stoppers	**4 s.**	**4 s. 7 d.**	**6 s.**	**7 s.**	**8 s.**	**12 s. per 10.**

If without stoppers the bottles cost about half the price charged for these with squat stoppers.

51,369. **Bottles for Liquids,** with narrow necks, with tall or squat stoppers, F i g u r e, of white glass. Price, empty:

	150	200	300	400	500	1000 ccm capacity
(a) With Grips . . .	**2 s. 3 d.**	**2 s. 6 d.**	**3 s. 6 d.**	**4 s.**	**4 s. 10 d.**	**7 s. 6 d. per 10**
(b) With Flat Stoppers	**3 s.**	**3 s. 6 d.**	**4 s. 6 d.**	**5 s. 3 d.**	**6 s. 4 d.**	**9 s. 6 d. per 10**

51,370. **Bottles for Reagents or Powders,** with enamel labels, burnt-in black or etched inscriptions, with tall or squat stoppers and wide or narrow openings, F i g u r e.

100	150	200	300	400	500	1000 grams capacity
1 s. 1 d.	**1 s. 2½ d.**	**1 s. 3½ d.**	**1 s. 5 d.**	**1 s. 6½ d.**	**1 s. 8½ d.**	**2 s. 1 d.** each.

Prices 10% extra for brown or blue glass bottles.


51378.


51379.


51382.


51389.


51397. 1 : 5.

Reagent Stands with Reagent Bottles, Fig. 51,374, of polished wood. £ s. d.

List No.	51,371	51,372	51,373	51,374	
Number of bottles without contents .	24	32	40	48	
(a) **In Alder Wood** . . . . . £	**2. 15. 0**	**3. 5. 0**	**3. 15. 0**	**4. 5. 0**	
(b) **If in Mahogany or Oak** . . . . £	**0. 7. 0**	**0. 8. 0**	**0. 9. 0**	**0. 10. 0**	extra.

These stands have two drawers and 3—5 stages for taking the bottles of 33—125 ccm volume, the bottles having well fitting squat stoppers. The inscription is burnt into these bottles. List of inscriptions on application; the inscriptions are also prepared according to instructions supplied by clients.

51,375. **Rotary Reagent Stand** for placing on the table. Price, without bottles 1.10. 0

51,376. **Boiling Flasks,** long-necked, or with short necks strengthened at the upper edge

100	150	200	250	400	500	1000	ccm capacity	
1½ d.	**1½ d.**	**2½ d.**	**2½ d.**	**3 d.**	**3½ d.**	**5½ d.**	(Per set of 7)	0. 1. 8

51,377. — idem, of refractory glass.

4 d.	—	**5 d.**	—	**7 d.**	**8 d.**	**1 s.**	(Per set of 5)	0. 3. 0

Measuring Flasks, with a mark on neck.

25	50	100	250	500	1000 ccm capacity.

51,378. — Without stoppers, Figure:

5 d.	**4 d.**	**4½ d.**	**7½ d.**	**10 d.**	**1 s. 2 d.**

51,379. — With stoppers, Figure:

7 d.	**6½ d.**	**7 d.**	**11 d.**	**1 s. 2 d.**	**1 s. 6 d.**

Woulff Flasks.

Content	1	1.5	2	3 litres
51,380. — with 2 or 3 necks	**1 s. 6 d.**	**1 s. 11 d.**	**2 s. 6 d.**	**3 s. 3 d.**
51,381. — with 2 or 3 necks and tube at bottom .	**2 s.**	**2 s. 5 d.**	**3 s. 3 d.**	**4 s.**

51,382. **Retorts,** without tube, Figure. Per set of 6 . . . . . 0. 2. 3

100	150	250	400	500	1000 ccm capacity
Each **2½ d.**	**3 d.**	**4 d.**	**5 d.**	**5½ d.**	**7 d.**

51,383. — idem, with tubulure and ground-in stopper. Per set of 6 . . . . . 0. 4. 3

100	150	250	400	500	1000 ccm capacity
Each **5½ d.**	**6 d.**	**7½ d.**	**9 d.**	**10 d.**	**1 s. 1 d.**

Retorts of refractory glass.

	50	100	250	500 ccm		
51,384. — without tube	**3 d.**	**4 d.**	**6 d.**	**10 d.**	Per set (4)	0. 1.11
51,385. — with tube, **without** stopper . . .	**5 d.**	**6 d.**	**9 d.**	**1 s. 1 d.**	Per set (4)	0. 2. 9

Receivers for Retorts.

	100	250	500 ccm		
51,386. — without tube, Figure	**3 d.**	**4 d.**	**6 d.**	Per set (3)	0. 1. 1
51,387. — with 1 tube	**4 d.**	**6 d.**	**7 d.**	Per set (3)	0. 1. 5
51,388. — with 1 tube and ground-in stopper . . .	**5 d.**	**7 d.**	**10 d.**	Per set (3)	0. 1.10

Oxygen Generating Retorts (see Nos. 50,960 and 50,961, p. 174).

51,389. **Funnels,** Figure.

50	80	120	155 mm aperture		
1½ d.	**2 d.**	**3½ d.**	**5 d.**	Per set (4)	0. 1. 0

51,390. **Funnel Tubes** (Safety Tubes).

200	300	400	500 mm tube-length		
1½ d.	**2½ d.**	**3 d.**	**4 d.**	Per set (4)	0. 0.11

51,391. **Safety Funnel with bulb** 0. 0. 5

51,392. — idem, with 2 bulbs. 0. 0. 6

51,393. **Separating Funnels,** round, with stoppers.

¼	½	1 litre capacity	
3 s.	**3 s. 6 d.**	**4 s. 3 d.**	each.

51,394. **Drying Cylinder** (calcium chloride cylinder), as suggested by Fresenius, 250 mm high 0. 1. 0

51,395. **Drying Tubes** (Schmitz') (Fresenius, Ztschr. f. analytische Chemie, **23**, 1884, p. 515) 0. 4. 0

51,396. **Desiccators** (Fresenius'), with ground-on cap and glass triangle, 80 mm diameter, cf. Fig. 51,397 . . . . . 0. 3. 6

51,397. — idem, 100 mm diameter, Figure 0. 4. 0

51,398. — idem, Scheibler's, with glass lid, 120 mm diameter, with porcelain inset . . 0. 5. 0

51,399. — idem, for evacuating, with glass stopcock, glass plate and porcelain inset . . 0. 8. 6

Max Kohl A. G. Chemnitz, Germany.



51412. 1 : 2.



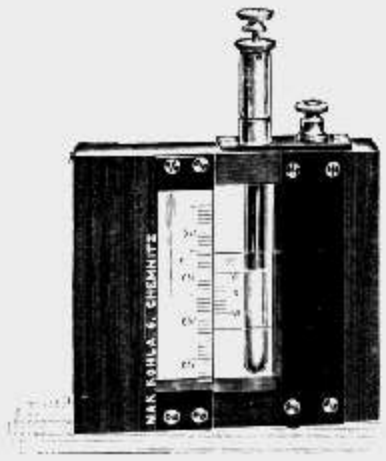
51416. 1 : 10.



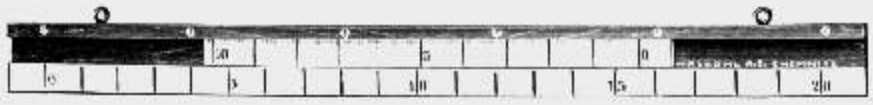
51414.

	£ s. d.
51,400. **Spray Flask** (Fresenius') (W. D., p. 60 [54])	0. 0. 7
51,401. **Hardened Filters** . . . . . Per set of 50	0. 3. 5
Diameter cm 4 7 11 15 24	
Per 10 **2½ d.** **3½ d.** **7 d.** **10 d.** **1 s. 6 d.**	
51,402. **Filter Paper,** medium thick, absolutely white and specially pure; also suitable for liquids difficult of filtration, 58×58 cm size. Price per 100 sheets	0. 13. 0
51,403. **Gas Washing Flasks,** Bunsen's. 250 500 ccm capacity	
£ **0. 0. 10** **0. 1. 0**	
51,404. **Combustion Boat,** porcelain, 40×5 mm	0. 0. 4
51,405. — idem, larger, 62×7 mm	0. 0. 5
51,406. **Bent Tubing** . . . . . Per kg	0. 2. 0
51,407. **Spherical Tubes** (M. T., p. 11), with 1 2 3 bulbs . . Per set (3)	0. 2. 0
6 d. **7½ d.** **10½ d.**	
51,408. **Combustion Tubes,** thickness of wall, abt. 1/10 of the diameter, in lengths of 1 m. Per kg	0. 3. 3
51,409. **U-Tubes** (desiccating tubes) (M. T., p. 11). Per set of 3	0. 1. 1
80 130 180 mm length of limb	
£ **0. 0. 3** **0. 0. 4** **0. 0. 6**	
51,410. **Stirring Rod,** glass, 25 cm long, with round-fused ends	0. 0. 3
51,411. **Overflow Pipettes** . . . . . Per set (9)	0. 5. 6
1 2 5 10 20 25 50 100 200 ccm	
4 d. **4 d.** **4½ d.** **5 d.** **6 d.** **7½ d.** **9 d.** **11 d.** **1 s. 3 d.**	
51.412. **Pipette,** for small vessels and tubes the lower orifice of which is plunged in a liquid	0. 3. 0
Burettes (Mohr's). 25 50 75 100 ccm capacity	
1/10 1/5 1/5 1/5 ccm graduation	
51,413. — with pinch cock, see Fig. 51,119, p. 203.	
1 s. 7 d. **2 s. 6 d.** **3 s.** **4 s. 6 d.**	
51,414. — with glass stopcock, Figure. **2 s. 8 d.** **3 s. 6 d.** **4 s. 4 d.** **4 s. 8 d.**	
51,415. **Floater** for above	0. 0. 8
51,416. **Demonstration Gas Burette** (Bunte's), modified by Rischbieth, Figure (Ztschr. f. d. phys. u. chem. U. **15**, 1902, p. 74), 100 ccm capacity, graduated in fifths of a ccm, with stand. The burette tube has at the top a branch tap, emission tube and funnel for filling, with a simple tap at the bottom. The rubber tubing can be closed by a pinch cock. With platinum wires.	1. 4. 0
51,417. **Eudiometer** (Bunsen's). 300 500 800 mm graduation	
£ **0. 3. 2** **0. 4. 0** **0. 5. 6**	
51,418. **6 Brushes for reagent glasses, beakers, boiling flasks** and **measuring glasses** (M. T., p. 11)	0. 9. 0
51,419. **Picein** (Walter's): a cement for assembling physical apparatus; quite insoluble in water and alcohol (Drudes Annalen d. Phys., Vol. **18**, 1905, p. 860). Per 200 grams . . .	0. 2. 0
51,420. **Various Materials for general purposes** (as suggested by F. C. G. Müller; see No. 50,254, p. 40)	6. 10. 0
51,421. **Glass Pearls,** abt. 3—4 mm diameter (M. T., p. 11) . . . . . Per kg	0. 5. 0
51,422. **Glass Plates,** round, ground matt one side, 50—210 mm diameter (M. T., p 10). Per set of 7	0. 3. 3

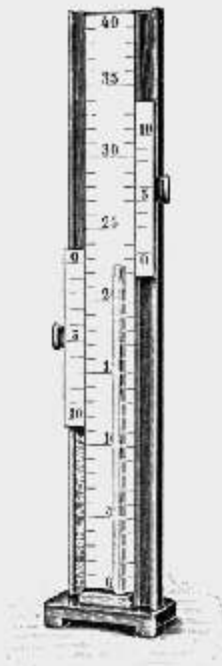
Max Kohl A. G. Chemnitz. Germany.



51423. 1 : 4.



51426. 1 : 10.



51425. 1 : 12.



51433. 1 : 9.

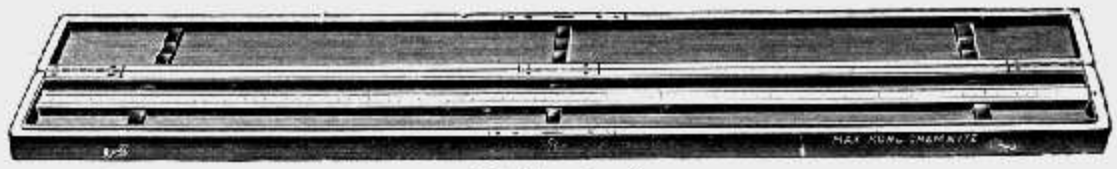
Measurement of Lengths, Angles, Surfaces and Volumes, Dividing Engines, Slide Rules.

Max Kohl A. G. Chemnitz, Germany.

		£ s. d.
* 51,423.	**Linear Vernier Model** for the projection lantern, with **forward** vernier, demonstrating barometer reading, Figure (Ztschr. f. d. phys. u. chem. U. **16**, 1903, p. 345), with screw adjustment	1. 5. 0
* 51,424.	— idem, with **rear** vernier	1. 5. 0
51,425.	**Linear Vernier Model** with **forward** and **rear** verniers, Figure, of wood (Fr. phys. Techn. **I**, 2, Fig. 2025)	1. 0. 0
51,426.	**Linear Vernier Model**, 1.10 m long, Figure, graduations on lacquered paper, with 1 cursor containing on one side the rear and on the other side the forward vernier (W. & E. phys. Prakt., Figs. 7 and 8. — Gan.-Man. Fig. 54 and 55. — Gan.-Rein. Fig. 1)	0. 10. 0
51,427.	— idem, Weinhold's, **larger**, 2.30 m long, with 2 cursors of 1 m length for the forward and rear vernier	1. 0. 0
51,428.	**Millimeter Rule**, of thin cardboard, 500 mm long, with horizontal or vertical figures, or without figures (M. T., p. 24) . . . . . Per 10	0. 3. 0
51,429.	— idem, **of wood**, 500 mm long . . . . . Each	0. 2. 0
51,430.	**Millimetre-Scale**, paper pasted on wood, can be used vertically and horizontally, 50 cm long, with stand (M. T., p. 24)	0. 18. 0
51,431.	**Prismatic Rule**, box-wood, 30 cm long	0. 1. 3
51 432.	**Metre Rule**, wood, both sides graduated in millimetres, with brass bound ends	0. 3. 0
51,433.	**Metre Rule**, wood, Figure, with coloured graduations in centimetres (W. D., Fig. 46 [42])	0. 2. 0
51,434.	**Ruler**, white with black graduations and large figures, with 4 graduations: metres, yards, "sasehen", "arschin"	0. 15. 0
51,435.	**Mirror Rule for the class**, 5 cm wide, 60 cm long, graduated direct on the glass in millimetres (Hahn, Handbuch für physik. Schülerübungen, p. 38. — Kaiser, Physikalische Schülerübungen, p. 19), with wood stand	0. 16. 0
51,436.	— idem, simple pattern, graduations on paper, with wood stand	0. 10. 0

* Can be used with the Projection Apparatus.

Cl. 5579, 5585, 5537, 414.



51440. 1 : 8.



51443. 1 : 11.



51452. 1 : 5.

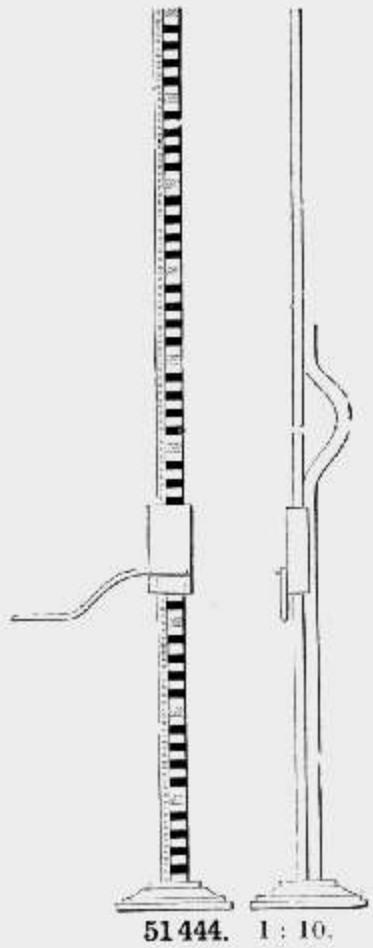


51453. 1 : 2.



51455. 1 : 3.

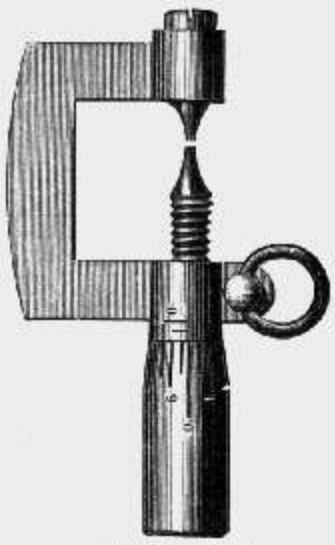
51457. 1 : 2.



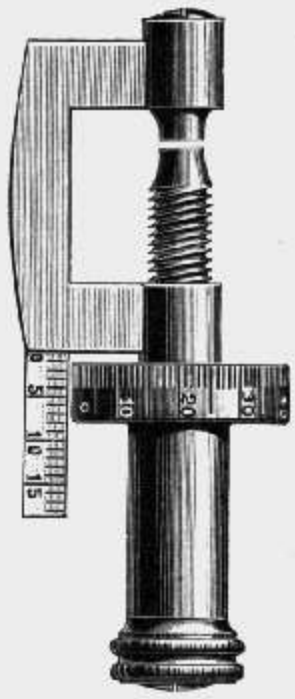
51444. 1 : 10.

	£ s. d.
51,437. **Steel Ruler, 1 m long (Standard Rule),** divided on one side in millimetres and on the other in English inches, in case	1. 0. 0
51,438. **Dividing Ruler,** with steel angle rail, for rapidly dividing a length into 10 equal parts (Fr. phys. Techn., Vol. **I**, 2, Fig. 2018)	0. 10. 0
51,439. **Standard Metre,** divided in centimetres, of hard brass, 20 mm wide and 10 mm thick, the first decimetre being divided into millimetres. In box	4. 0. 0
51,440. **Standard Metre,** of brass, Figure, with millimetre graduation on silver, for reading in conjunction with a telescope or microscope, extremely accurate, serving as comparing measure in physical experiments. In case	7. 0. 0
51,441. **Standard Metre (H-section),** with millimetre graduation on silver, the first and last millimetres being divided in tenths, lines of extreme fineness on the neutral stratum, for reading with the telescope or microscope	10. 0. 0
This rule is massively constructed of a suitable metal alloy and is in accordance with the conditions laid down by the Bureau International for the standardisation of this class of rule. Standardisation fee is quoted on application.	
51,442. **Carrier** for suspending rules Nos. 51,439—51,441 vertically, with clamps and adjusting device for the rule	6. 5. 0
51,443. **Demonstration Rule,** Figure, 1.15 m long, arranged for horizontal and vertical measurements	1. 5. 0
51,444. **Vertical Rule,** Figure, 1.2 m long, on iron stand, with cursor and pointer, with coloured centimetre graduation visible from a distance, and millimetre graduation, for conveniently measuring heights (W. D., Fig. 47 [43])	0. 18. 0
51,445. — idem, with graduation **2 metres** long	1. 4. 0
51,446. — idem (Rebenstorff's), **1 m long,** with cursor, number scale and coloured scale in the German military colours (Ztschr. f. d. phys. u. chem. U. **18**, 1905, p. 346).	0. 18. 0
In the coloured graduation from cm to cm gray signifies 0 and 5, white 1 and 6, red 2 and 7, yellow 3 and 8, blue 4 and 9.	
51,447. **Simple Vertical Rule** (Grimsehl's), millimetre rule on iron base with brass cursor	0. 12. 0

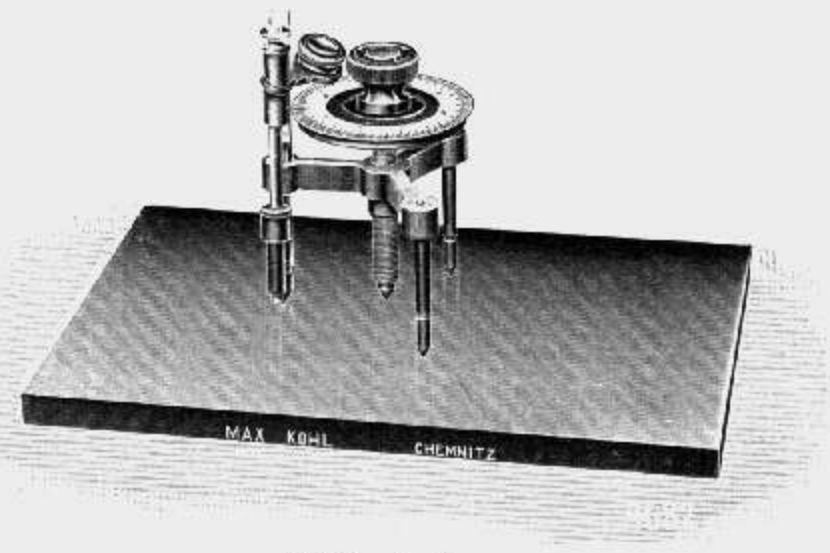
Cl. 415, 5375, 3289, 416, 413, 4488, 154.



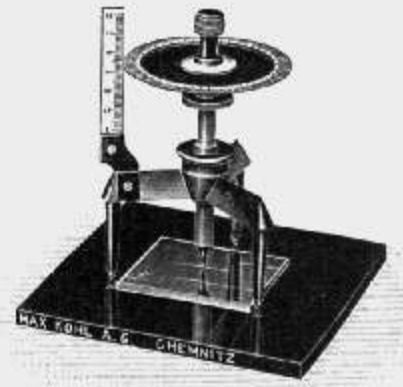
51459. 1 : 1.



51458. 1 : 1.

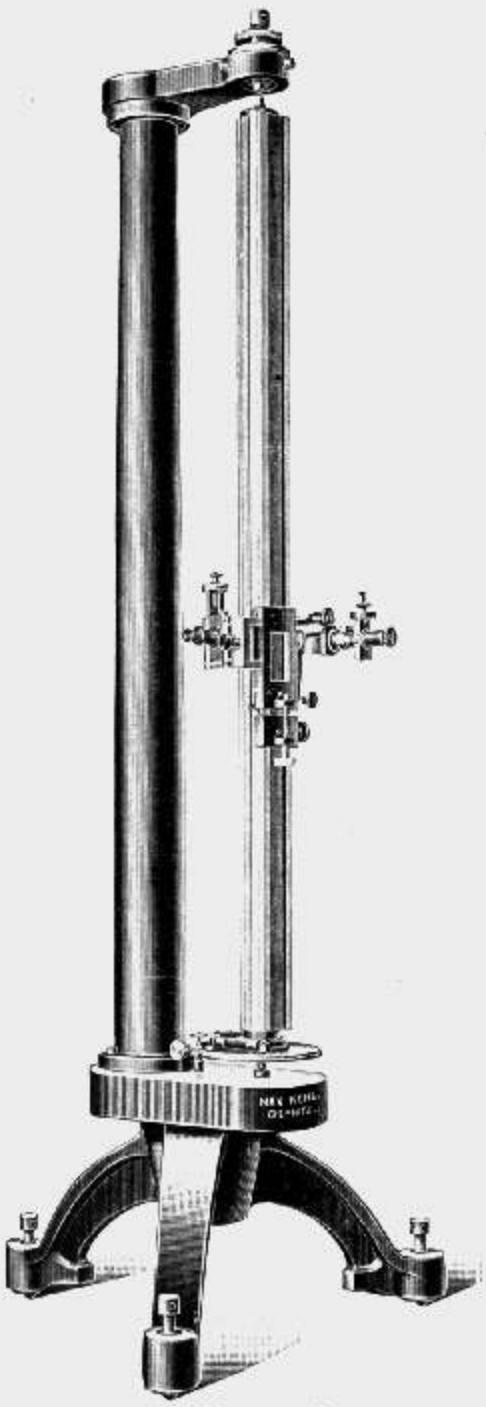


51460. 1 : 2.

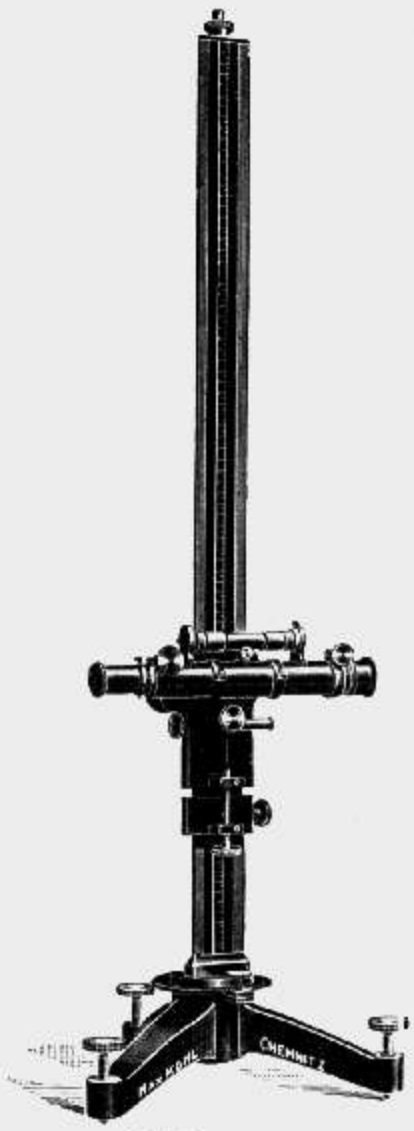


51461. 1 : 5.

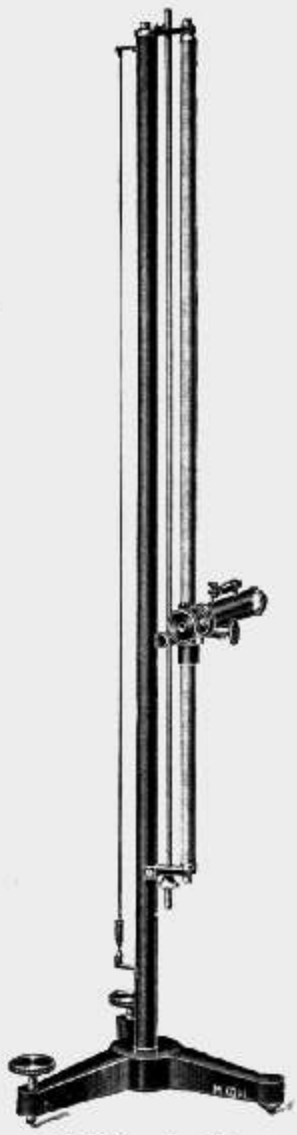
	£ s. d.
51,448. **Vertical Rule for placing on wall** (as suggested by F. C. G. Müller: M. T., p. 23), with projecting end plate and spring cursor	0. 15. 0
51,450. **Measuring Staff,** 3 m in length (M. T., p. 24)	0. 7. 0
51,451. **Tape Measure,** 20 m long, with metre and inch graduation, in leather case, with turn-in handle	0. 12. 0
51,452. **Indicator Cylinder** (Müller's), Figure, for the magnification of small variations in length (M. T., Fig. 4)	2. 5. 0
51,453. **Curvimeter,** Figure, for measuring the length of curved lines, with 3 graduations for scales of 1 : 15,000, 1 : 25,000 and 1 : 35,000, or with other graduations if required	0. 8. 0
51,454. **Pedometer,** watch form, nickelled, counting to 100,000 steps, with press-knob zero fly-back action, with 3 dials	0. 15. 0
51,455. **Wire Gauge,** Figure, for wires from 0.01 to 1 mm diameter	0. 5. 0
51,456. **Hole Gauge** for cylindrical holes from 1—15 mm.	0. 2. 6
51,457. **Vernier Caliper,** Figure, with vernier for the millimetre graduation, also with graduations in Rhenish, English and Paris inches	0. 7. 6
51,458. **Micrometer Gauge** (Palmer's) (M. P. I, Fig. 52) for measuring thickness of wires, sheets and the like, Figure, 15 mm span, measuring accurately to 0.01 mm, with feeler screw which secures that always just the same pressure may be exerted. In case	0. 12. 0
51,459. — idem, without feeler screw, nickelled, Figure, span 10 mm, reading 0.05 mm	0. 5. 6
51,460. **Small Spherometer,** Figure, with magnifying glass and black plate glass . . .	2. 10. 0
51,461. **Spherometer** (W. & E. phys. Prakt. Fig. 17), Figure, with micrometer screw of 0.5 mm pitch and head circle graduated in 500 parts, accurately measuring to 0.001 mm, with plate glass base	3. 5. 0
51,462. — idem, with feeler lever	6. 15. 0



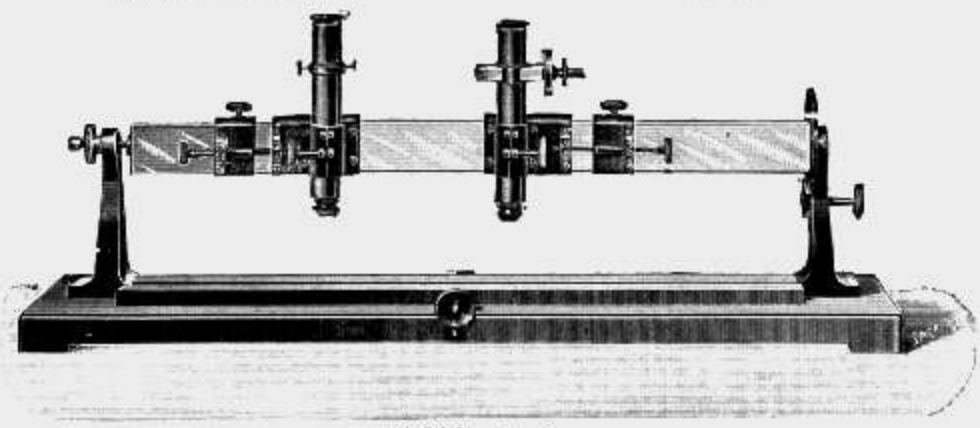
51463. 1 : 12.



51464. 1 : 11.



51466. 1 : 10.



51468. 1 : 8.

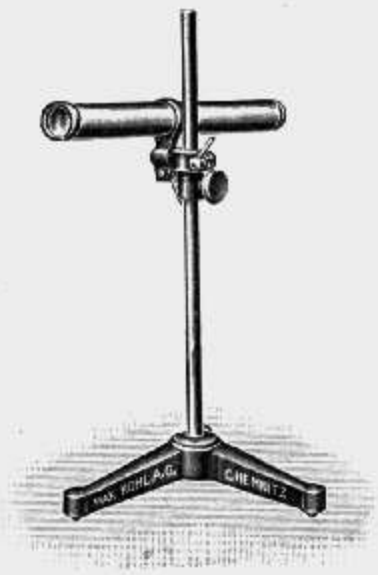
	£ s. d.
51,463. **Cathetometer,** Figure, large, constant apparatus, telescope being regulated by micrometer screw, graduation on silver, capable of reading by vernier to $^1/_{20}{}^{th}$ mm, instrument rotating on journals	65. 0. 0
Differences of height up to 1 m can be measured with the instrument; the prismatic, rotary pillar has micrometer adjustment and 2 levels at right angles. A Fraunhofer magnifying glass with micrometer and movable thread is fitted to the telescope slider for accurately reading the fine graduation. The reading telescope has a level fitted.	
51,464. **Cathetometer,** Figure, first-class construction, with massive prismatic pillar capable of rotation about its axis	22. 0. 0
The pillar of the instrument is 1.15 m high, is divided in millimetres, and is provided with a vernier for $^1/_{20}{}^{th}$ mm. The telescope of 27 mm aperture, adjustable to any angle, and carrying a level, permits of making readings at distances of from 0.6 to 10 m.	
51,465. — idem, telescope with micrometer screw and adjustable thread	25. 0. 0
51,466. **Cathetometer,** Figure, telescope of 25 mm aperture, with rack and pinion focussing; on steel pillar, and adjustable, for reading barometers and air thermometers, scale and vernier of German silver	7. 0. 0
The instrument has a range of 90 cm; the vernier gives direct 0.1 mm. The instrument is maintained perpendicular by plummets. The telescope is provided with an inclinable level and has a fine screw-adjustment.	

Cl. 423, 3287, 421, 425.

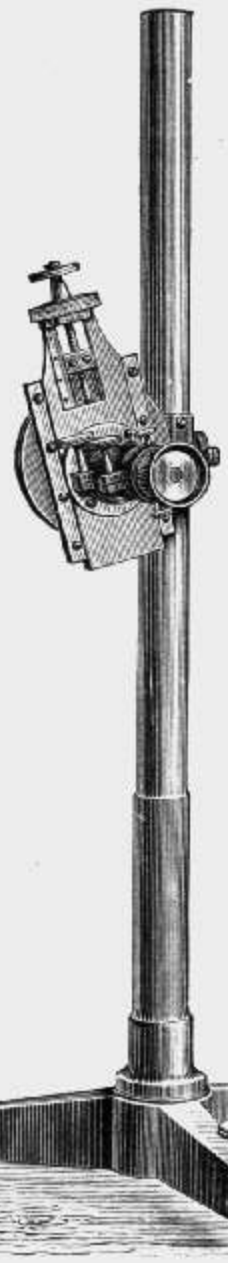
Max Kohl A. G. Chemnitz, Germany.

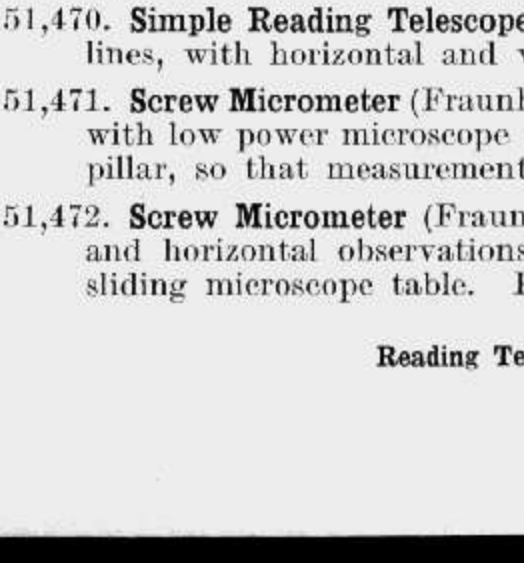


51469. 1 : 8.

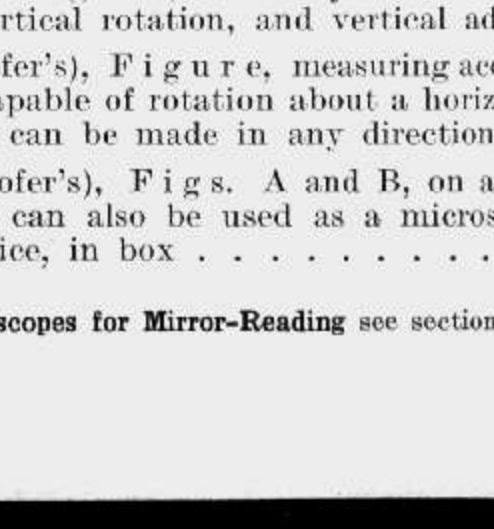


51470. 1 : 7.

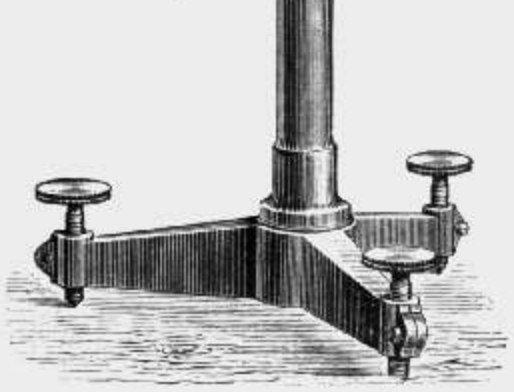




51472 A. 1 : 5.



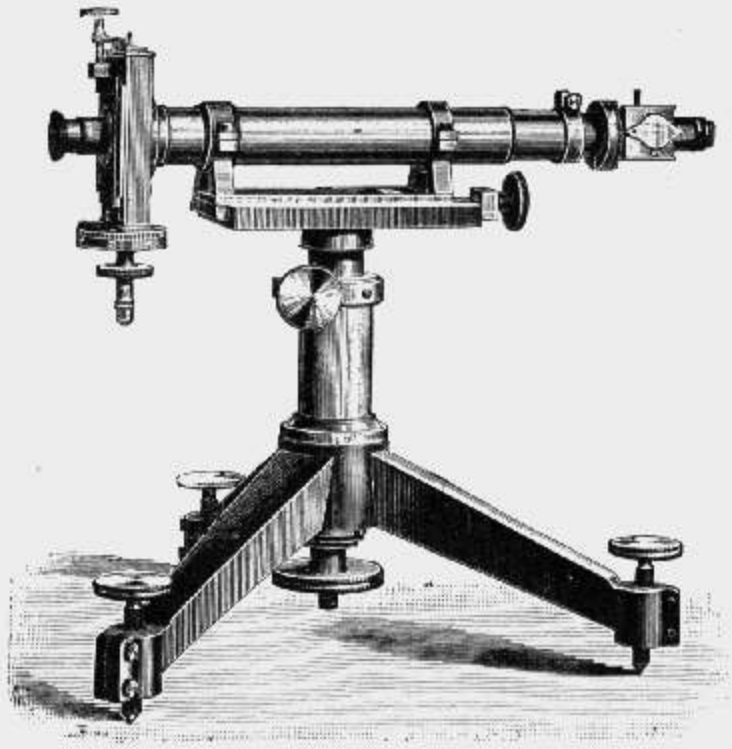
51472 B. 1 : 5.



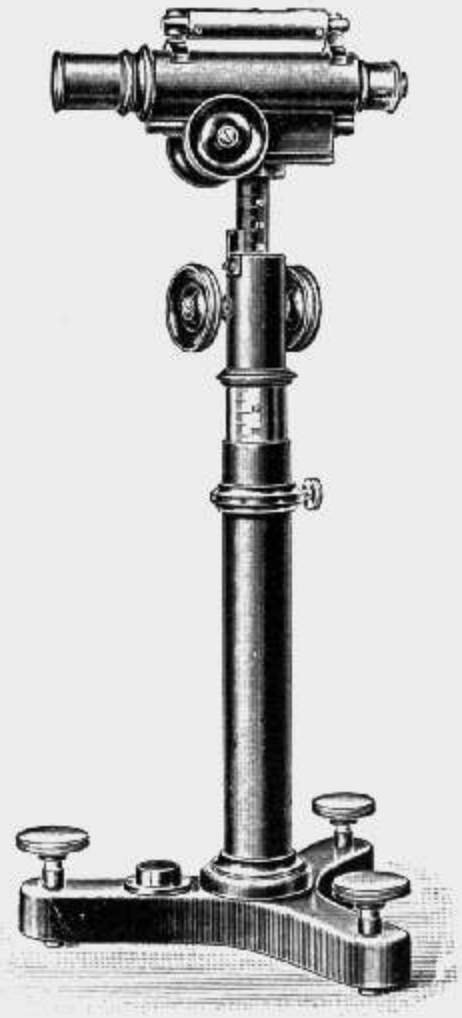
51471. 1 : 4.

	£ s. d.
51,467. **Comparator** for rules divided with lines	47.10.0
Lengths up to 1 m can be compared with this instrument. It consists of an iron bench, and two reading microscopes can be moved along the entire length of this bench, being also capable of lateral motion. The microscopes have micrometer eyepieces with movable line. If desired, Fraunhofer micrometers are supplied at a proportionate increase in price.	
51,468. **Apparatus for Calibrating and Testing Thermometers (Comparator)**, Figure . . .	17.10.0
Two micrometrically adjustable reading microscopes can be moved along the length of a horizontal rail.	
51,469. **Reading Telescope,** on stand, Figure, rack and pinion focussing; objective 25 mm aperture and 200 mm focal length, with two magnifications ×12 and ×24, astronomical; quite free from iron parts so as to enable galvanometrical and magnetometrical readings to be made with it	5.10.0
51,470. **Simple Reading Telescope.** Figure, with objective 24 mm in diameter and cross lines, with horizontal and vertical rotation, and vertical adjustment	1.15.0
51,471. **Screw Micrometer** (Fraunhofer's), Figure, measuring accurately 30 mm to $^1/_{200}$ mm; with low power microscope capable of rotation about a horizontal axis and sliding on a pillar, so that measurements can be made in any direction	14. 0.0
51,472. **Screw Micrometer** (Fraunhofer's), Figs. A and B, on a folding stand, for vertical and horizontal observations; can also be used as a microscope with detachable and sliding microscope table. Price, in box	17.10.0

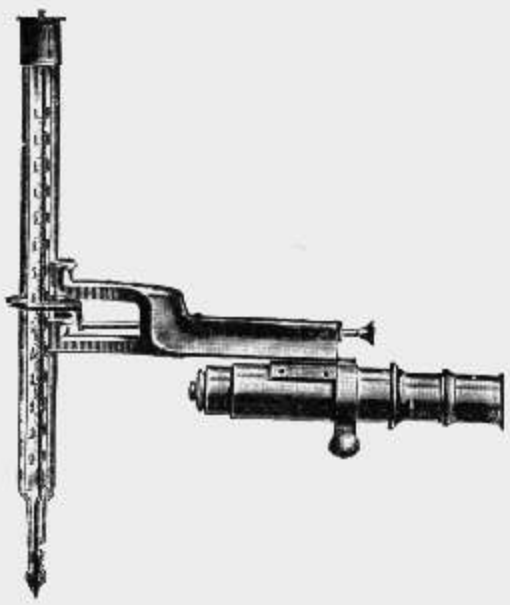
Reading Telescopes for Mirror-Reading see section: **"Electricity".** Cl. 426, 5532, 429, 430, 428.



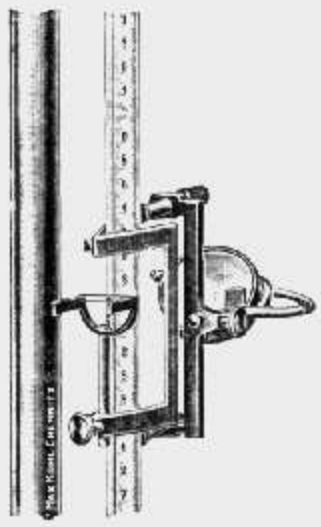
51473. 1 : 5.



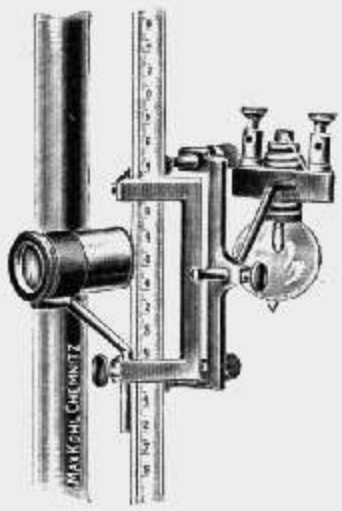
51474. 1 : 4.



51475. 1 : 3.



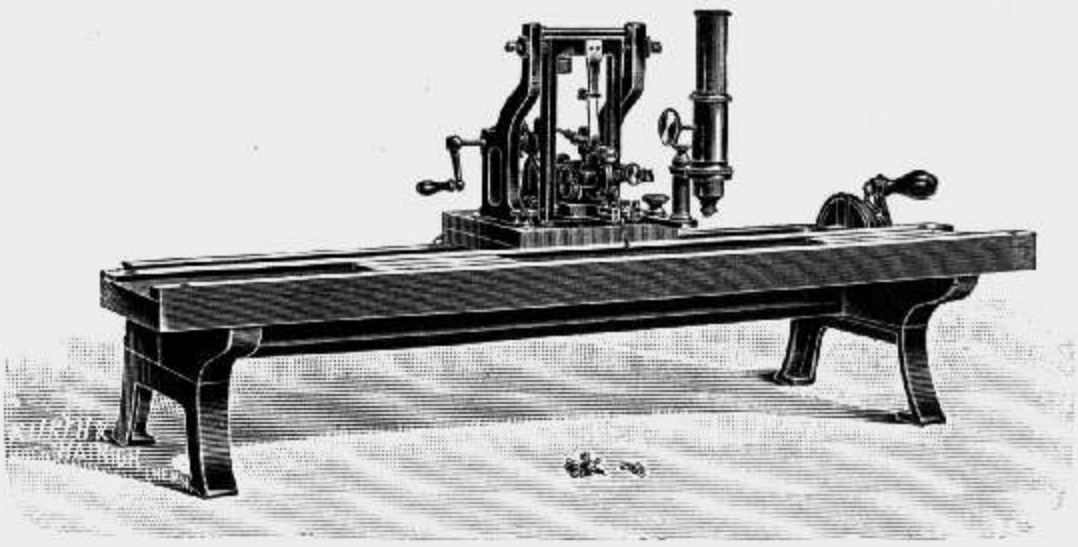
51476A. 1 : 2.



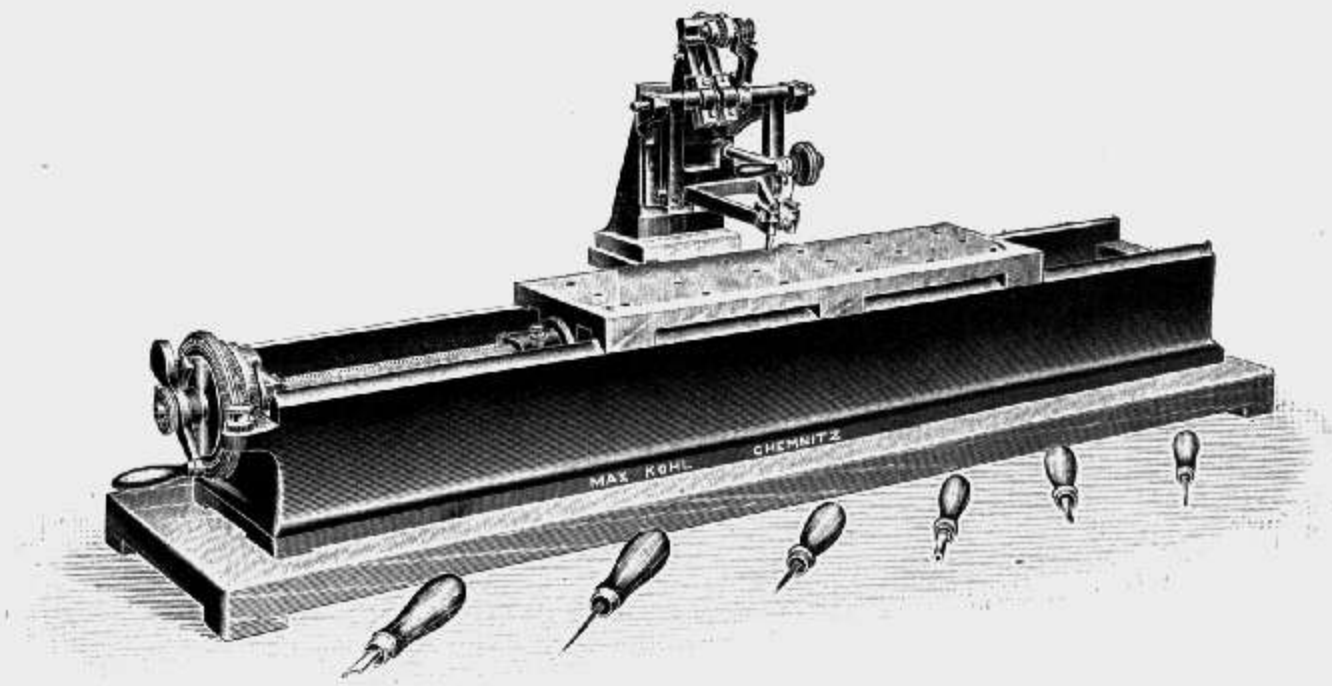
51476B, 51477. 1 : 2.

	£ s. d.
51,473. **Large Reading Microscope,** on stand with levelling screws, with 3 oculars, Figure The microscope can be raised and lowered, rotated and moved by means of fine adjustments. The measuring graduations within the limits of about 20 mm are effected by a horizontal and vertical motion. The objective is illuminated by a glass plate inclined at an angle of 45°.	19. 0. 0
51,474. **Reading Microscope,** Figure, with extension and rack work for adjusting at heights of from 340 to 550 mm, draw tube and prism are graduated; vernier reading to $^1/_{10}$ mm; rotary in horizontal plane; with level, double objective for the 3 widths of objective 50, 90 and 480 mm, eyepiece and micrometer eyepiece	6. 0. 0
51,475. **Reading Microscope** for Thermometer Degrees, as suggested by Nansen, Figure The microscope holder has a spring clamping arrangement for fixing thermometers of various thicknesses. The microscope has a micrometer eyepiece and a magnification of ×12.	3. 0. 0

Max Kohl A. G. Chemnitz, Germany.

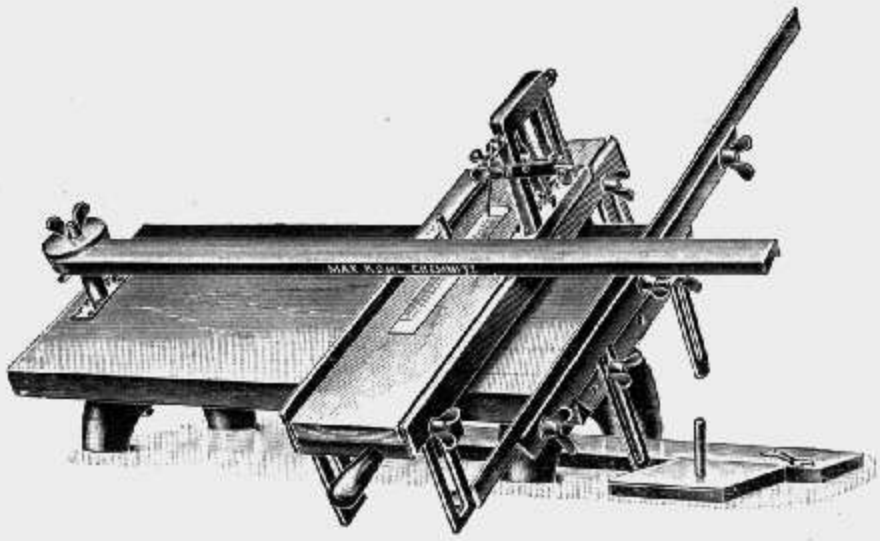


51478. 1 : 8.

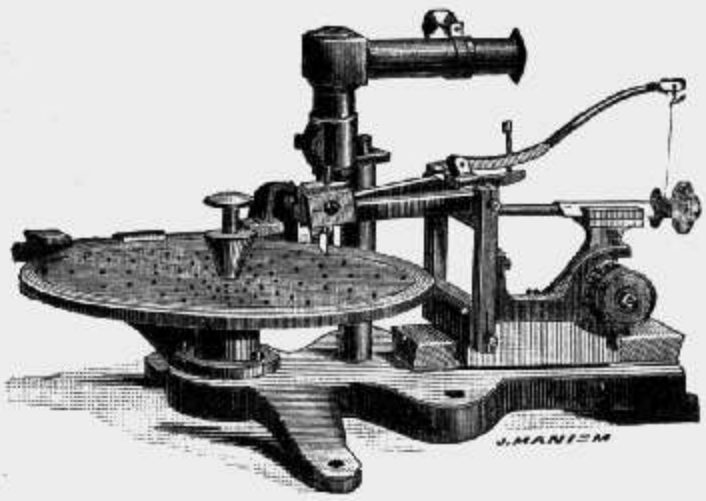


51480. 1 : 7.

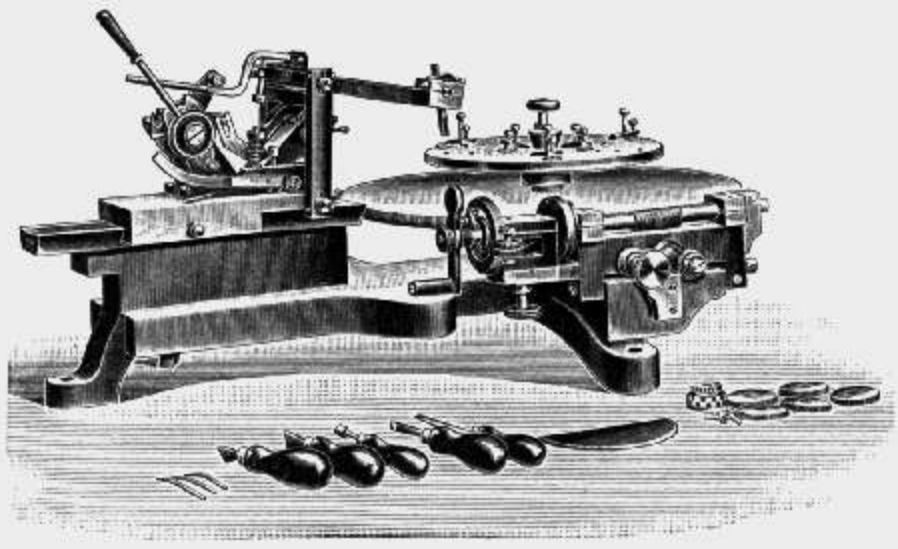
	£ s. d.
51,476. **Reading Device for Thermometers, Burettes,** etc. from 6—20 mm diameter, Figs. A and B, comprising stand with locking frame, mirror inserted for mirror readings and glow lamp inserted for illuminating	0.13.0
The glow lamp is supplied for 2, 4 or 6 volts; if voltage is not stated when ordering, a 4 volt lamp is supplied.	
51,477. **Magnifying Glass with Cross Wires,** for high magnification (cf. Fig. 51,476 B) . .	0. 8.0
51,478. **Dividing Engine** for lengths to 500 mm, carefully and massively constructed, Figure, with screw of 1 mm pitch, arrangement on the drawing mechanism for drawing the 5^{ths} and 10^{ths} longer, and with reading microscope	25. 0.0
The illustration does not now represent the drawing mechanism, this having been considerably improved.	
51,479. — idem, without reading microscope	22.10.0
51,480. **Longitudinal Dividing Engine** for fine and coarse graduation, Figure, for lengths to 350 mm, total length of machine 850 mm (Fr. phys. Techn. I, 1, Fig. 1963) . .	32.10.0
This machine divides accurately to $^1/_{200}$ mm by means of a dividing wheel and a screw with millimetre pitch; the drawing mechanism rests firmly on the powerful cheeks and permits of the mechanical drawing of graduations of various lengths. For reading microscope for this engine, see No. 51,481.	
51,481. **Reading Microscope** with adjustable wires, on a slider fitting the machine . Each	7.10.0



51482. 1 : 10.



51484. 1 : 6.



51485. 1 : 6.

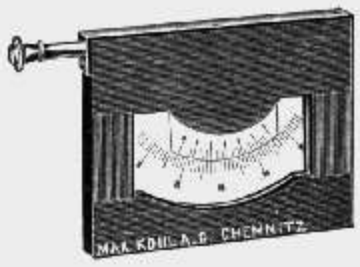


51486. 1 : 4,5.

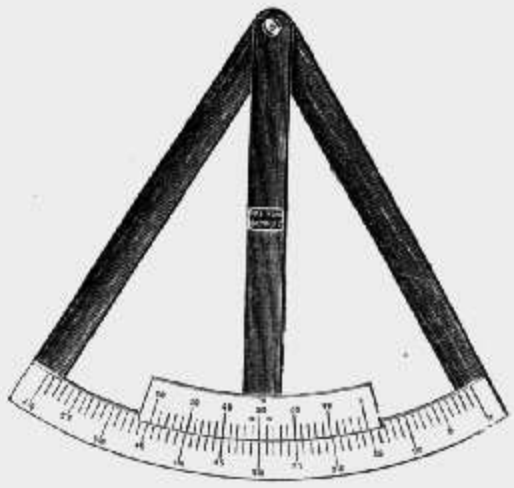
	£ s. d.
51,482. **Dividing Engine,** Figure, 0.75 m long, of polished oak, with adjustable, iron arm and female scale holder, iron runner, rails which can be conveniently adjusted as regards height and sliders which may be firmly clamped, unscrewable bow, device for obtaining graduations of varying lengths, and with sliding drawing mechanism having triple arresting device (Fr. phys. Techn. I, 1, Fig. 1959), without female scale . . .	8. 5.0
This machine is specially intended for glass and thermometer scales, also for simple scales on wood, glass or opal glass.	
51,483. **Female Scale** for above, with 360 divisions of each 2 mm on one and 180 divisions of each 4 mm on the other side	1. 4.0
51,484. **Circle Dividing Engine,** Figure, with plate 250 mm diameter, graduated on silver in $^1/_6{}^0$ and graduations for the verniers, tangential screw and dividing drum, with Microscope (Chwolson, Physik, Vol. I, Fig. 131)	40. 0.0
51,485. **Circle Dividing Engine,** Figure, similar in construction to preceding, with plate 300 mm diameter, graduated on brass, without microscope (Fr. phys. Techn. I, 1, Fig. 1970)	48.15.0
The circle is divided into 720 parts and has a tangent screw; one complete turn of this corresponds to $^1/_2{}^0$.	
51,486. **Microscope for Circle Dividing Machine** No. 51,485, Figure	3.15.0
51,487. **Small Circle Dividing Engine,** for rapidly making graduations for which too great an accuracy is not necessary	25. 0.0
The brass plate, 250 mm in diameter, has a point-alidade of 360 and 400 points bored in so as to be firmly held in any position.	
* 51,488. **Circular Vernier Model,** Figure, for the projection lantern	1. 5.0
51,489. **Circular Vernier Model** (W. & E. phys. Prakt., Fig. 11. — Gan.-Man. Fig. 66), sextant of wood of 80 cm radius, giving 1 minute of arc, cf. Fig. 51,490	1. 4.0

* Can be used with projection lantern

Cl. 442, 444, 445, 5489.



51488. 1 : 3.



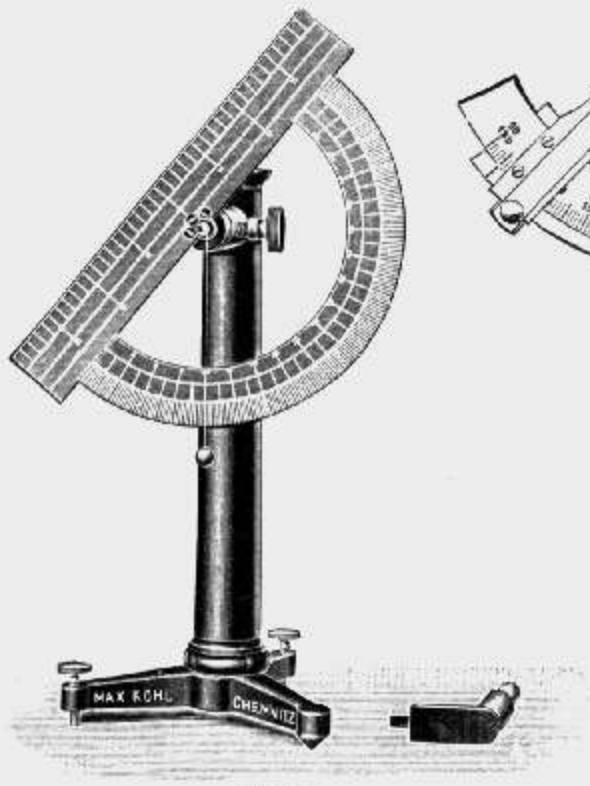
51490. 1 : 7.



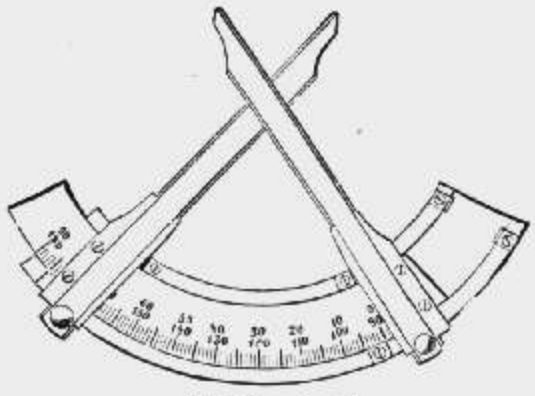
51492. 2 : 3.



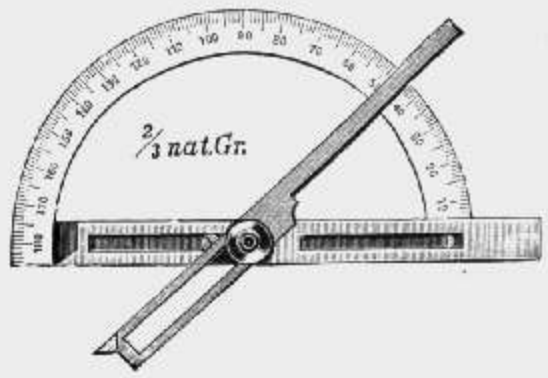
51493. 2 : 3.



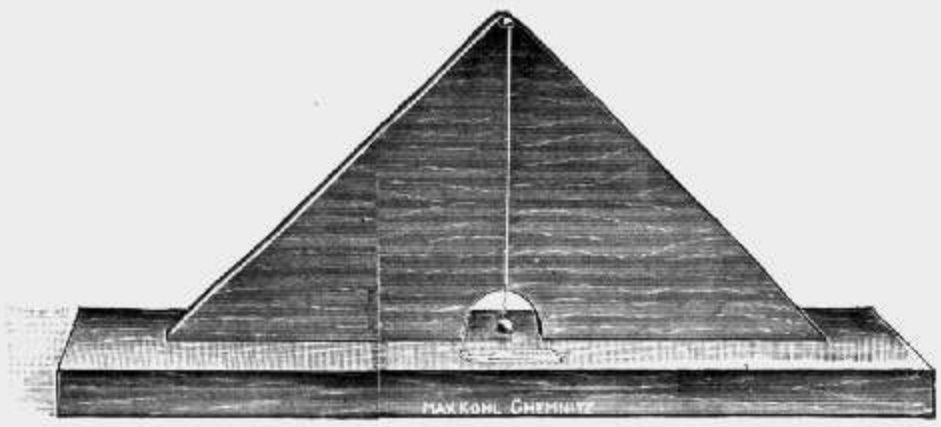
51491. 1 : 8.



51495. 1 : 2.



51496. 2 : 3.



51498. 1 : 6.

51,490. **Circular Vernier Model,** small pattern, sextant of 40 cm radius, giving 2 minutes of arc, Figure . . . . . £ 1. 0. 0

51,491. **Wood Protractor on Stand,** Figure (F. C. G. Müller's), with plumb bob (M. T., Figs. 6, 14, 15), for angular measurements in mechanics and optics 2. 10. 0

51,492. **Plumb Bob,** brass, Figure, with steel tip for unscrewing 0. 2. 6

51,493. **Plumb Bob with Spirit Level,** Figure, of brass, with steel tip for unscrewing . 0. 5. 0

51,494. **Simple Gnomon,** for class use (Noack, Leitfaden, Fig. 6) 0. 13. 6

51,495. **Surface Goniometer** with fixed limbs, circle divided in $^1/_2$ degrees, surface bar of steel, radius of circle 70 mm, in case, Figure 1. 16. 0

51,496. — idem, smaller, Figure, with detachable limbs, in case, 80 mm diameter . 1. 12. 0

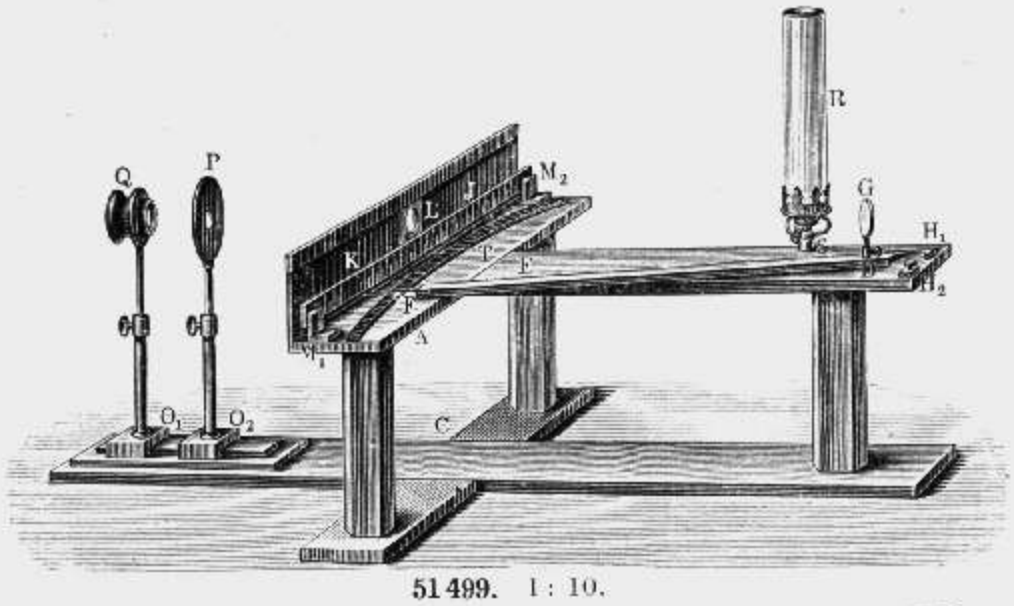
51,496 a. — idem, limbs undetachable 1. 0. 0

51,497. **Field Goniometer** (Ohmann's), for class use (Ztschr. f. d. phys. u. chem. U., **5**, 1892, p. 166) 1. 15. 0

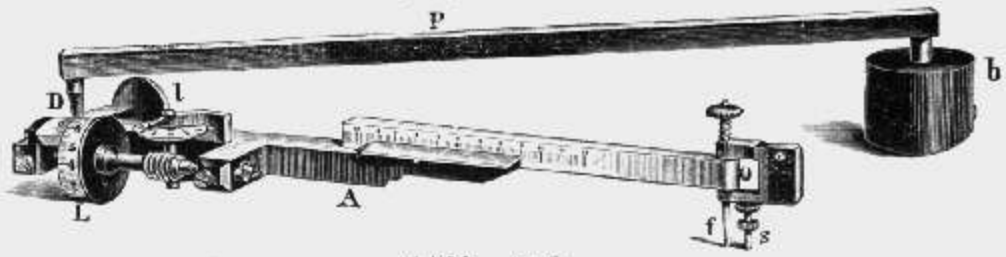
51,498. **Plumb Line,** Figure 0. 5. 0

For spirit and other Levels, see section **Equilibrium, etc. of Liquids.**

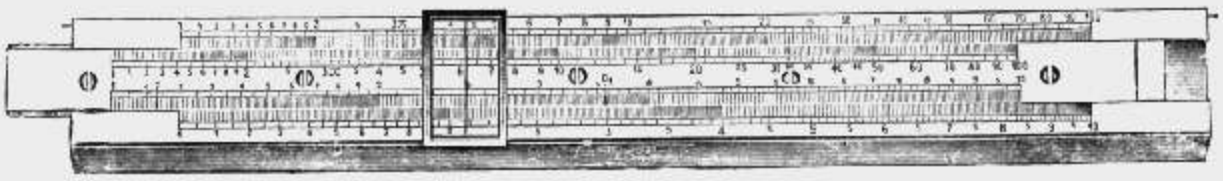
Cl. 5598, 3928, 3292, 3293, 5621, 5619, 4537, 4521.



51 499. 1 : 10.



51 500. 1 : 2.

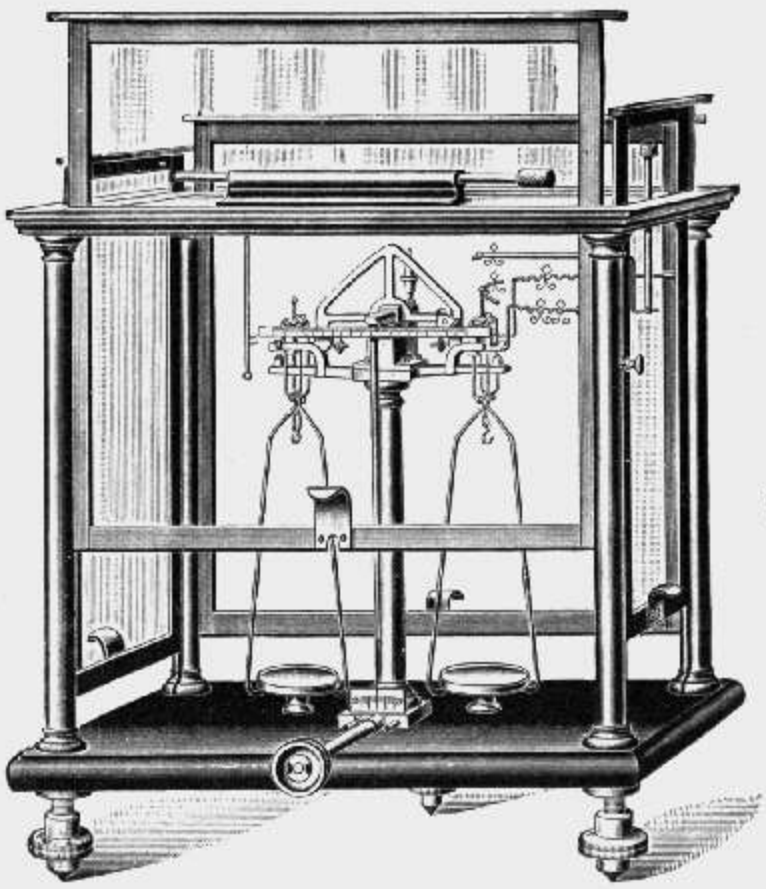


51 504. 1 : 10.

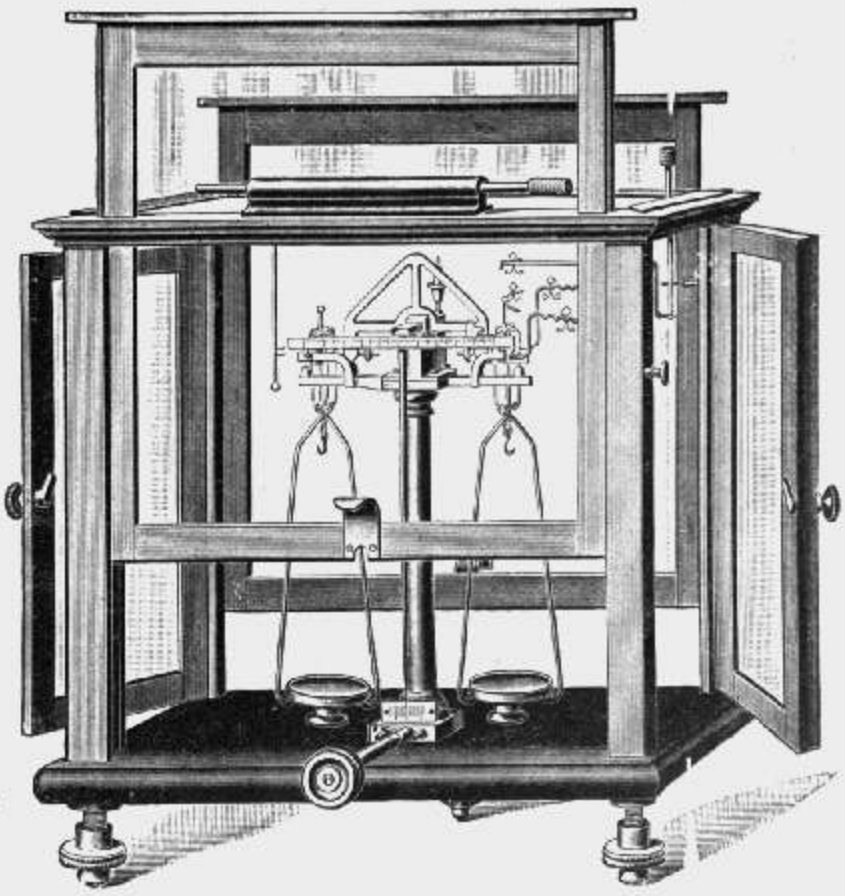
	£ s. d.
51,499. **Model of a Mirror Reading** (W. & E. phys. Prakt., Fig. 19), Figure, for subjective and objective reading	3. 15. 0
51,500. **Planimeter** (Amsler's), Figure, arranged for a vernier unit between 8 and 10 sq. mm, as desired, with check ruler, in case The pole arm is 19 cm long, the travelling rod 16 cm.	2. 10. 0
51,501. — idem, with micrometer and vernier on the travelling rod, for any values of the vernier unit from 2 to 10 sq. mm, adjusted for 4 vernier units	3. 10. 0
51,502. — idem, with correction for parallel position of the roller axis and of the travelling rod	3. 15. 0
51,503. **Slide Rule with Instructions** (M. T., p. 24), 27 cm long, readings accurate to 3 places This slide rule is arranged for rapidly multiplying, dividing, squaring, cubing, obtaining square and cube roots, for obtaining logarithms and numbers, sines and tangents. The slide rule is also used as a scale for drawings and as a longitudinal rule for lengths up to 50 cm.	0. 13. 0
51,504. **Demonstration Slide Rule,** Figure, $2^1/_2$ m long, without stand, graduations 8 times as long as in rule No. 51,503	4. 0. 0
51,505. — idem, with stand (Fr. phys. Techn., Vol. I, 2, Fig. 2030)	6. 0. 0
51,506. **Litre Vessel,** cube shape, with black and white graduations in square centimetres (M. T., p. 23; also see Meyer, Naturlehre, p. 7). The wood cube No. 51,514 fits this	0. 5. 0
51,507. — idem, **cylindrical** (Meyer, Naturlehre, p. 7)	0. 1. 3
51,508. **Hollow Cube** of thick sheet brass, volume 1 litre exactly, with white and black graduation in square centimetres on two sides	0. 12. 0
51,509. **Hollow Cube** of 3 cm length of side (W. D., p. 60 [54]), for reducing the gramme weight to the metric measure	0. 12. 0
51,510. **Vessel of 1 Cubic Inch,** of brass, cuneiform	0. 3. 0
51,511. **Metal Cube** with **Hollow Cube** of 1 cm side, fitting one in the other	0. 14. 0
51,512. — idem, 2 cm side	0. 16. 0
51,513. — idem, 3 cm side	0. 17. 0
51,514. **Cubic Decimetre of Wood,** cube shape, fitting the litre vessel No. 51,506 (Meyer, Naturlehre, p. 7)	0. 2. 6

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



51519. 1 : 6.



51523. 1 : 6.

Balances and Sets of Weights.

£ s. d.

Analytical Balance, with short-arm triangular Aluminium Beam and rapid-oscillation pointer, Fig. 51,519, best nickelled brass pillar, with arrestment for beam and suspension, also a device for shifting the rider when the case is closed. The balance has agate bearings, gilt or platinised pans; the case is of dull, nickelled brass and glass, the balance rests on a dead-black plate glass base with levelling screws; it has 4 aluminium and glass sliding windows. A level is given in. The balance is very compact and very neat in appearance.

List No.	**51,517**	**51,518**	**51,519**	**51,520**	
To carry	5	50	200	1000	grams
Sensitivity	0.02	0.05	0.1	0.2	mg
Price with gilt steel axes £	**10. 10. 0**	**13. 0. 0**	**16. 0. 0**	**19. 10. 0**	

Prices without Rider Weights. For Sets of Weights and Rider Weights, see pp. 241—243.

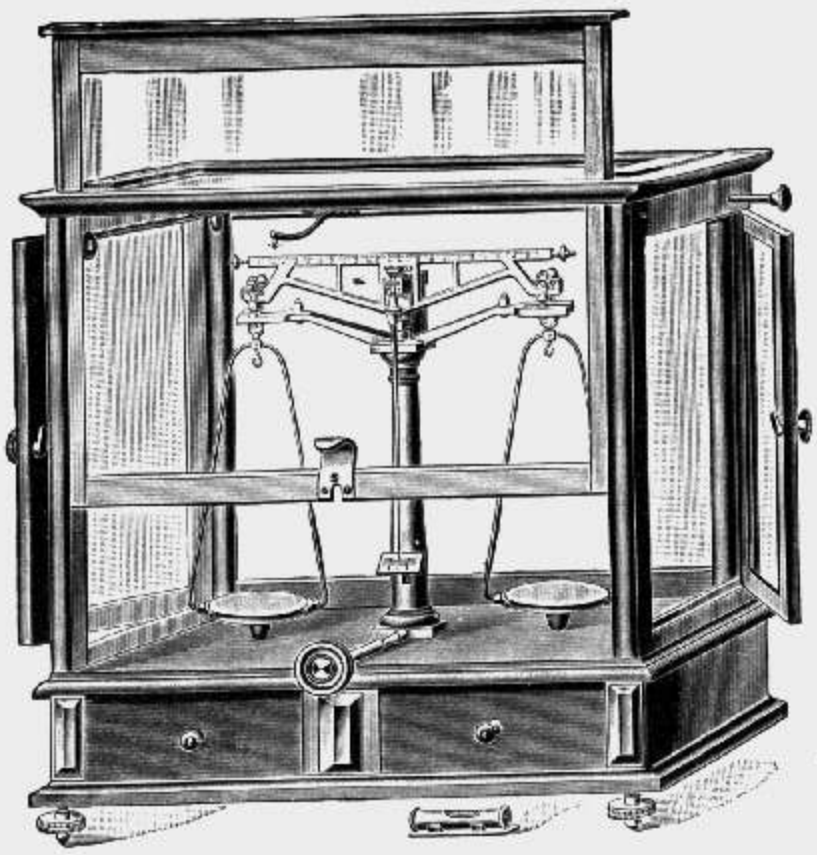
Without the **lateral Rider Arrangement** the prices of these balances are reduced by **5 s.**

Analytical Balance with short-arm triangular Aluminium Beam and rapid-oscillation pointer, Figure, with round, best nickelled brass pillar, with arrestment for the beam and suspensions, also arrangement for shifting the rider without opening the case. The balance has agate bearings, gilt or platinised pans, finely polished case of mahogany and glass, with 2 glass sliding windows and 2 side doors; resting on dead-black plate glass base with levelling screws and a level.

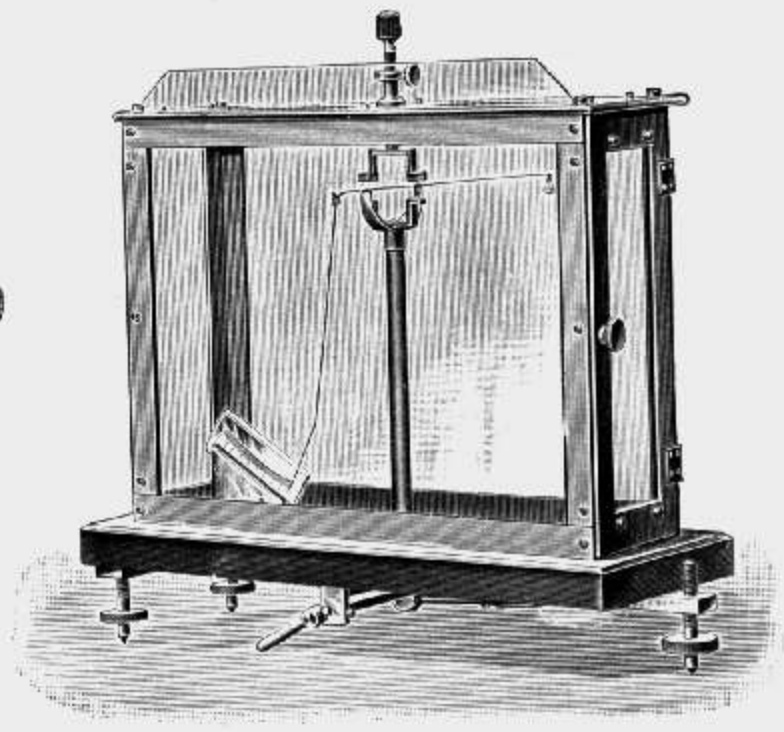
List No.	**51,521**	**51,522**	**51,523**	**51,524**	
To carry	5	50	200	1000	grams
Sensitivity	0.02	0.05	0.1	0.2	mg
Price with gilt steel axes £	**7. 15. 0**	**9. 0. 0**	**11. 0. 0**	**13. 5. 0**	

Prices without Rider Weights. For Sets of Weights and Rider Weights, see pp. 241—243.

If without the lateral Rider Arrangement these balances are reduced in price by 5 s.



51526. 1 : 6



51528. 1 : 3.

Analytical Balance, with half-length Beam, Figure 51,526, with adjustable end knife edges; round, best lacquered or nickelled brass pillar; with arrestment for the beam and suspensions, by means of which the centre and end knife edges can be removed from the bearing; and with arrangement for shifting the rider and brush device for arresting the pans. The bearings are of agate. The glass case has a walnut frame, a sliding door in front balanced by counterpoises, and side doors. The case is finely polished, the cornices and projecting ornamental parts being polished black. Levelling screws and level are supplied. £ s. d.

List No.	51,525	51,526	51,527
To carry	50	200	1000 grams
Sensitivity	0.1	0.1	0.5 mg
Price, lacquered or nickelled, with gilt axes £	**8. 15. 0**	**10. 10. 0**	**12. 0. 0**

Prices without rider weights. For Sets of Weights, see pp. 241—243.

The rider slide of this balance is arranged for the entire length of the beam. The two halves of the beam are divided into 100 parts. The balance is so adjusted that its sensitivity when the maximum load is applied is the same as when unloaded.

These balances are also, if desired, supplied with mahogany cases instead of walnut cases, without extra price.

51,528. **Micro-Balance,** Nernst's, Figure, a torsion balance for weights to 2 milligrams and for an accuracy of $^1/_{1000}$ to $^2/_{1000}$ milligrams. (Berichte der Deutschen Chemischen Gesellschaft, **36**, No. 10, and **38**, No. 1. — Fr. physik. Techn. **I**, **2**, Fig. 2251) . . . 5. 10. 0

Short Triangular Beam Analytical Balance, of lacquered brass, quick-swinging type, with pointer suitable for rapid work; plane, firm centre bearing. The pans are nickelled. The balance has a black enamelled iron pillar with plummet. The arrestment of the compensating suspenders moves in the arc of oscillation of the beam. The rider scale rests in the axial plane and is divided on both sides into 100 parts. The glass case, resting on a dead-black plate glass slab, is fitted with levelling screws, and has a sliding window in front balanced by counterpoises. Figure 51,529.

List No.	51,529	51,530
To carry	200	500 grams
Sensitivity	0.2	0.5 mg
Price £	**6. 10. 0**	**7. 10. 0**

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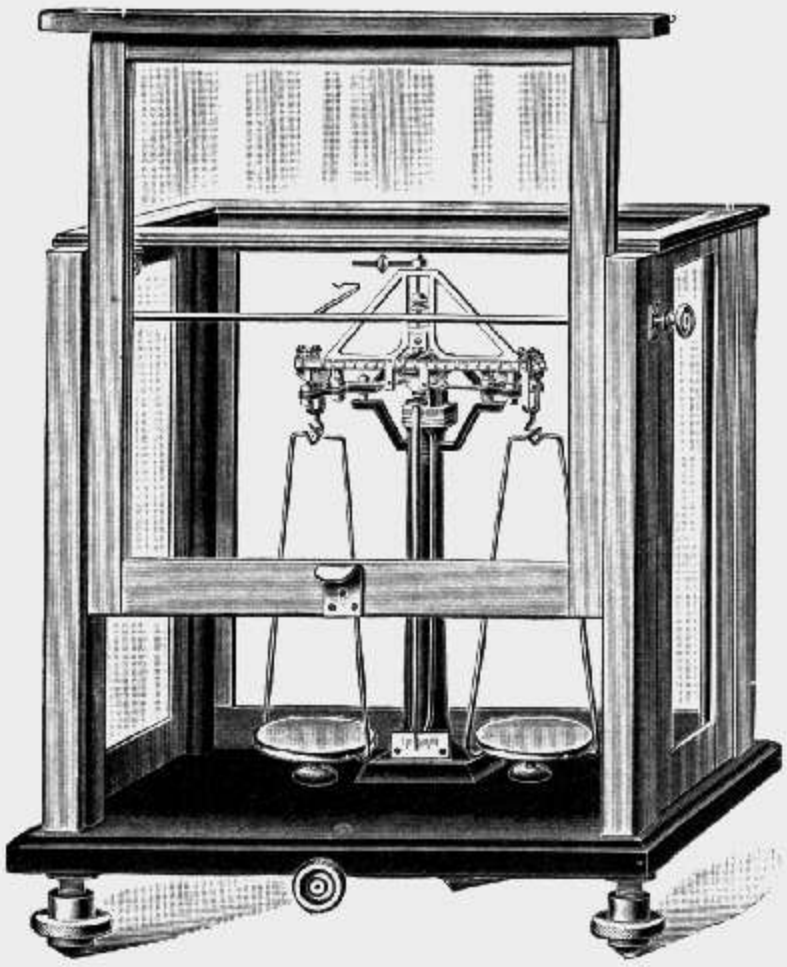
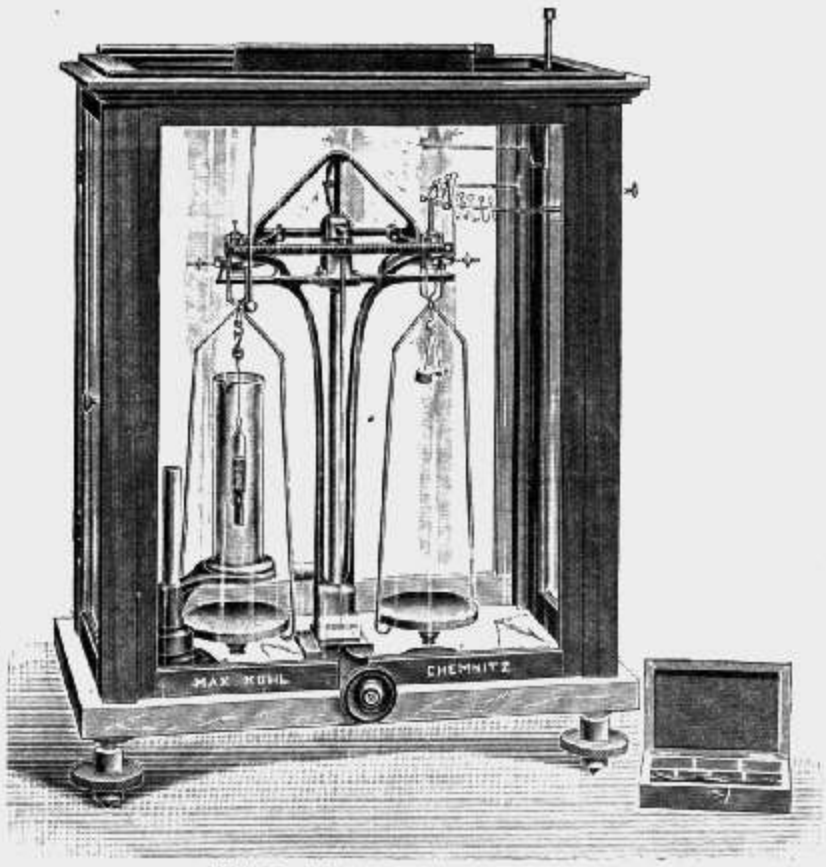


51529. 1 : 6.



51533 (51537), 51578. 1 : 8.

Analytical Balance, also suitable for specific gravity determinations, cf. Fig. 51,533, with agate planes, gilt or platinised pans, mahogany-glass case with 4 sliding windows, aluminium beam with quick-swing pointer, on white or black plate glass base, with rider slide when case is closed. The following are not included in the price: the stage, the glass vessel, the Reimann thermometer flask, the rider weights and counterpoises. £ s d.

List No.	**51,531**	**51,532**	**51,533**	**51,534**
To carry	5	50	200	1000 grams
Sensitivity	0.1	0.1	0.2	1 mg
Price £	**5. 15. 0**	**6. 10. 0**	**7. 15. 0**	**10. 5. 0**

Prices exclusive of Rider Weights. For Sets of Weights and Rider Weights, see pp. 241—243.

— The preceding, **without iron or steel parts,** agate axes.

List No.	**51,535**	**51,536**	**51,537**	**51,538**
To carry	5	50	200	1000 grams
Sensitivity	0.1	0.1	0.2	1 mg
Price £	**6. 5. 0**	**7. 0. 0**	**8. 10. 0**	**11. 0. 0**

51,539. **Precision Balance for Rapid Work.** Figure on p. 234, for load of 200 g, with lens-mirror reading and two superposed scales, case with sliding windows and side doors, axes and bearings of best agate, mounted on marble slab **9. 10. 0**

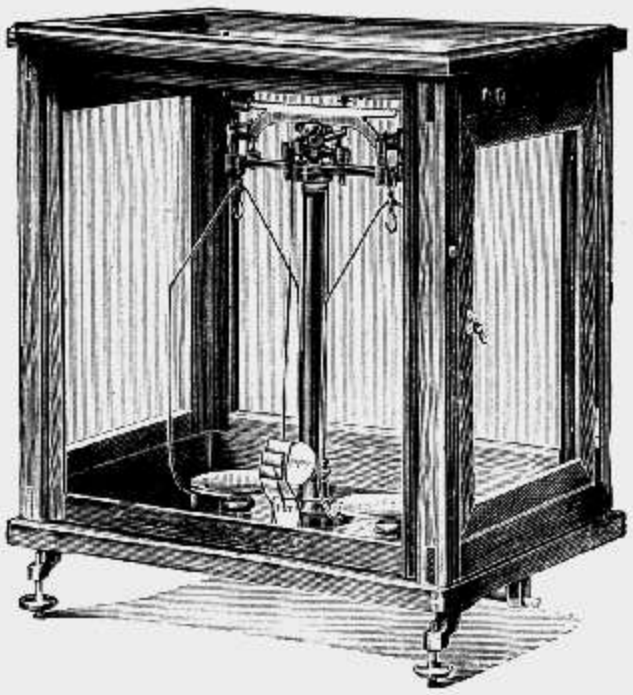
In order to read the tenth-milligrams direct with this quick-swing balance, a power 5 lens-mirror (achromatic objective with silver coating) is fixed on the pillar and magnifies, without reflex or distortion, the whole of an opal glass scale, divided in $^1/_5$ths mm, fitted about 20 mm above the ivory scale.

The whole milligrams are read off on the ivory scale; the tenth-milligrams being determined by glancing at the glass scale on the mirror for purposes of confirmation.

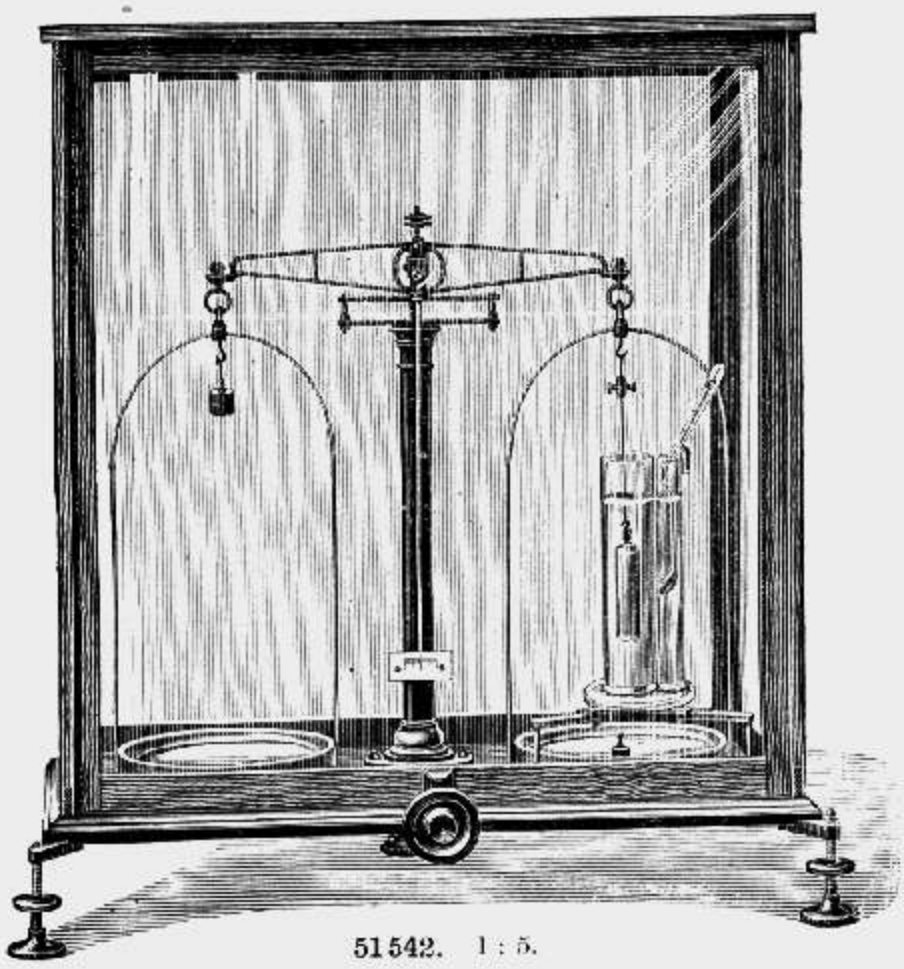
As therefore the mirror and the magnification which is read by both eyes is only used at the last moment, the eyes are not in any way strained. The work with both scales is excellent, sure and rapid. The deflection with all loads is, in the mirror, 10° and on the ivory scale 2° per milligram.

Extra if mounted on glass slab **0. 5. 0**

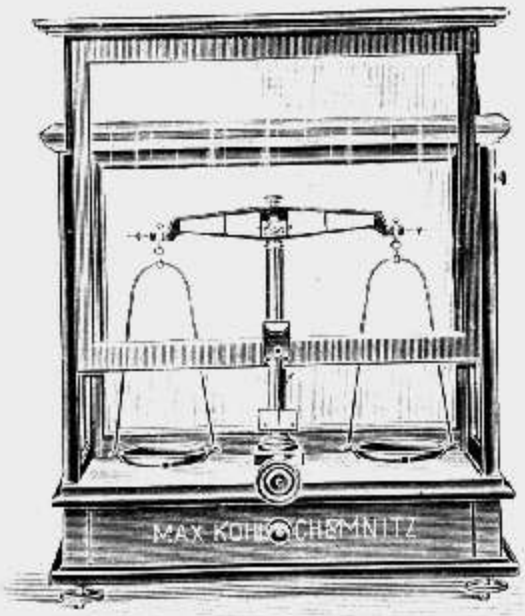
If Microscope Reading is fitted in place of the mirror the balance is increased in cost by . . **1. 5. 0**



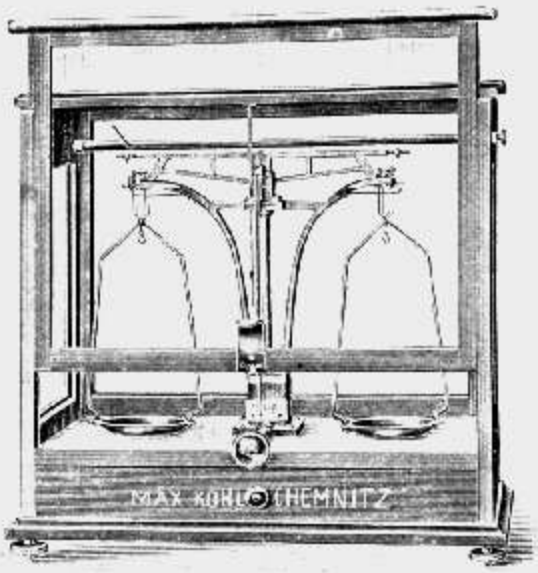
51539. 1 : 6.



51542. 1 : 5.



51548. 1 : 8.



51556. 1 : 8.

Precision Balance for Chemical and Physical Purposes, see Fig. 51,542, high sensitivity, also arranged as a hydrostatic balance, with beam and pan arrestments; glass case with balanced front sliding window. The price does not include the auxiliary parts illustrated, see No. 51,545. £ s. d.

List No.	**51,540**	**51,541**	**51,542**	**51,543**	**51,544**
To carry	100	200	500	1000	5000 grs.
(a) On Board . . . . . £	**3. 10. 0**	**4. 0. 0**	**4. 5. 0**	**4. 15. 0**	**8. 5. 0**
(b) On base with levelling screws £	**4. 0. 0**	**4. 10. 0**	**4. 15. 0**	**5. 5. 0**	**9. 0. 0**

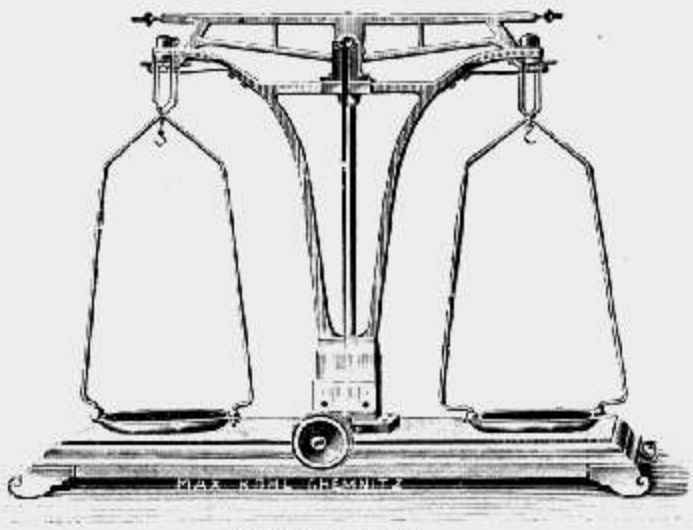
51,545. **Auxiliary Parts** to Balances Nos. 51,540—51,544: Tripod, Glass Jar, Plummet and Thermometer 1. 0. 0

Chemico-Technical Balance, Fig. 51,548, in polished, glazed walnut case with front sliding window (which may be fixed in any position) and with levelling screws.

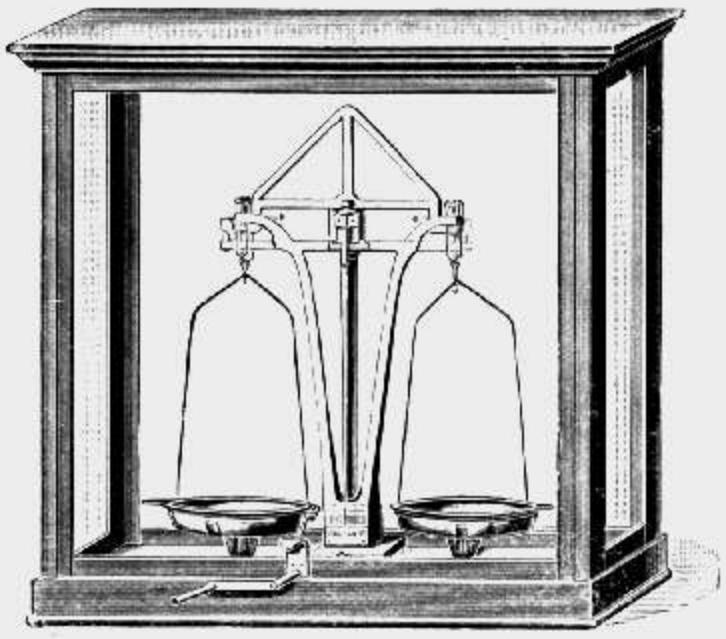
List No.	**51,546**	**51,547**	**51,548**	**51,549**	**51,550**	**51,551**
To carry	20	50	100	200	500	1000 grams
Sensitivity	1	1	1	2	2	5 mg
Price £	**2. 0. 0**	**2. 5. 0**	**2. 10. 0**	**2. 15. 0**	**3. 5. 0**	**3. 15. 0**

Max Kohl A. G. Chemnitz, Germany.

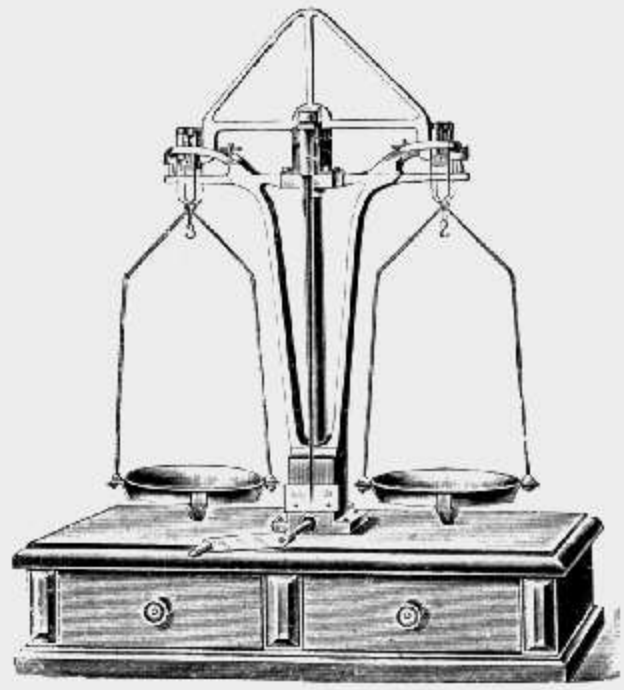
Max Kohl A. G. Chemnitz, Germany.



51 552. 1 : 5.



51560a. 1 : 8.



51561b. 1 : 8.

Precision Balances for technical purposes, Figs. 51552 and 51,556.

	On Iron Base		On Wood Box		In Glass Case with levelling screws, plummet and rider slide	
To carry grams	100	250	100	250	100	250
Sensitivity mg	2	3	2	3	1	2
Lacquered { List No.	51,552	51,553	51,554	51,555	51,556	51,557
Lacquered { Price £	1. 18. 0	2. 2. 0	2. 0. 0	2. 5. 0	3. 15. 0	4. 5. 0

£ s. d.

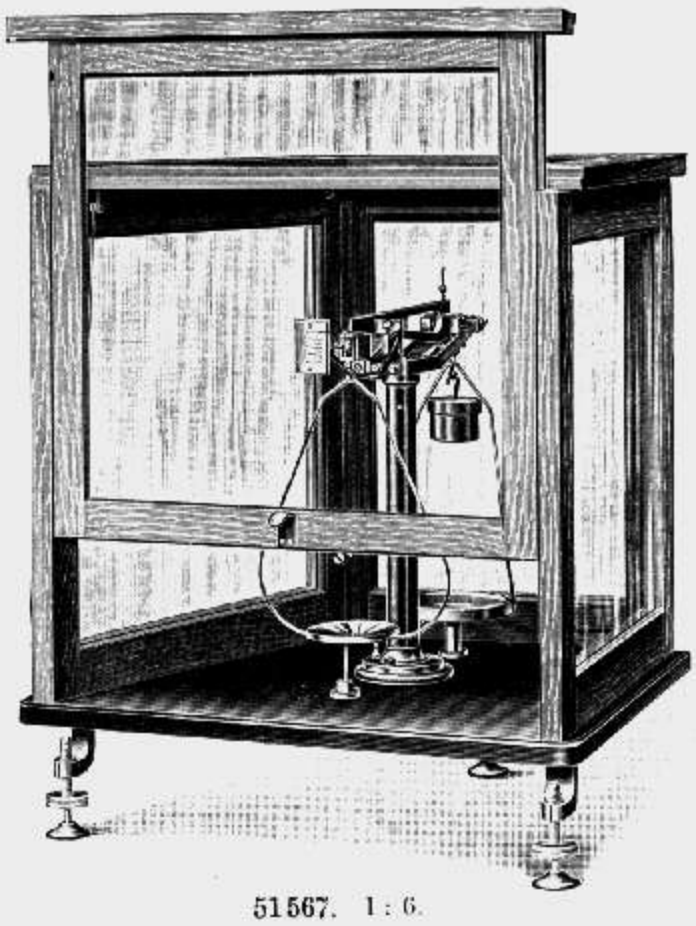
The balances in glass cases can, if desired, be adjusted to be still more sensitive than here mentioned.

Chemico-Technical Precision Balance, with aluminium beam and brass stand (short beam), with arrestments for beam and suspenders, brush pan-stops, Figs. 51,560a and 51,561b.

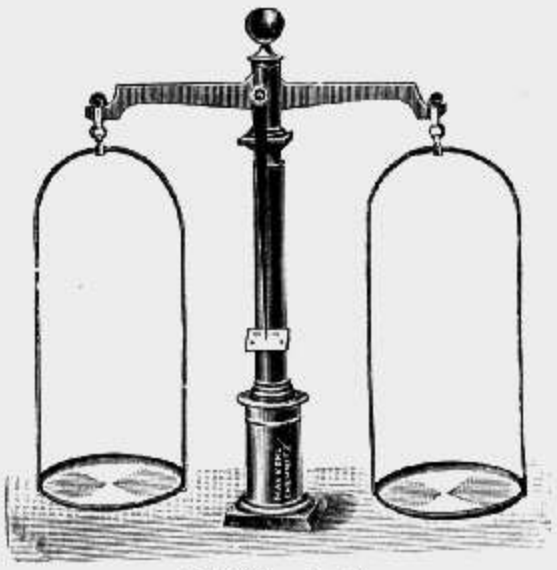
	List No.	51,558	51,559	51,560	51,561
	To carry	5	50	200	1000 grams
	Sensitivity	1	2	4	10 mg
(a)	In Glass Case . . . . . £	2. 12. 0	3. 5. 0	4. 0. 0	5. 5. 0
(b)	On Box, with moulding . £	2. 5. 0	2. 12. 0	3. 5. 0	4. 2. 0
(c)	On Board . . . . . £	1. 16. 0	2. 4. 0	2. 15. 0	3. 10. 0

Precision Balance for heavier Loads. with short aluminium beam, arrestments for beam and suspender, brush pan-stops.

	List No.	51,562	51,563	51,564	51,565	51,566
	To carry	1	3	5	10	20 kg
	Sensitivity	10	20	30	50	100 mg
(a)	In Glass Case . . . . £	4. 15. 0	6. 0. 0	7. 10. 0	9. 10. 0	12. 0. 0
(b)	On Box, with cornice . £	3. 12. 0	4. 6. 0	5. 10. 0	7. 5. 0	9. 10. 0
(c)	On Board . . . . . £	3. 0. 0	3. 12. 0	4. 15. 0	6. 5. 0	8. 5. 0



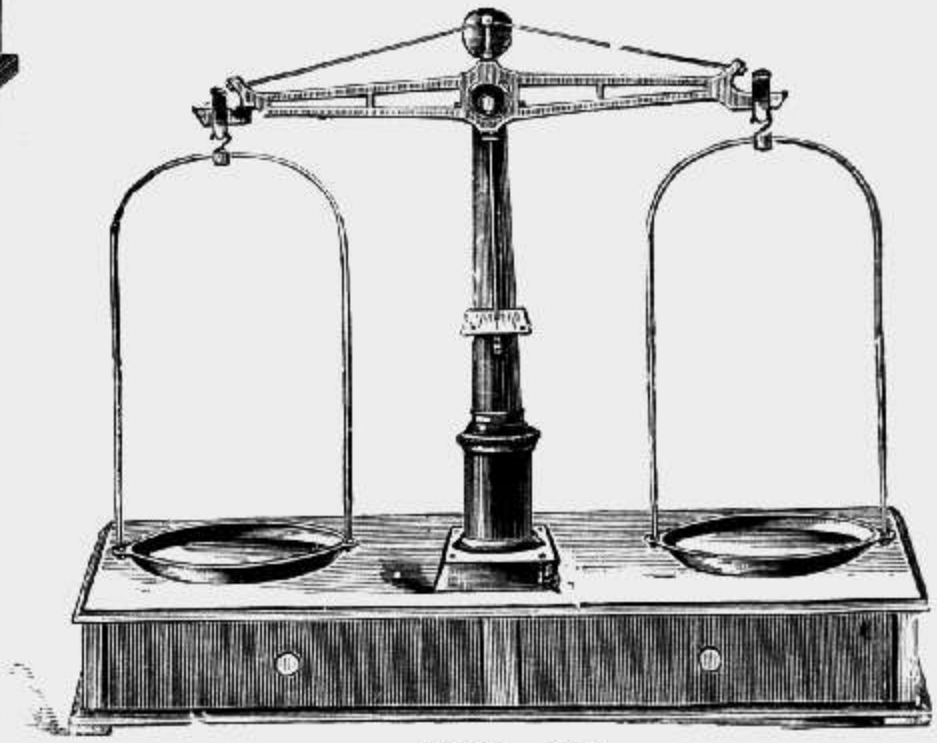
51567. 1 : 6.



51 569. 1 : 8.



51573. 1 : 9.



51571. 1 : 5.

51,567. **Precision Tare Balance** (Mach's), for rapid work, Figure, nickelled, with side doors, on black plate glass base (Chemiker-Ztg. **25**, 1901, p. 1139, and **27**, 1903, p. 249) — £ 6. 0. 0

The balance is set up so that the balance-beam is turned towards the viewer, the one weighing pan being accessible for both hands. This balance is very convenient, especially when a large series of samples of the same weight have to be weighed and the weight has not often to be changed. If specially desired, the balance is also supplied set up in the ordinary manner.

51,568. **Set of Weights** for above, 500, 200, 100, 50 grams, for placing inside the case . . — £ 0. 18. 0

Mohr's Pillar Tare Balance, Figure 51,569, beam working in the pillar, sensitivity 50 mg for 1 kg load; constructed entirely of brass.

List No.	51,569	51,570
To carry	0.5	1
(a) Without box or base . . . . £	1. 5. 0	1. 8. 0
(b) Polished box with 2 drawers £	0. 11. 0	0. 11. 0

Tare Balance, Figure 51,571, with pierced gunmetal beam, prismatic axes, resting on 3 agate planes, with elegant brass pillar; the pointer plays on an ivory scale.

List No.	51,571	51,572
To carry	1	3 kg
On Mahogany box with 2 drawers £	2. 5. 0	2. 10. 0

51,573. **Single Arm Balance** (Westphal's) **for specific gravity determinations,** Figure, with adjustable, lacquered brass stand. . . . . — £ 1. 6. 0

With this balance the specific gravity of liquids can be determined to 4 places of decimals. The following pertain to the balance: 1 glass plummet, 1 Reimann flask with thermometer stopper, 1 counterpoise, 8 riders, 1 pair forceps and 2 platinum wires, case and instructions.

Cl. 5036, 207, 757, 206.

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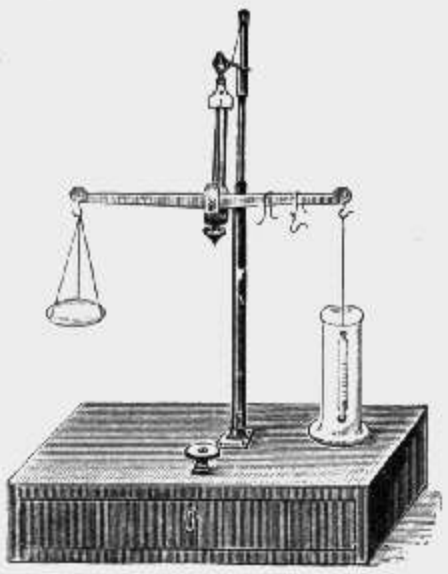
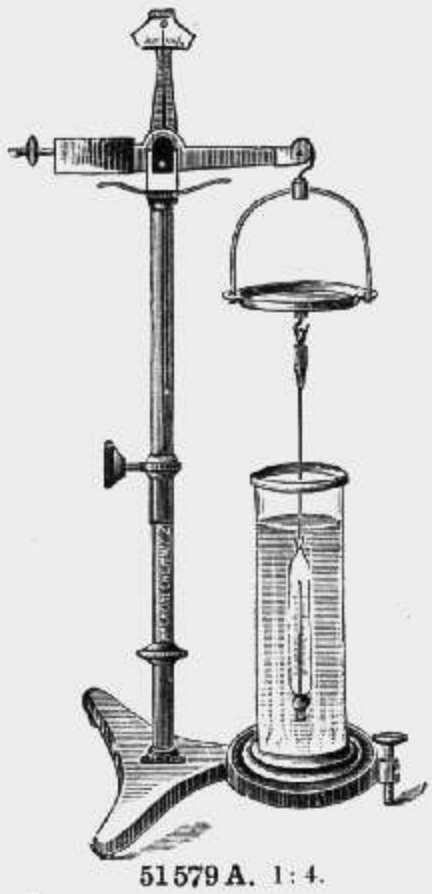


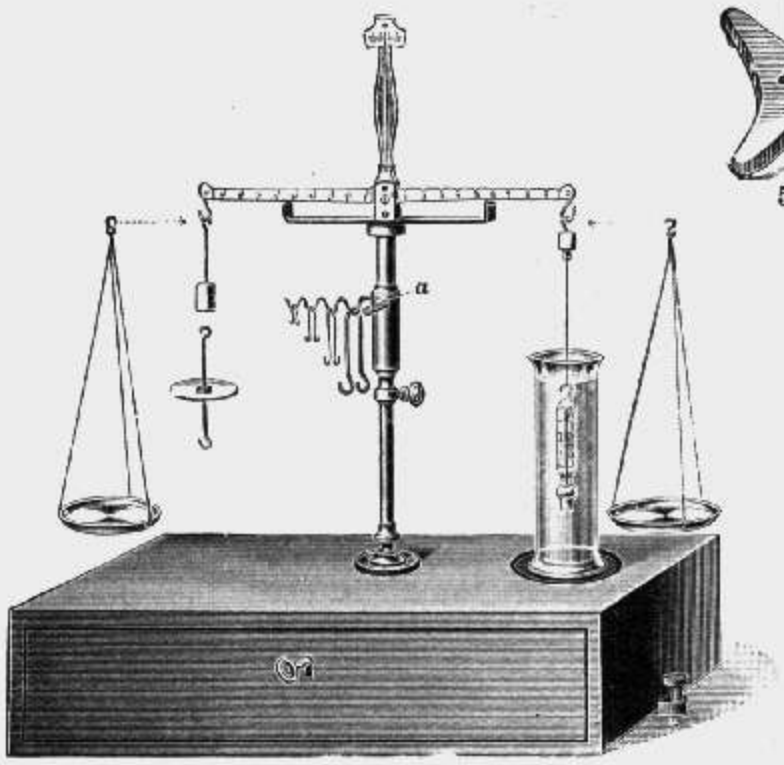
51 574. 1 : 8.



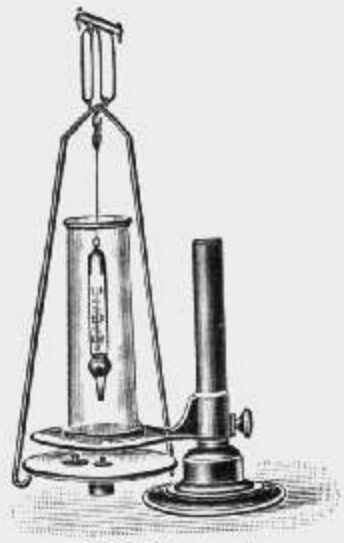
51 579 A. 1 : 4.



51 579 B. 1 : 4.



51 576. 1 : 6.



51 578. 1 : 5.

51,574. **Specific Gravity Balance** (Mohr's), Figure, with arrestable stand and pans for ordinary weighings, of lacquered brass with accessories illustrated . . . . . £ 1. 15. 0

This balance serves for determining the specific gravity of liquids and solids to 4 decimal places. All parts can be placed in the lock-up drawer of the support.

51,575. — idem, with nickelled brass parts 1. 18. 0

51,576. **Specific Gravity Balance,** Figure, both arms graduated, with adjustable stand with support and with spring arrestment, the latter being actuated by lightly pressing the knob a. The central bearing and arrestment are of agate. The lock-up drawer is arranged to take the entire balance and the lower base has levelling screws.

Price, including accessories illustrated, balance lacquered . . . . . 2. 0. 0.

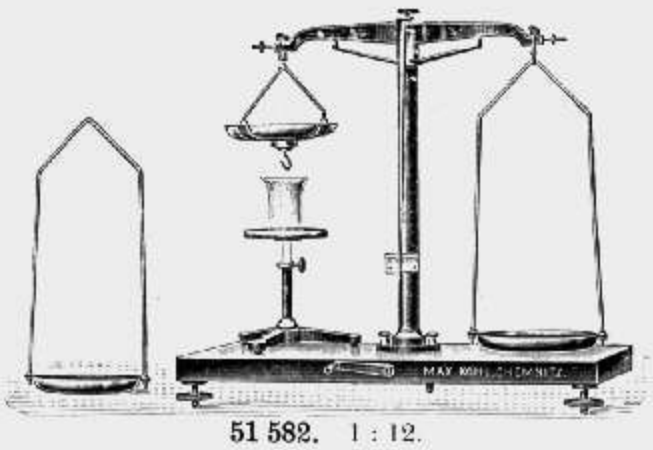
51,577. — idem, the balance nickelled 2. 3. 0

51,578. **Outfit for Specific Gravity Determinations** on liquids and solids, for analytical balances Nos. 51,519, 51,520 and 51,523, 51,524, Figure, owing to the height of the pans this outfit can only be used for the balances to carry 200 grams and 1 kg 0. 9. 0

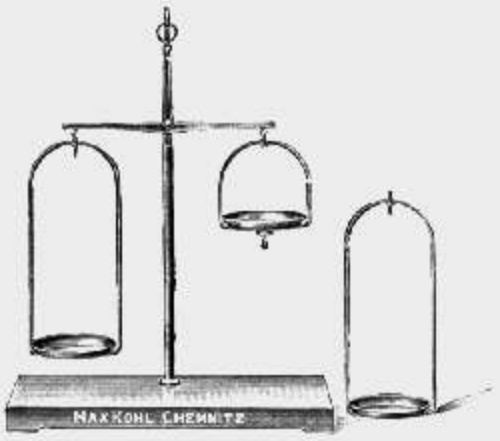
1 Reimann Thermometer, 15 g weight, displaces 5 g distilled water at 15° C. (**4 s. 3 d.**), 1 adjustable stage for the glass jar (M. T., p. 103 [**3 s.**]), 1 counterpoise each of 10 and 5 grams each 6 d. (**1 s.**), 1 glass plummet (**9 d.**).

51,579. **Hydrometer** (Reimann's), Figs. A and B, for determining the specific gravity of liquids, with a 1-gram patent body and a pan for use as substitution balance, resting in polished box, with 2 glass jars 1. 10. 0

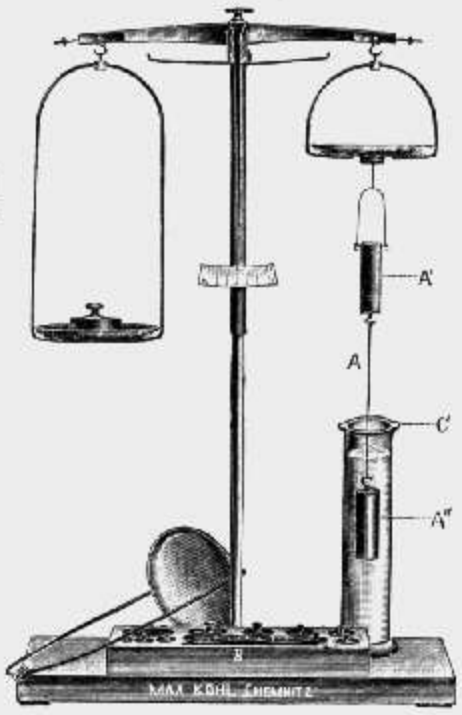
51,580. — idem, **in glass case** 2. 5. 0



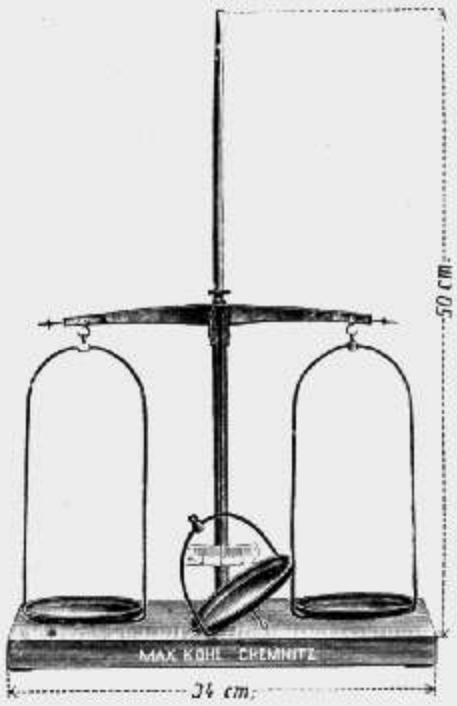
51 582. 1 : 12.



51 586. 1 : 10.



51 588. 1 : 8.



51 589. 1 : 8.

Hydrostatic Balance, Figure 51,582.

List No.	51,581	51,582	51,583
To carry	1	2	5 kg
Sensitivity	10	20	50 mg
Price £	**3. 10. 0**	**4. 0. 0**	**5. 0. 0**

Gunmetal Beam working on brass pillar, with beam arrestment, on mahogany board with two long and one short brass pans and adjustable plate stand. Axes working on stones.

Hydrostatic Balance, sufficient where demands are not great, Fig. 51,586.

List No.	51,584	51,585	51,586	51,587
To carry	100	250	500	1000 grams
Price £	**0. 13. 6**	**0. 14. 6**	**0. 17. 0**	**1. 0. 0**

51,588. **Hydrostatic Balance,** to carry 250 grams, Figure, with beam adjustable in an up-and-down direction, 2 pans with long stirrup and 1 pan with short stirrup, brass body, jar and plummet (for explaining the Archimedian principle) and with set of weights from 1 mg to 200 grams. The balance indicates 5 mg . . . . . £ s. d. 1. 10. 0

51,589. — idem, without above-named accessories, Figure, with 3 pans 1. 0. 0

51,590. **Demonstration and Hydrostatic Balance,** Figure, with 2 weights of 200 g and 1 weight of 100 g, also 2 long and 2 short pans 6. 10. 0

The balance is 60 cm high, fitted with rigid pillar and is very sensitive for its size. The deflections are large and can be read from a distance.

The balance permits of explaining: distribution of the lever — shifting of centre of gravity — increase and decrease of sensitivity on lengthening and shortening the lever — results of placing the suspension axes above or below the central axis — testing the balance for proportionality — adjusting the inequality of arms — correct weighing with an unequal arm balance — determining the error of the lever — use of balance for determining the specific gravity of solids and liquids.

The balance can in addition be used as a tare balance for loads to 1 kg.

51,591. **1 Case** in which to lay and despatch the balance No. 51,590 . . . . . 1. 5. 0

51,592. **Arrangement for Hydrostatic Tests,** Figure, for raising and lowering the glass mechanically 1. 0. 0

51,593. **Large Demonstration and Hydrostatic Balance,** Figure 10. 0. 0

The balance is 1.10 m high and has a sensitivity of 10 mg on each side with its maximum load of 5 kg, thus rendering it suitable for use as an ordinary balance.

The balance has excentric arrestment, rider scale and two pairs of pans of different sizes; as the suspenders are exactly equal the smaller pans can be suspended instead of the larger.

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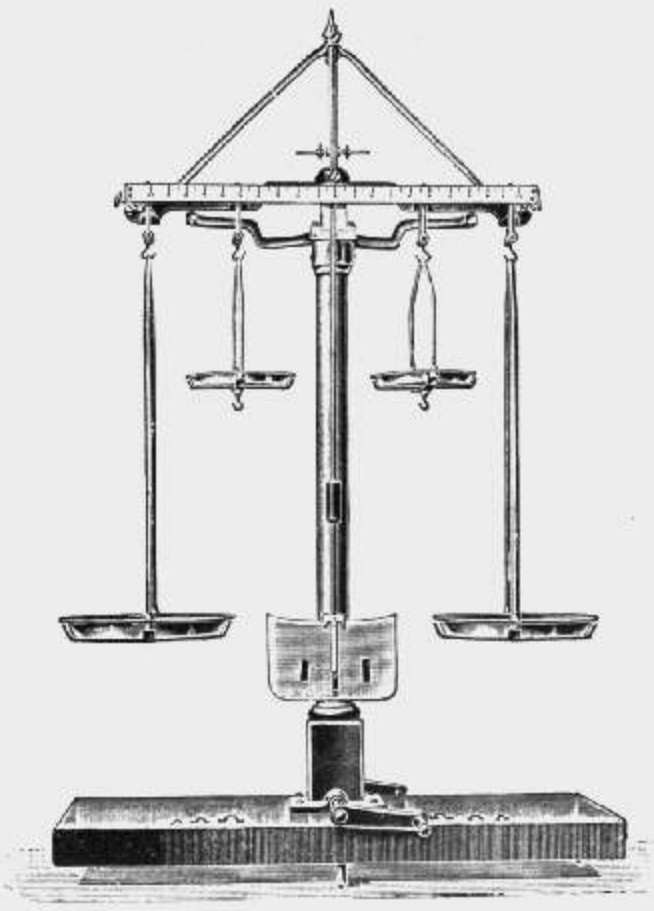
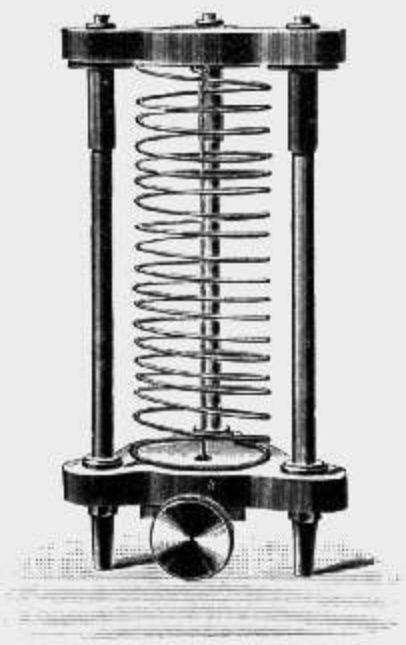
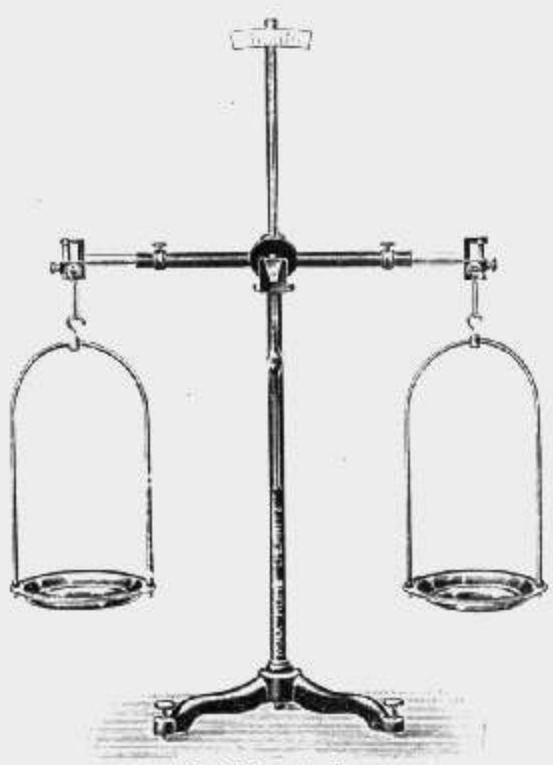
51 590. 1 : 5.



51 593. 1 : 11.



51 592. 1 : 5.



51 594. 1 : 8.

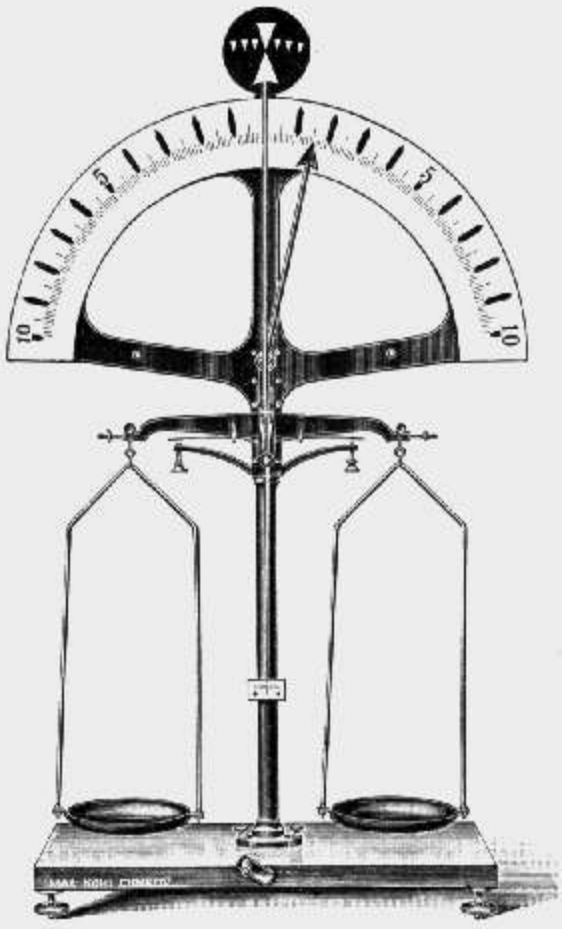
	£ s. d.
The beam has two pointers and the pillar two scales, one of each of these facing the lecturer and the other the audience. The following instructive experiments, amongst others, may be carried out with the balance: (a) Equal and unequal arm balance with long pointer; (b) Weighing with the rider scale; (c) Equal arm balance with short pointer; (d) Lengthening a lever arm; (e) Shifting the line of axis above or below; (f) Hydrostatic balance.	

Outfit for Hydrostatic Experiments: see No. 51,592.

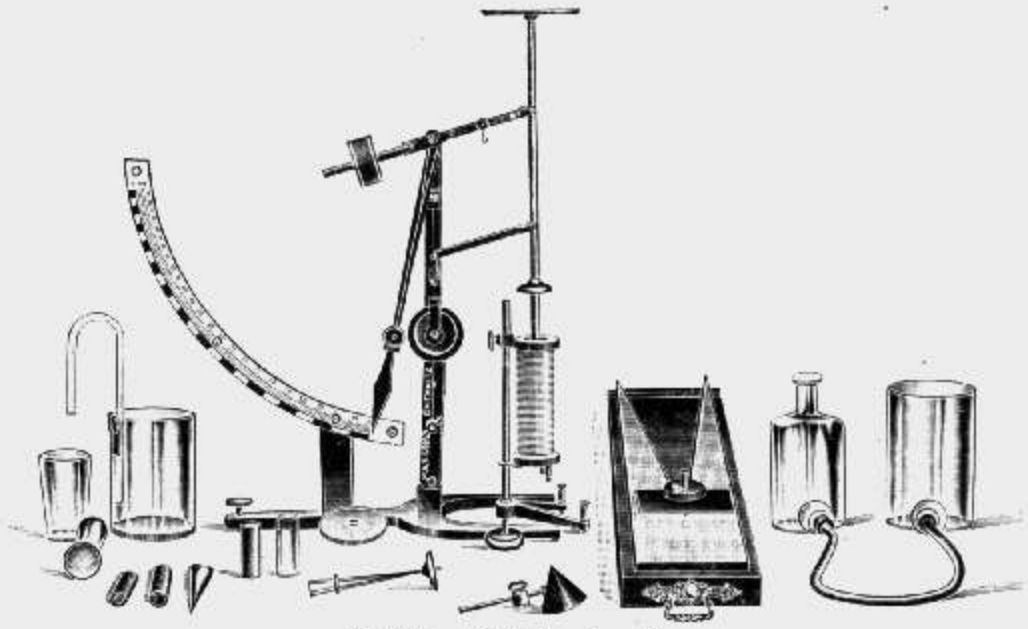
51,594. **New Demonstration Balance** (Buff's) (W. & E. phys. Prakt., Fig. 29) 2. 10. 0

(1) The knife edges carrying the pans can be brought into the same plane as the central knife edge or be removed from the latter. (2) The centre of gravity of the beam can be displaced, and (3) the length of the arms of the beam can be varied.

Cl. 5553, 211, 210, 3791.



51 595. 1 : 10.



51 597 — 51 600. 1 : 10.

	£ s. d.
51,595. **Chemical and Hydrostatic Demonstration Balance** (Schwedoff's), Figure (Ztschr. f. d. phys. u. chem. U. **16**, 1903, p. 321. — Frick, Phys. Techn. II, 1, Fig. 2128) . .	6. 10. 0
In order to obviate the tedious selection of suitable small weights and the inconvenience of laying the rider on the beam during the lecture, and to facilitate reading from a distance, a spring pointer is firmly fixed to the beam of the balance, this pointer being arranged in front of a semi-circular scale. In using the balance the weight to be determined is first obtained roughly by adding tare weights to the pan; the fine pointer is then guided by hand over the scale, this motion causing a small knob, fixed in front, to move in the corresponding direction until the beam has reached the state of equilibrium. In this position the fine pointer shows the fractions. With the aid of the arresting fork it is possible to support both arms of the beam at once or each separately.	
51,596. **Weighing Pan** for hydrostatic experiments, for preceding balance	0. 5. 0
51,597. **Demonstration Indicating Balance** (Hartl's), Figure, suitable for a large number of experiments in statics, mechanics and electro-mechanics (Ztschr. f. d. phys. u. chem. U. **10**, p. 127), for 250 and 500 grams range, without accessories	3. 15. 0
The balance is used for measurement experiments as to adhesion and cohesion of liquids, friction, stability, magnetic attraction, etc.; also for demonstrating Archimedes' principle and for determining the density of solids and liquids.	
51,598. **Simple Accessories for Balance No. 51.597:** 1 adhesion plate (glass), 1 tribometer with slider, 1 glass jar and 1 glass flask, connected together by rubber tubing; 1 plunger, 1 holder with wire clamp, 1 massive iron cylinder (see Figure)	1. 5. 0
51,599. **Further Accessories** for Balance No. 51,597: 1 floater, 1 glass jar with syphon, 1 beaker, 1 hollow cylinder, 1 solid cylinder, 1 sheet metal plate, 1 wood block (cf. Ztschr. f. d. phys. u. chem. U. **8**, p. 207); in addition, for experiments on the dependence of wind pressure on the shape of the impressed surface and the dependence of the resistance of a liquid against the motion of a solid in the same on the velocity and the shape of the impact surface of the body: 1 hollow brass cone, 1 hollow brass sphere, 1 base support. There is also comprised in the accessories 1 measuring flask (pycnometer) for determining the density of pulverulent bodies (see Figure)	3. 0. 0
51,600. **Solenoid on Stand,** with soft iron core and hollow iron cylinder, for experiments on magnetic attraction. Accessory for balance No. 51,597, see Figure	0. 15. 0
51,601. **Plane Plate and Hollow Hemisphere** for impact experiments with liquids (M. T., Fig. 74 and p. 109)	0. 3. 0
51,602. **Table for Hydrostatic Balances,** with serpentine base, Figure	0. 3. 0

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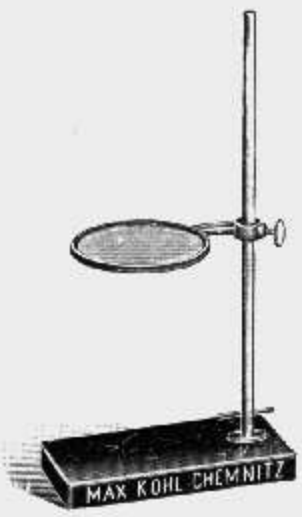
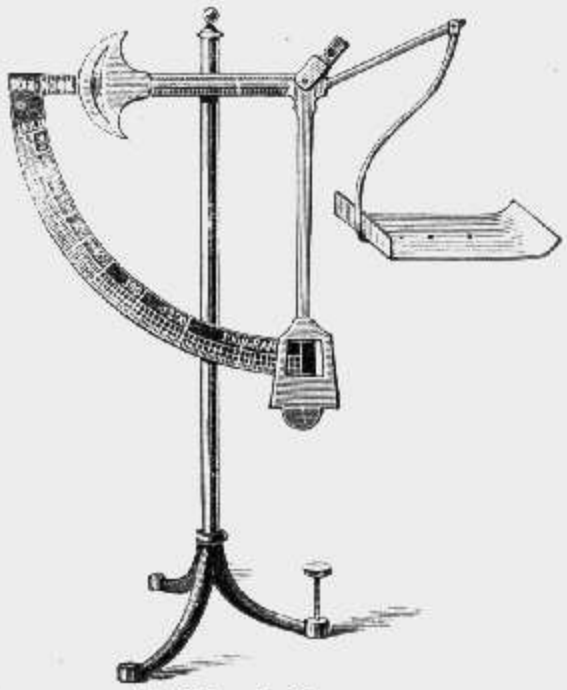
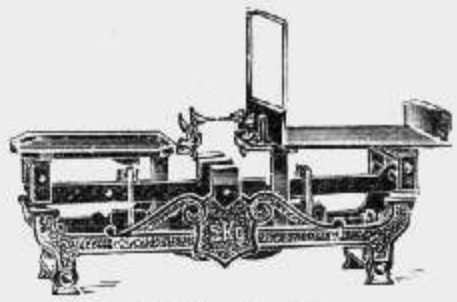


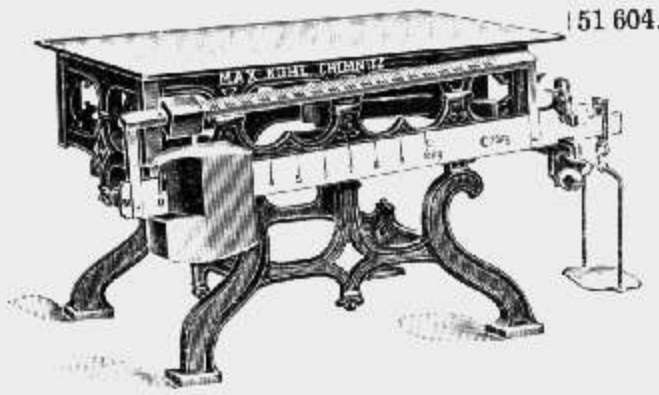
51 602. 1 : 5.



51 604. 1 : 8.



51 614. 1 : 10.



51 619. 1 : 8.



51 609. 1 : 8.



51 624. 3 : 10.

51,604. **Large Letter and Sorting Balance** (German "rapid" balance), Figure, accurately divided to 500 grams, compactly constructed for demonstrations and weighings in rapid succession (Fr. phys. Techn., **I, 2,** Fig. 2122) . . . . . £ s. d. 1. 16. 0

The manufacture of indicating balances is carried on as a special branch of our trade, and we supply these as per special price list, especially for the textile and paper trades.

51,605. **Bridge Balance** for 200 kg carrying capacity (M. T., p. 28), of oak 2. 0. 0

Hand Balance with round horn pans, Figure 51,609.

List No.	51,606	51,607	51,608	51,609	51,610	51,611
Length of beam cm	10	13	17	22	30	35
To carry	5	20	50	200	500	1000 gr
Price £	**0. 2. 6.**	**0. 3. 3**	**0. 4. 0**	**0. 5. 0**	**0. 8. 6**	**0. 12. 0**

Flat Balance, Beranger system, Figure 51,614 (M. T., p. 28).

List No.	51,612	51,613	51,614	51,615	51,616	51,617	51,618
To carry	1	3	5	10	15	20	25 kg
Price £	**0. 11. 0**	**0. 12. 0**	**0. 13. 0**	**0. 15. 0**	**1. 0. 0.**	**1. 5. 0**	**1. 10. 0**

Table Balance with Jockey Weight, Figure 51,619, with tare weigh-pan.

List No.	51,619	51,620
Scale divided every 10 gr to	20	25 kg
Size of slab mm	230×350	250×400
Price £	**2. 5. 0**	**2. 10. 0**

The small pan to the right serves for calculating the tare of vessels and the like which have not to be weighed in with the contents.

Analytical Weights for Chemico-technical and Physical Purposes, accurately adjusted among each other, Figure 51,624.

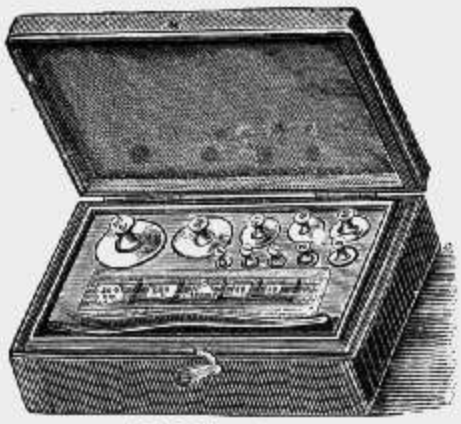
List No.	51,621	51,622	51,623	51,624	51,625	51,626	51,627
From 1 mg to	10	20	50	100	200	500	1000 gr
Comprising altogether	31	51	101	201	501	1001	2001 gr
Price per Set £	**0. 18. 0**	**1. 0. 0**	**1. 3. 0**	**1. 8. 0**	**1. 17. 0**	**2. 7. 0**	**2. 19. 0**

The weights, with ivory forceps, are contained in a neat mahogany box; in the sizes down to 1 gram they have small knobs screwed in; they are made of brass, gilt and are each inserted in velvet. The fractional gram weights from 500 to 10 mg are placed under a thick glass cover.

The sets Nos. 51,621 to 51,627 can also be supplied at the same price **platinised** instead of gilt.

Spring Balances, Pression and Tension Dynamometers: see Mechanics (Elasticity). Cl. 3244, 4459, 5487, 4082, 5490, 213. 16

Balance Brackets: see page 41, No. 50,267.



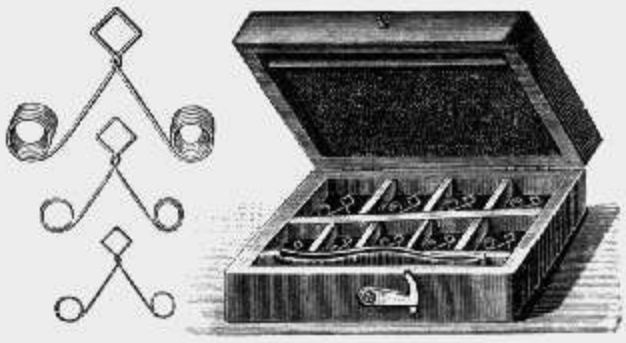
51 631. 3 : 10.



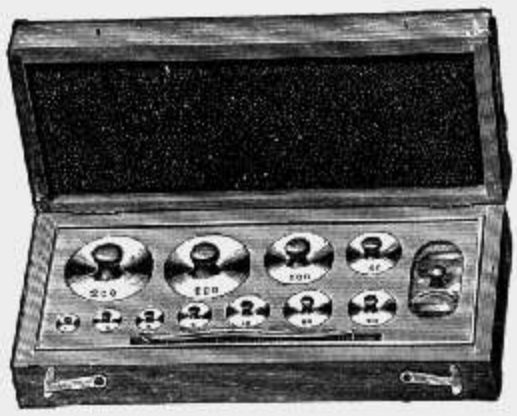
51 635. 3 : 10.



51 636 oder 51 645. 1 : 3.



51 637. 1 : 3.



51 638. 1 : 4.

Analytical Weights, somewhat simpler construction, accurately calibrated, Figure 51,631. £ s. d.

List No.	51,628	51,629	51,630	51,631	51,632	51,633	51,634
From 1 gr to	10	20	50	100	200	500	1000 gr
Comprising together	31	51	101	201	501	1001	2001 gr
Price per Set £	**0. 12. 0**	**0. 13. 6**	**0. 15. 0**	**0. 17. 0**	**1. 3. 0**	**1. 9. 0**	**1. 18. 0**

The weights, together with brass forceps are contained in a polished mahogany case; in sizes to 1 gram they are made of brass with heads screwed in and are gilt; the fractional grammes, of German silver, are under glass.

We also supply sets Nos. 51,628—51,634 at the same price **platinised** instead of gilt.

51,635. **Analytical Fractional Gram Weights** of **Platinum** and **Aluminium,** from 1 gram to 500 mg, 0.1 and 0.01 mg in duplicate, 0.001 mg in triplicate, in elegant mahogany case with stout glass lid, each lying in separate frame, Figure, 0.5 to 0.01 mg weights of platinum, 5, 2 and 1 mg of aluminium. Per set **0. 11. 0**

51,636. **Analytical Fractional Gram Weights, of platinum,** from 1 mg to 500 mg, in mahogany case with lid and forceps, Figure **0. 12. 0**

51,637. **Rider Weights,** Figure, of aluminium, in dull walnut case with forceps, containing 9 aluminium riders from 10 to 500 mg, for the rider slides of the analytical balances Nos. 51,517—51,527, 51,529—51,534. The rider weights can easily be recognised one from the other by the number of the rings; the 10 and 100 mg have each one ring underneath on each side; the 20 and 200 mg have each two rings, and the 50 and 500 mg each 5 rings. Case with 9 riders and forceps **0. 5. 6**

51,638. **Precision Weights,** Check Standards, with No. I extra fine calibration, in polished mahogany case with forceps, Figure, going from 1 mg to 200 grams, all "twos" in duplicate, containing altogether 611 grams. The gram weights are gilt, and the fractional grams are of German silver, under glass **0. 16. 6**

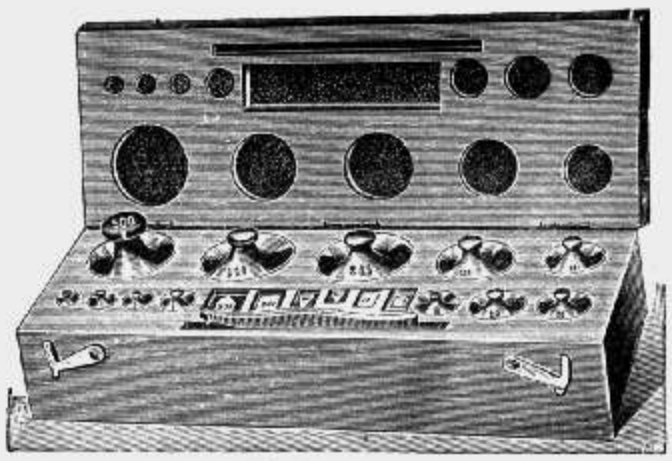
Precision Weights, extra-fine calibration I, in polished pear-wood box with forceps, the grams being of phosphor bronze, the fractions of German silver, under glass, all the "twos" being in duplicate, Figure 51,643.

List No.	51,639	51,640	51,641	51,642	51,643	51,644
1 mg to	20	50	100	200	500	1000 gr
Price per Set £	**0. 7. 0**	**0. 8. 6**	**0. 10. 0**	**0. 15. 6**	**1. 0. 0**	**1. 8. 0**

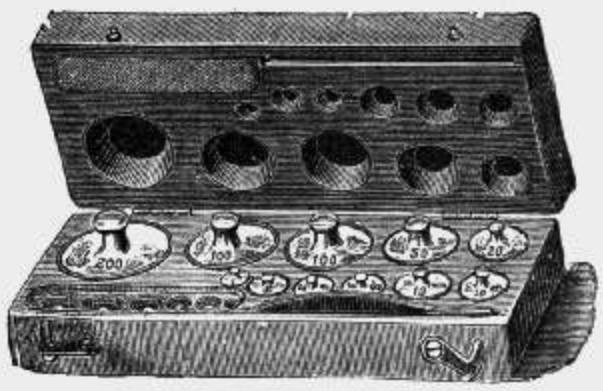
Cl. 214, 215, 216, 5491, 217.

Max Kohl A. G. Chemnitz, Germany.

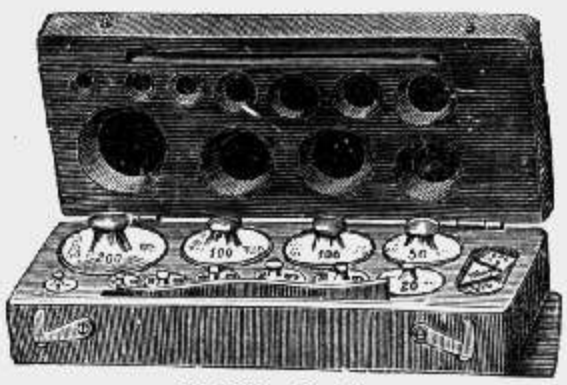
Max Kohl A. G. Chemnitz, Germany.



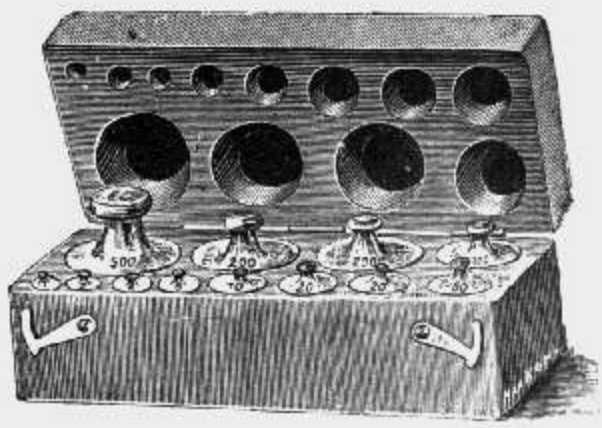
51 643. 1 : 4.



51 649. 3 : 10.



51 655. 3 : 10.



51 662. 3 : 10.



51 666. 1 : 4.

51,645. **Precision Fractional Gram Weights,** extra-fine calibration I, from 1 mg to 500 grams; 5, 2 and 1 mg of aluminium, the remainder of pure nickel, in mahogany case with lid and forceps, Figure on p. 242 . . . . . £ 0. 5. 6

Precision Weights, with **fine** calibration II, Figure 51,649, in polished beech box, with forceps, of nickelled brass, the fractions of German silver, under glass; containing 100, 10, 2, 0.1, 0.01 g in duplicate; the 100 gram set has only one 100 gram weight.

List No.	**51,646**	**51,647**	**51,648**	**51,649**	**51,650**	**51,651**
10 mg to	20	50	100	200	500	1000 grams
Price per Set £	**0. 4. 6**	**0. 5. 0**	**0. 6. 0**	**0. 9. 0**	**0. 12. 0**	**0. 17. 0**

Precision Weights, with fine calibration II, in polished beech block case, with forceps, of brass, nickelled, the fractional grams of German silver, without glass. The 100, 10, 2, 0.1 grams are in duplicate. Figure 51,655.

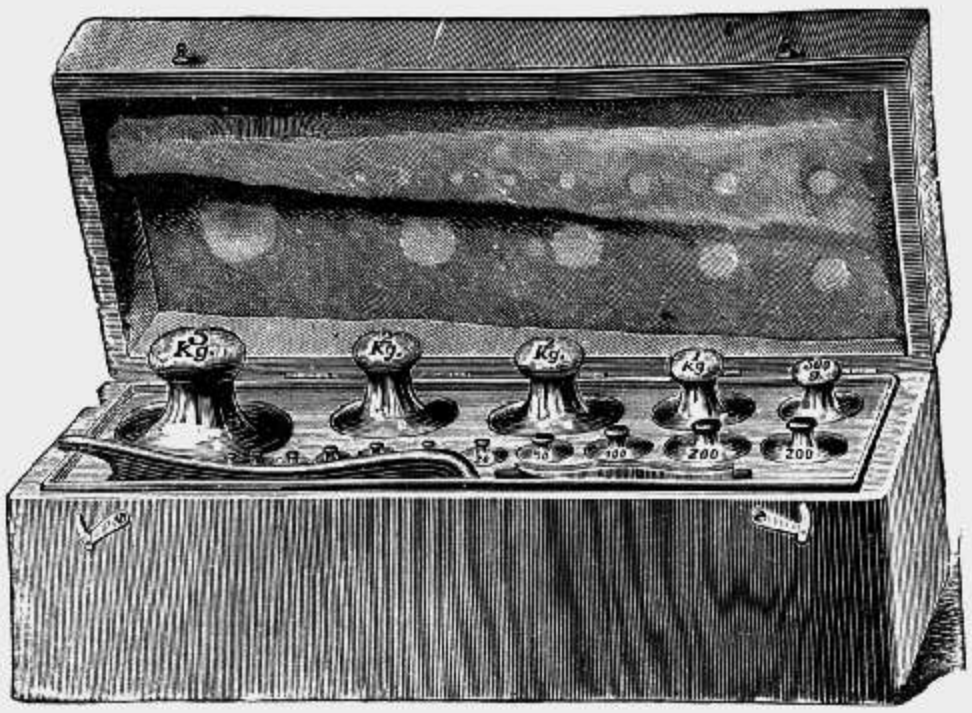
List No.	**51,652**	**51,653**	**51,654**	**51,655**	**51,656**	**51,657**
100 mg to	20	50	100	200	500	1000 grams
Price per Set £	**0. 3. 6**	**0. 4. 6**	**0. 5. 6**	**0. 8. 0**	**0. 11. 6**	**0. 16. 6**

Precision Weights, with No. III calibration, in polished beech block box, of nickelled brass, the 100, 10 and 2 grams being in duplicate. Figure 51,662.

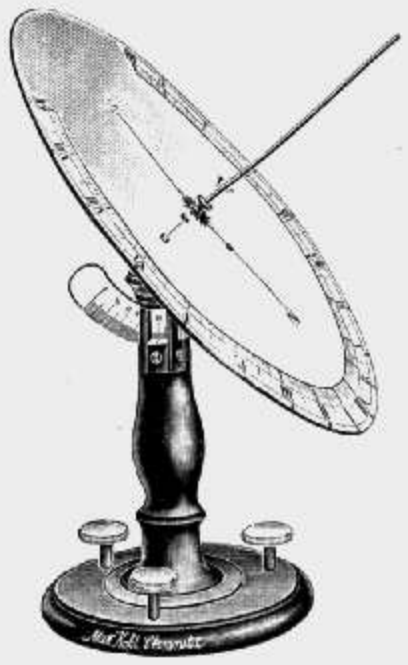
List No.	**51,658**	**51,659**	**51,660**	**51,661**	**51,662**	**51,663**
1 g to	20	50	100	200	500	1000 grams
Price per Set £	**0. 2. 6**	**0. 3. 0**	**0. 4. 0**	**0. 6. 0**	**0. 8. 6**	**0. 13. 0**

Precision Weights, with No. III calibration, in sliding box with forceps, nickelled, the "twos" being in duplicate, Figure 51,666.

List No.	**51,664**	**51,665**	**51,666**	**51,667**
1 mg to	1	2	5	10 grams
Price per Set £	**0. 2. 0**	**0. 2. 3**	**0. 2. 6**	**0. 2. 9**



51 670, 51 674. 1 : 4



51 686. 1 : 5.

Precision Weights, with No. III calibration, in polished walnut case, upholstered plush, with fork and forceps, nickelled, the "twos" being in duplicate, Figure 51,670.

			£ s. d.
List No.	**51,669**	**51,670**	**51,671**
1 gram to	2	5	10 kg
Price per Set £	**1. 17. 0**	**2. 17. 0**	**4. 12. 0**

Precision Weights, same construction as Nos. 51,669—51,671, but of **Phosphor Bronze,** with No. I **extra-fine** calibration, Figure 51,674.

List No.	**51,673**	**51,674**	**51,675**
1 gram to	2	5	10 kg
Price per Set £	**3. 3. 0**	**4. 13. 0**	**7. 10. 0**

The analytical weights are most carefully calibrated, the single weights in each set being in perfect agreement among each other. They are adapted for the most accurate physical and chemical weighings.

The sets of weights with "Calibration I" have the accuracy required for Precision Check and Ordinary Standards; they can replace the analytical weights in a number of cases.

The sets with "Calibration II" have the accuracy required for Commercial Check Standards and Standards for ordinary use; they are employed for physical weighing operations.

The sets with "Calibration III" have the accuracy of the usual Precision and Medical Weights; they are used in physical experiments in which absolute accuracy is not essential, e. g., hydrostatic weighings.

Calibrated Iron Weights.

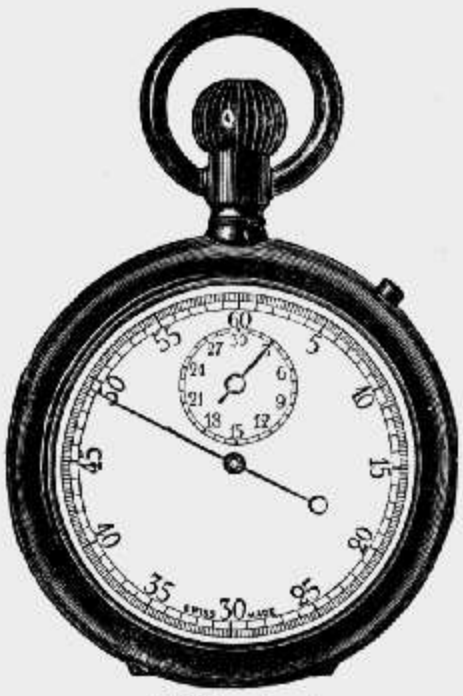
List No.	**51,676**	**51,677**	**51,678**	**51,679**	**51,680**	**51,681**	**51,682**	**51,683**	**51,684**
	100 g	200 g	500 g	1 kg	2 kg	5 kg	10 kg	20 kg	50 kg
Each £	**0. 0. 7**	**0. 0. 8**	**0. 0. 9**	**0. 11. 0**	**0. 1. 4**	**0. 2. 8**	**0. 4. 5**	**0. 9. 0**	**1. 0. 0**

Measurement of Time.

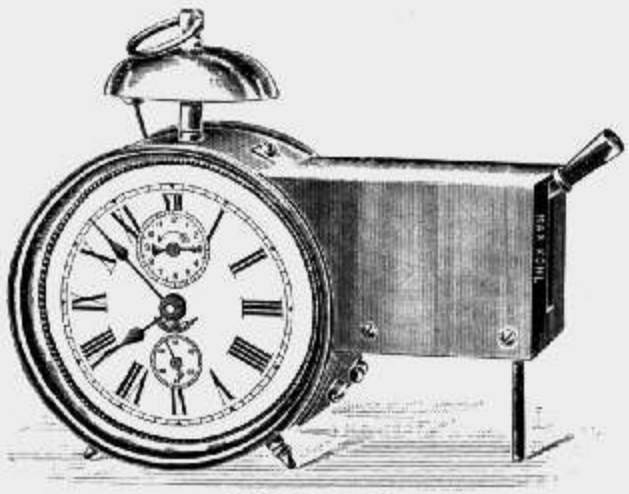
	£ s. d.
51,686. **Sundial,** simple form, Figure	2. 0. 0
51 687. **Simple Gnomon** for school use (Noack, Leitfaden, Fig. 6), see No. 51,494	0. 13. 6
51,688. **Seconds Watch** (**Stop Watch** or **Chronoscope**), Figure, keyless, "stop" and "zero" positions, indicating $^1/_5$ seconds	1. 0. 0
51,689. **Alarm Clock,** simple (M. T., Fig. 27)	0. 3. 0
51,690. **Alarm Clock with switch,** Figure	1. 0. 0

This clock is employed for breaking an electric circuit automatically after a definite time has elapsed. The apparatus can be used with advantage in charging accumulators and in physical and chemical work, etc.

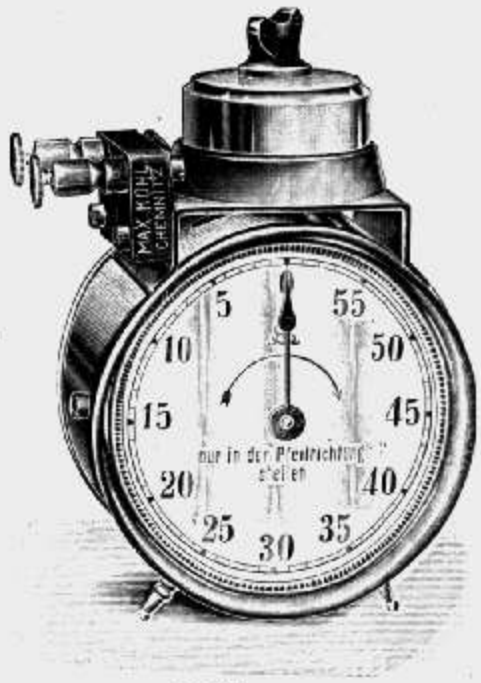
Max Kohl A. G. Chemnitz, Germany.



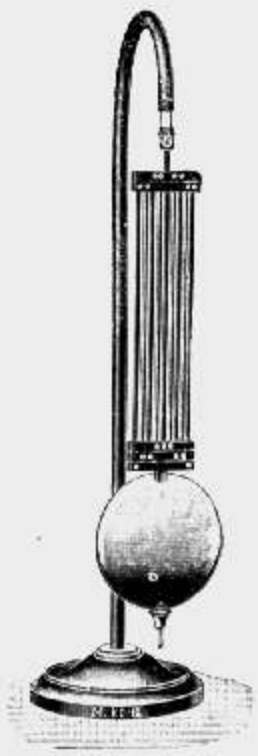
51 688. 1 : 1.



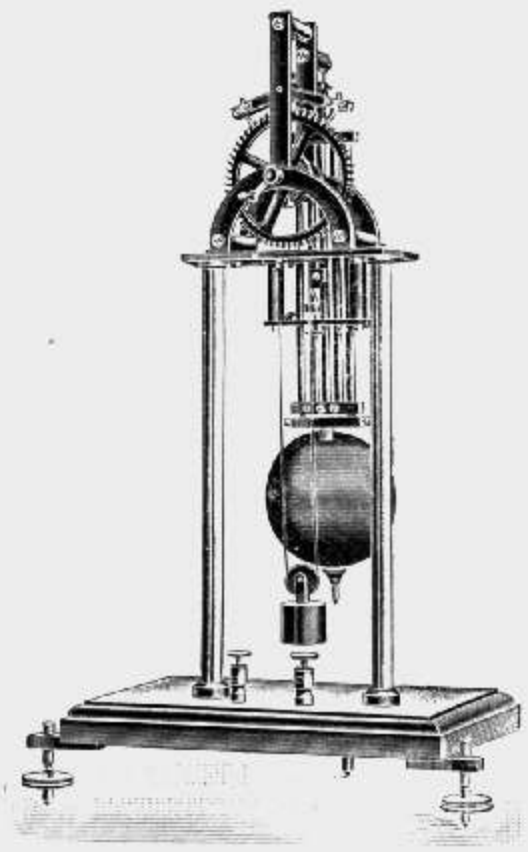
51 690. 1 : 3.



51 691. 1 : 4.



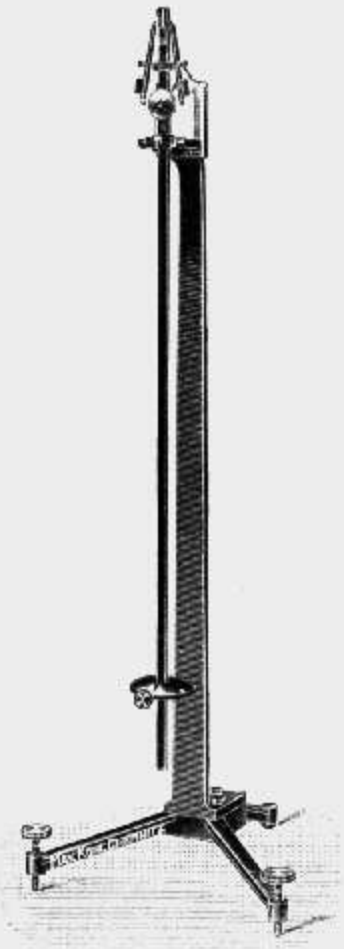
51 695. 1 : 5.



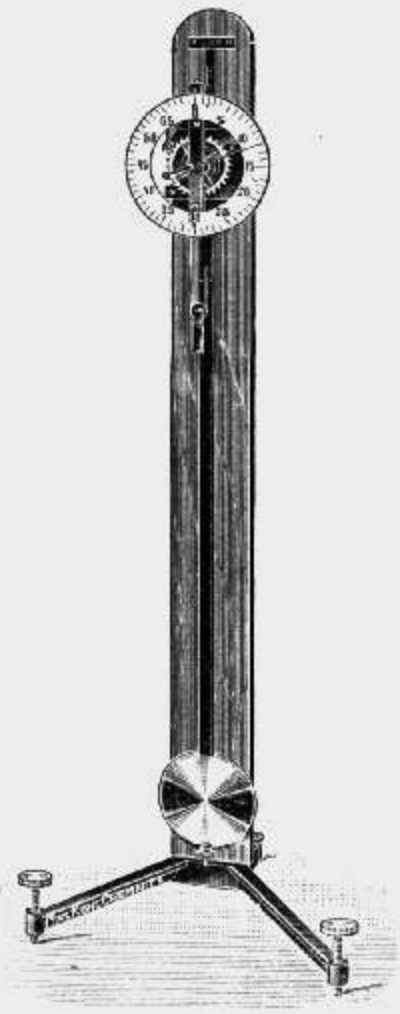
51 696. 1 : 5.

	£	s.	d.
51,691. **Alarm Clock with switch** (Gocht's), Figure, for accurate setting of the minutes After reaching the minute for which it has been set this clock gives a ring of the bell, at the same time putting out of circuit the current at its terminals.	1.	5.	0
51,692. **Clock with 10-second Signal,** for Laboratories; the clock gives a soft signal every 10 seconds	1.	2.	0
51,693. — idem, with **Half-minute Signal**	1.	0.	0
51,694. — idem, with **Minute Signal**	0.	17.	6
51,695. **Compensating Pendulum,** on stand, Figure, with 9 brass and steel rods, swinging to $^1/_2$ seconds	2.	10.	0
51,695 a. — idem, in simpler yet reliable form, with 2 zinc and 3 steel rods	1.	4.	0
51,696. **Compensating Pendulum,** Figure, on stand with levelling screws, swinging accurately to $^1/_2$ second, with driving mechanism, escapement and electric contact device	5.	0.	0
51,697. — idem, with **dial**	6.	5.	0

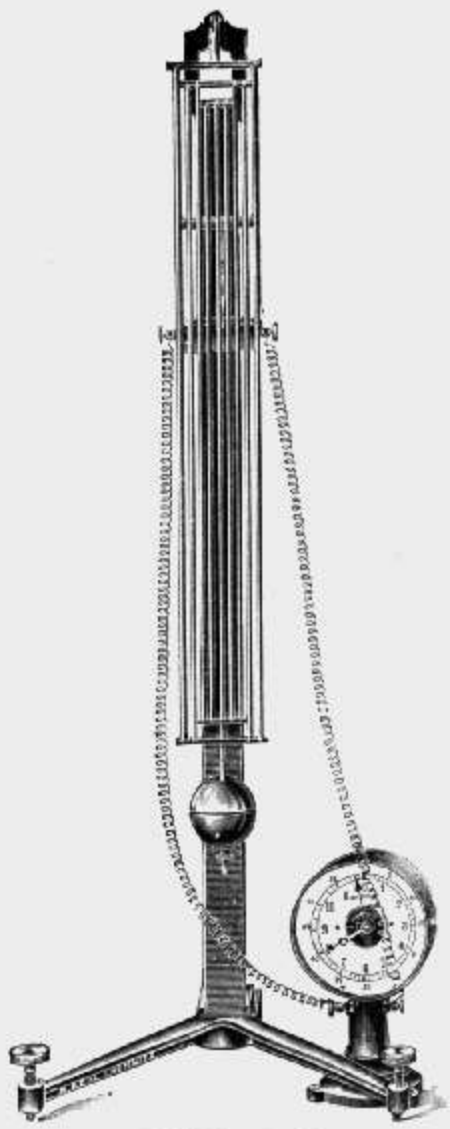
Cl. 466, 3139, 4983, 629, 630.



51 698. 1 : 15.



51 701. 1 : 14.



51 703. 1 : 10.

51,698. **Seconds Pendulum,** in Cardanic suspension, with audible seconds beat, with firm iron stand fitted with levelling screws, Figure (Fr. phys. Techn. **I, 2,** Fig. 3364) . . £ 2. 5. 0

The pendulum bob is adjustable, so that this pendulum is at the same time adapted for explaining the law of the pendulum.

51,699. — idem, with electric contact device for combining with the electric dial No. 51,705 3. 0. 0

51,700. **Seconds Pendulum** with wall bracket 1. 15. 0

51,701. **Seconds Pendulum** with audible beat, with dial and projecting pointer, on iron stand with levelling screws, Figure (Fr. phys. Techn. **I, 2,** Fig. 3372; Gan.-Man. Fig. 61) 6. 0. 0

51,702. — idem, with **electric Seconds Contact** and an **electric Dial** 10. 5. 0

The dial is set up at a spot in the lecture room which is easily visible by all. This arrangement can be thoroughly recommended for larger lecture rooms. The dial can also be used as an electric secondary clock with the aid of a clock having an electric contact.

51,703. **Seconds Compensating Pendulum,** Figure, with 5 brass and 4 steel rods, with audible beat and electric seconds contact, on iron stand with levelling screws, and electric dial 9. 10. 0

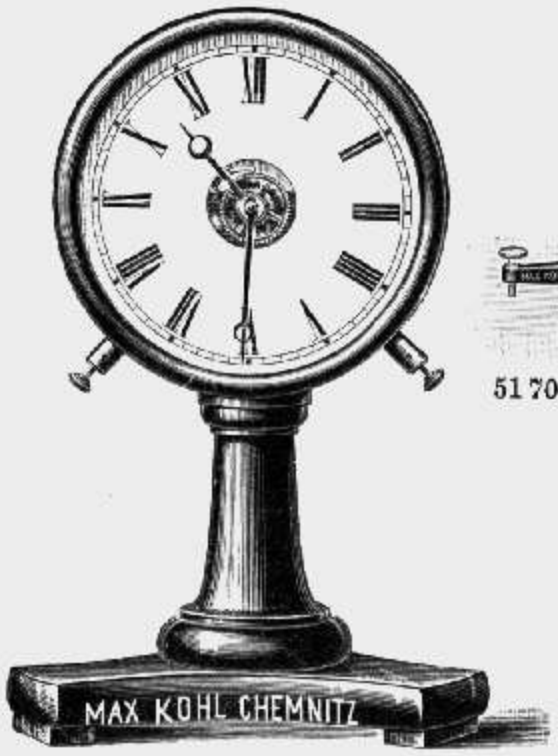
51,704. **Clock with electric Minute Contact,** Figure, for use in combination with an electric Dial No. 51,705, neat construction; can also be used as a model of a clock 3. 0. 0

51,705. **Electric Dial,** Figures A and B 3. 10. 0

The electric dial is used either with Clock No. 51,704 (having an electric minute contact) and it then serves the function of a secondary electric clock; or with a seconds pendulum having an electric contact, being then used as an electric seconds clock in fall experiments, etc.

51,706. **Regulator Clock** with seconds pendulum, case of oak, with compensating (or gridiron) pendulum 4. 10. 0

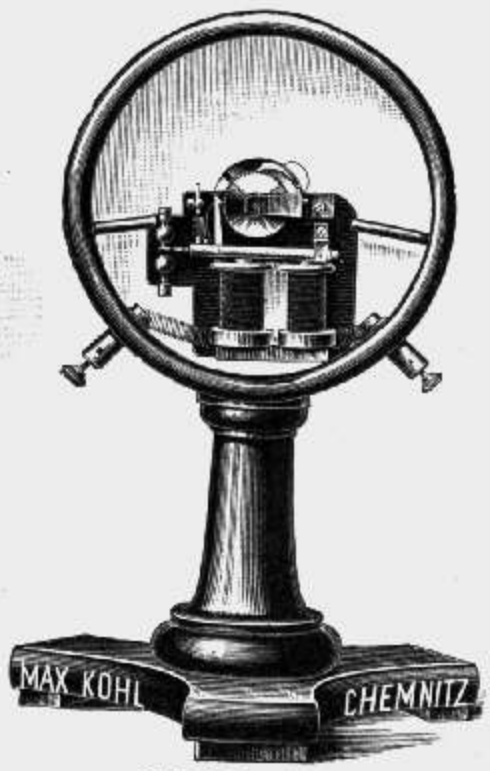
Max Kohl A. G. Chemnitz, Germany.



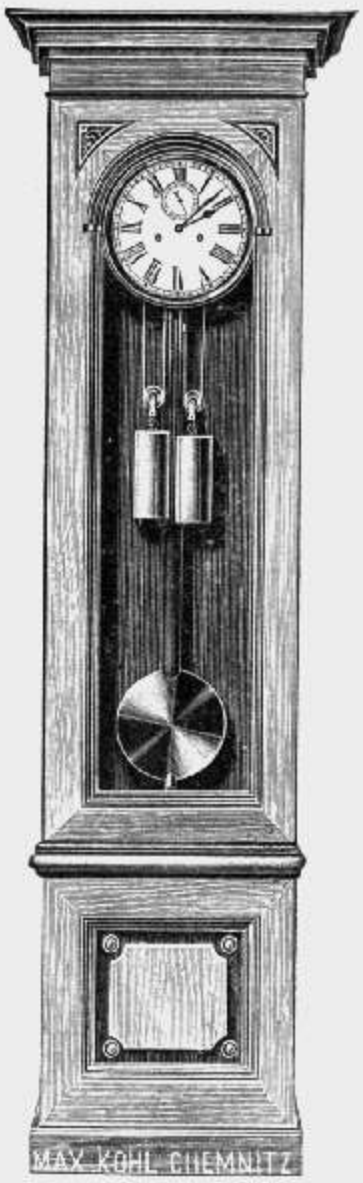
51 705 A. 1 : 5.



51 704. 1 : 10.



51 705 B. 1 : 5.



51 707. 1 : 8.

We supply **School Clocks** with automatic electric alarm, by which the commencement and finish of the studies are indicated with great punctuality; there are various patterns, and prices are quoted on application. | £ s. d.

51,707. **Electric Standard Clock** for Central Clock Systems, Figure, with seconds pendulum, capable of simultaneously operating 40 secondary clocks; driven by weights; in oak case . . . . . | 18. 10. 0

The clock is most carefully constructed; the dial, of finely silvered brass, is accurately graduated. This clock is also supplied in more richly designed cases in all kinds of woods, both as grandfather clocks and bracket clocks. Further details on application. We shall be glad to supply detailed estimates for the complete installation of clocks on receipt of precise plans.

51,708. Extra Price for a **Nickel-steel Compensating Pendulum** . . . . . | 15. 0. 0

51,709. Extra Price for a **Mercury Compensating Pendulum** . . . . . | 10. 0. 0

51,710. Extra Price for a **Metal Compensating Pendulum** . . . . . | 7. 10. 0

51,711. Extra Price for a **Seconds Contact**, so as to be able to read seconds on the secondary clocks also . | 4. 0. 0

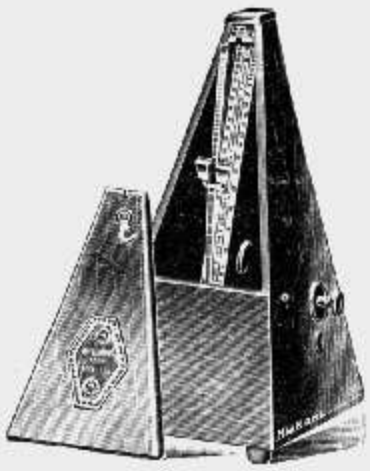
51,712. **Electric Standard Clock**, as No. 51,707, with mechanical striking mechanism, by which the half and whole hours can be struck on a bell at any other places . . . . . | 23. 10. 0

Large Standard Clock for extensive Central Clock Systems, in elegant case.

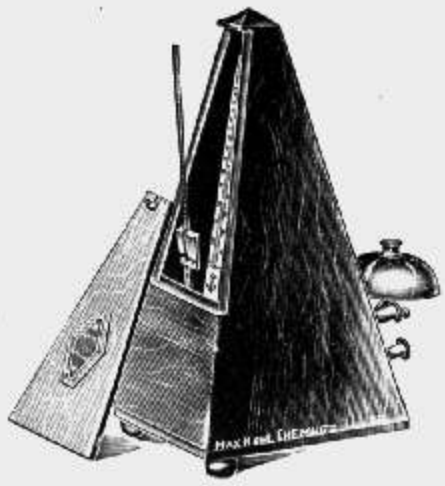
List No.	**51,713**	**51,714**	**51,715**	**51,716**
With	3	4	5	6 points of emission
Price £	**85. 0. 0**	**87. 10. 0**	**89. 0. 0**	**90. 0. 0**

These clocks have a large and massively constructed mechanism and can also be supplied with a mercury or metal compensating pendulum (cf. No. 51,709 and 51,710). Up to 40 secondary clocks can be connected up to each point of emission. The contacts are visible and easily accessible; they can be cleaned without influencing the going of the clock.

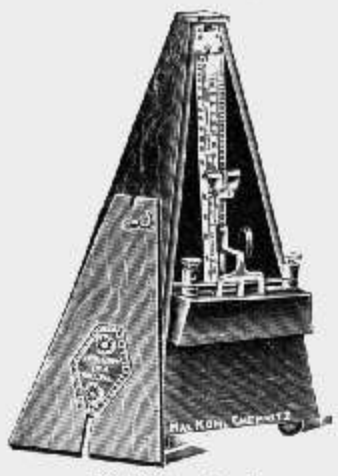
51,717. **Small Standard Clock** with 8-day going and contact mechanism, for working small electric clock systems . . . . . | 5. 10. 0



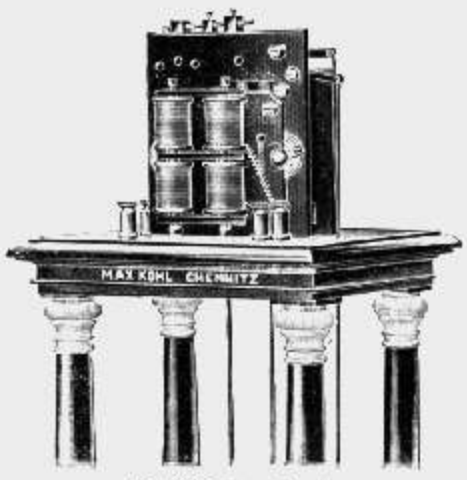
51 725. 1 : 5.



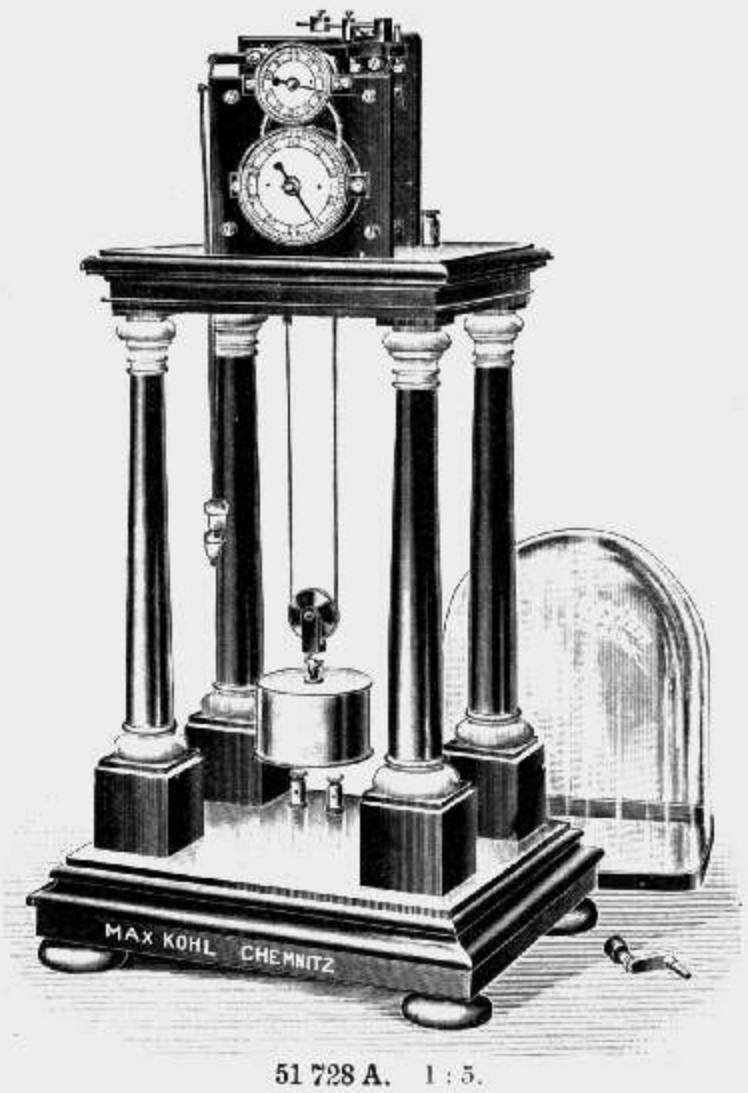
51 726. 1 : 5.



51 727. 1 : 5.



51 728 B. 1 : 5.



51 728 A. 1 : 5.

Secondary Clock (sympathetic clock), in wood case with carved frame and shielding glass for protected rooms. £ s. d.

List No.	51,718	51,719	51,720	51,721	51,722	51 723	51,724
Diam. of dial cm	21	24	31	40	50	64	74
Price £	**3. 0. 0**	**3. 5. 0**	**4. 0. 0**	**5. 0. 0**	**7. 10. 0**	**10. 0. 0**	**11. 10 0**

The dials have a white ground and black figures, also black pointers; other patterns can be supplied at a proportionate increase in cost. The clocks are also supplied with carved frame at a corresponding extra cost. If with **double dial** these clocks cost up to 31 cm diameter double, and the larger ones 75 to 40% more.

Prices for secondary clocks in metal cases for unprotected rooms and for the open quoted on application.

51,725. **Metronome** (Mälzl's) with **Bell,** Figure, striking the 2nd, 3rd 4th and 6th beats loud 0.15.0

51,725 a. — idem, without bell 0.12.0

51,726. — idem, with bell and **Electric Contact,** Figure, for releasing the fall machine and marking the closing of the circuit by striking a bell 1.10.0

51,727. **Metronome** with clockwork and mercurial contact, for **Beckmann's experiments,** Figure 1. 5.0

51,728. **Chronoscope** (Hipp's), Figures A and B 20. 0.0

This is a most accurately working instrument for determining small intervals of time. It is employed in the determination of the frequency of sounds, the velocity of free-falling bodies, the velocity of flight of shots, etc. The instrument indicates accurately to 0.001 second. The arrestment is released automatically by means of two draw cords or electrically by the aid of a double relay fitted to the back.

51,729. **Current Circuit Fall Trough** (Kolbe's) 1. 4.0

A ball traversing a fall channel closes an electric circuit during a certain duration of time, depending on the inclination of the channel.

51,730. **Spark Chronograph (Tuning Fork Chronograph),** as suggested by v. Beetz, Figure (Pogg. Ann., Vol. 135, 1868, p. 126) 7.10.0

A tuning fork of 250 vibrations, fixed to an axis of rotation, and sliding along a prism, writes with its style upon a lacquered and sooted surface. By discharging an induction apparatus, the sparks of which pass between the point of the style and the soot-covered surface, time marks will be given. The determination of time is accurate to within 0.0005 second.

51,731. **Cylinder Chronograph,** with Hipp Regulator, Figure, length of a second 10 mm; time of observation up to 60 minutes.

Price, without precision clock or chronometer 85. 0.0

The paper-covered cylinder is actuated by a weight-driven clockwork having a Hipp regulator.

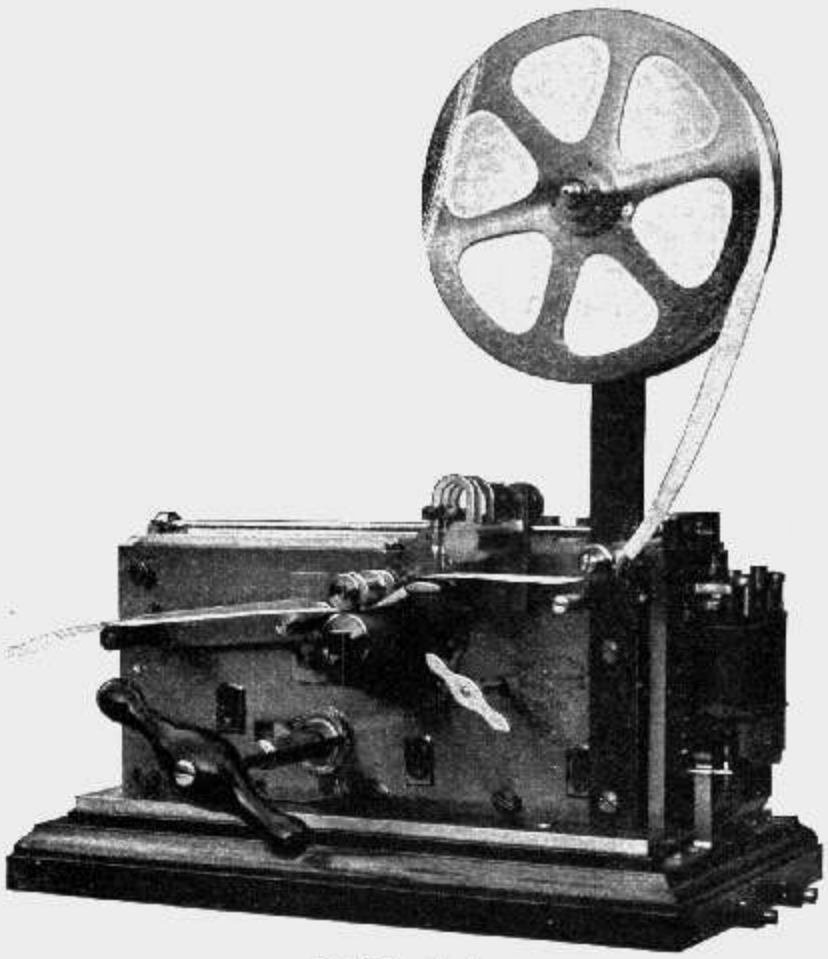
Max Kohl A. G. Chemnitz, Germany.



51730. 1 : 12.



51731. 1 : 10.



51736. 1 : 4.



51735. 1 : 4.

Two electro-magnets are moved along the cylinder, working two pens. One of the electro-magnets receives a rush of current every second from a suitable precision pendulum clock or a chronometer fitted with an electric contact, so that seconds marks are made in the form of projections on the screw line which the pen leaves behind it on the cylinder. The other electro-magnet is actuated by rushes of current, which are given off indirectly or directly by the phenomena to be registered.

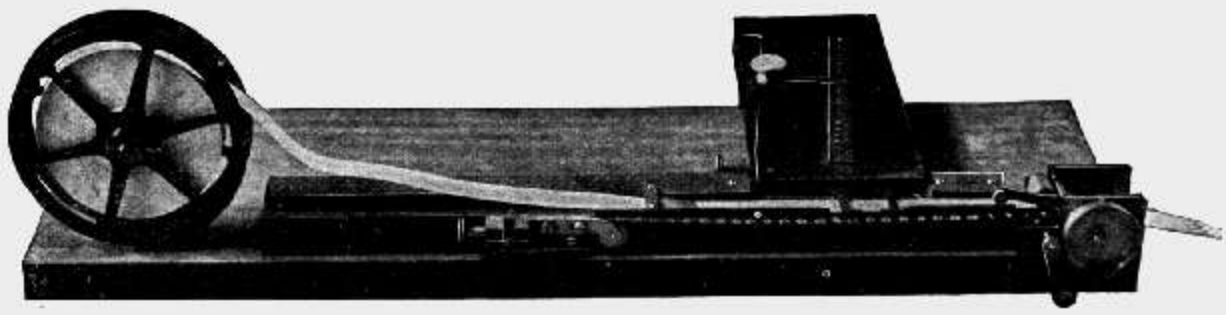
The registrations of the scribing magnet are immediately alongside each other and can be measured by means of a flexible millimetre rule or a reading machine. The clockwork can be wound up without interrupting work.

	£ s. d.
51,732. — i d e m, length of a second 15 or 20 mm . . . . . **Extra Price**	3. 0. 0
51,733. **Marine Chronometer** with electric seconds contact (precision instrument)	120. 0. 0
51,734. **Pocket Chronometer** with electric seconds contact	23. 0. 0
51,735. **Reading Machine** for cylinder diagrams, F i g u r e, for dividing into 10, 100 or 1000 parts the seconds recorded by Chronographs Nos. 51,731 and 51,732	6. 0. 0
51,736. **Strip Chronograph,** F i g u r e, with spring clockwork; length of a second 10 mm; time of observation: to 17 minutes; with 2 electromagnets	23. 0. 0

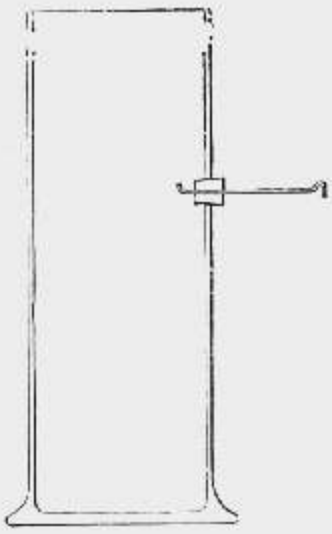
The record is made in the same manner as with the previous cylinder chronographs; instead of the pencil a style can be inserted. If desired, a weight-driven clockwork arrangement can be supplied at an **extra price** of £ **2. 15. 0.** This clockwork is arranged to run for 30 minutes; by lengthening the Gall chain from which the weight is suspended it is possible to prolong the time of running. Extra price on application.

51,737. — i d e m, with **3 Electro-magnets,** for registering the duration of two phenomena	26.10.0
51,738. **Carrying Case** for strip chronograph No. 51,736	2.10.0

Cl. 5706, 4849, 4848, 4828.



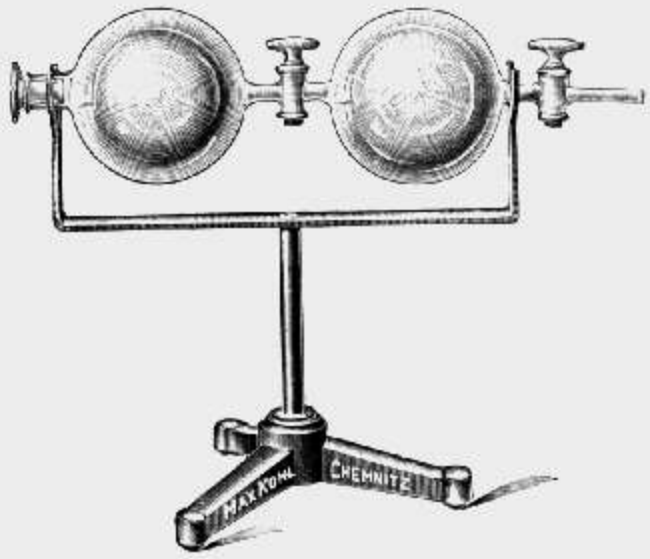
51 744. 1 : 5.



51 746. 1 : 5.



51 749. 1 : 3.



51 751. 1 : 5.

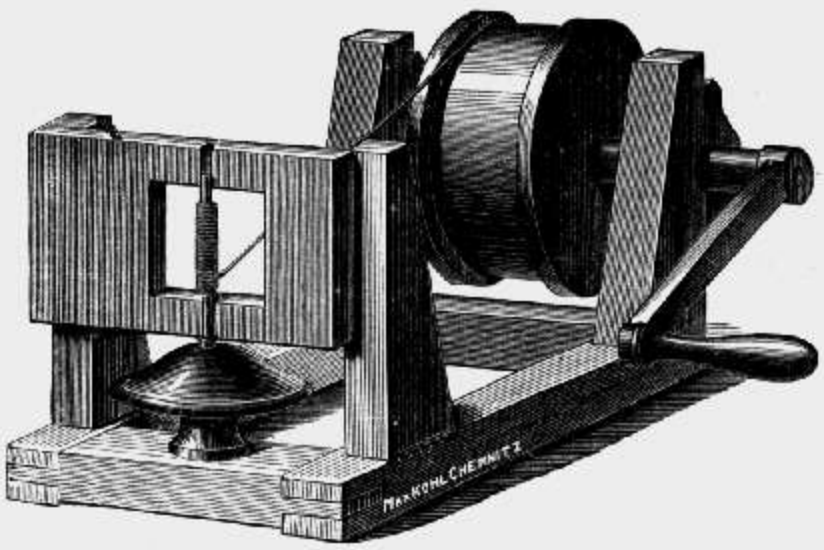
Max Kohl A. G. Chemnitz, Germany.

		£ s. d.
51,739.	**Switch** for putting the chronographs in and out of circuit from a distance. **Extra Price**	7. 5. 0
51,740.	Other lengths of seconds from 5 to 100 mm, as desired. **Extra Price £ 1. 10. 0** to	8. 15. 0
51,741.	**Device for two different lengths of seconds** . . . . . **Extra Price**	11. 10. 0
51,742.	— i d e m, for 3 lengths of seconds . . . . . **Extra Price**	14. 5. 0
51,743.	**Reading Machine** (Oppolzer's) for strip chronographs (cf. F i g u r e 51,744), consisting of a system of hairs and levers forming a parallelogram	17. 10. 0
51,744.	— i d e m, with **Seconds** and **Minutes Counter**, F i g u r e	29. 0. 0
51,745.	**Reading Glass** with finely diverging lines, in case	2. 0. 0

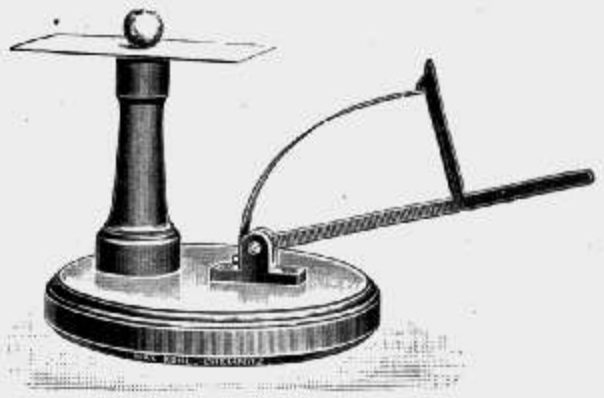
Introduction to Physics.

		£ s. d.
51,746.	**Displacing Cylinder** for determining the Specific Gravity, F i g u r e, with lateral eduction pipe (W. D., Fig. 57 [52])	0. 5. 0
51,747.	**Displacing Vessel** (F. C. G. Müller's) (M. T., Fig. 68)	0. 6. 0
51,748.	**Overflow Vessel** (Grimschl's) for volume determinations	0. 1. 0
51,749.	**Pycnometer**, F i g u r e, with lid ground on, pipette and tripod (W. D., Figs. 58 and 59 [53 and 54]), without measuring glass	0. 3. 0
* 51,750.	**Disc with hole and glass lid**, for showing the divisibility of fuchsin (W. D., Fig. 56 [51])	0. 2. 0
51,751.	**Double Bulb** on stand, F i g u r e, for explaining the expansion of gases by means of red nitrogen peroxide gas (W. D., Fig. 60 [55]), with 2 taps and 1 glass stopper	0. 10. 0
51,752.	— i d e m, without stand	0. 7. 0

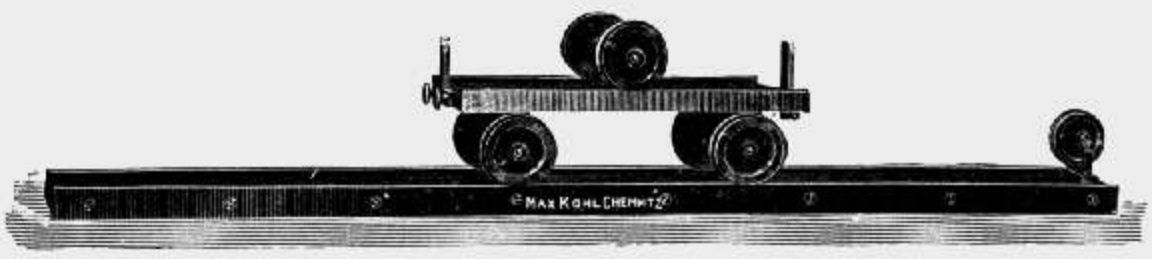
* Can be used with the projection apparatus.



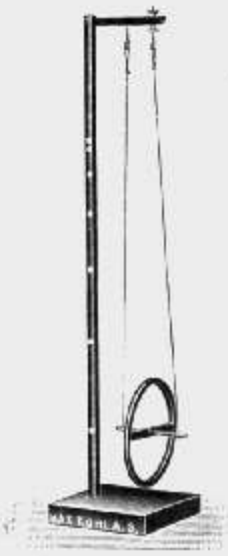
51760. 1 : 6.



51765. 1 : 4.



51761. 1 : 6.



51766. 1 : 10.

Max Kohl A. G. Chemnitz, Germany.

General Mechanics.

(Motion and Forces.)

51,760. **Inertia Top,** Figure (W. D., Figs. 61 and 62 [56 and 57]), of brass with wood stand for releasing . . . . . £ 2. 15. 0

The top runs for $^1/_2$—$^3/_4$ hour in a space filled with air and for 2 hours in vacuo. The steel bearing in which the top turns must be oiled.

51,761. **Carriage with movable rollers** (Schultze's), Figure, for demonstrating inertia (Inertia Apparatus) (Fr. phys. Techn. **I, 1,** Fig. 3170 [I, Fig. 452]), with rail track . 1. 16. 0

51,762. **Mass Apparatus,** for explaining the principles of the conservation of the centre of gravity and of live force 6. 10. 0

A large iron block is fixed to a small carriage, a reciprocal motion being imparted to the block by a flywheel and crank. The carriage is also set in motion, the latter travelling on a rail track in a direction opposite to the direction of motion of the mass.

51,763. **Apparatus for showing the Resistance of a body in repose to the reception of motion** (M. P., I, Fig. 227 [220]), consisting of a lead ball 1 kg weight, with two hooks joined to hemp threads 0. 5. 0

51,764. **Device for proving that an appreciable time is necessary for the change in the condition of motion of a body,** Figure on p. 252, as suggested by Weinhold (W. D., Fig. 63 [58]) 0. 12. 0

51,765. **Device for showing the Inertia of a body in repose,** Figure 0. 16. 0

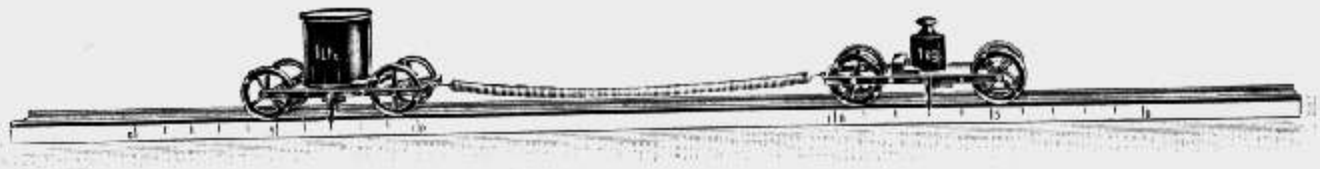
A card is projected away from under a ball by means of a spring, the ball remaining in position.

51,766 **Inertia Pendulum** (Maxwell's), Figure (Ztschr. f. d. phys. u. chem. U., **18,** 1905, p. 148) 0. 18. 0

If the wheel on the suspending threads is rolled in an upward direction and then released, it swings for some time in an up and down direction.

51,767. **Spiral Spring,** width 10 cm, for demonstrating the force-action of a weight (M. T., p. 31) 0. 3. 0

Cl. 450, 452, 451, 5568.



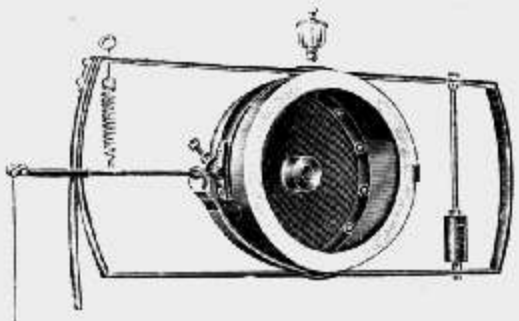
51 768. 1 : 15.



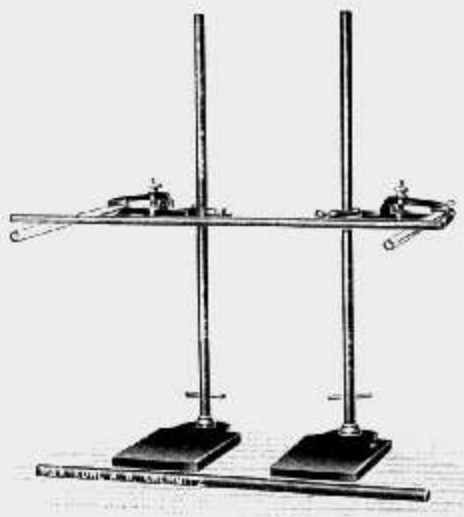
51 769. 1 : 13.



51 771. 1 : 8.



51 776. 1 : 20.



51 764. 1 : 9.

51,768. **Dynamic Balance,** Figure, with graduated rail track, adjustable holding pegs and two carriages connected by spiral springs (M. P. I, Fig. 80) . . . . . £ s. d. 5. 0. 0

51,769. **Work Rail** (Maey's), Figure, with 2 weights (Ztschr. f. d. phys. u. chem. U., **15**, 1902, p. 268; Kleiber, Lehrb. d. Phys., 3rd Edition, 1901, Fig. 38), for determining the energy of motion 2. 10. 0

One of the weights is twice as heavy as the other. If the lighter weight is allowed to fall from double the height that the heavier falls, the slab (pan of a spring balance) on which the weights fall are depressed to an equal extent. During its downward motion the plate describes a mark in front which remains at the lowest position.

51,770. **Pistol for determinations of mass** (Grimsehl's), Figure 51,841, p. 263, with shots and weigh pan, graduated (Ztschr. f. d. phys. u. chem. U., **16**, 1903, p. 136) . . . 1. 18. 0

51,771. **Double Gun** (Grimsehl's), Figure, for kinetic determinations of mass and for ascertaining the relations between force, mass and motion, with 10 shots and 1 cleaner (Ztschr. f. d. phys. u. chem. U., **16**, 1903, p. 138) 1. 2. 0

51,772. **Dynmeter** (F. C. G. Müller's), see **Magnetism Section,** No. 60,133.

Dynamometer (Fischinger's), Figure (Fr. phys. Techn. I, **2**, Fig. 3292—3295 [I, Fig. 457 to 460]). This is a **Rotary Steelyard Dynamometer,** being arranged between the driving machine or shafting and the work machine by a belt drive, so that readings can be taken by a jockey weight after deducting for the tensile force of the belt.

List No.	Size	For Capacities to HP	For r. p. m. to	Tensile Force of Belt kg	Belt Speed m. per Second	Belt Pulley Diam. mm	Belt Pulley Width mm	Belt Thickness mm	Weight of Dynamometer ab. kg	Price £ s. d.
51,773	0	8	1600	30	20	240	55	3	28	**33. 0. 0**
51,774	1	30	960	100	24	480	110	4,5	200	**54. 0. 0**
51,775	2	60	720	200	24	640	230	6	400	**82. 10. 0**

51,776. **Band Brake** (Brauer's), for efficiency measurements, with automatic arrangement for reducing the tension on the band brake when the friction is over great (Fr. phys. Techn. I, **2**, Fig. 3289), Figure . . . . . £ s. d. 9. 0. 0

Cl. 5319, 5593, 4092, 5502, 5576.

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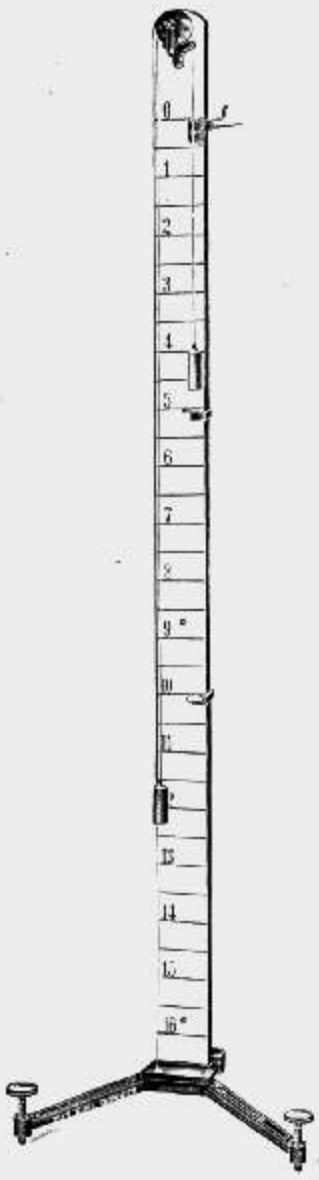
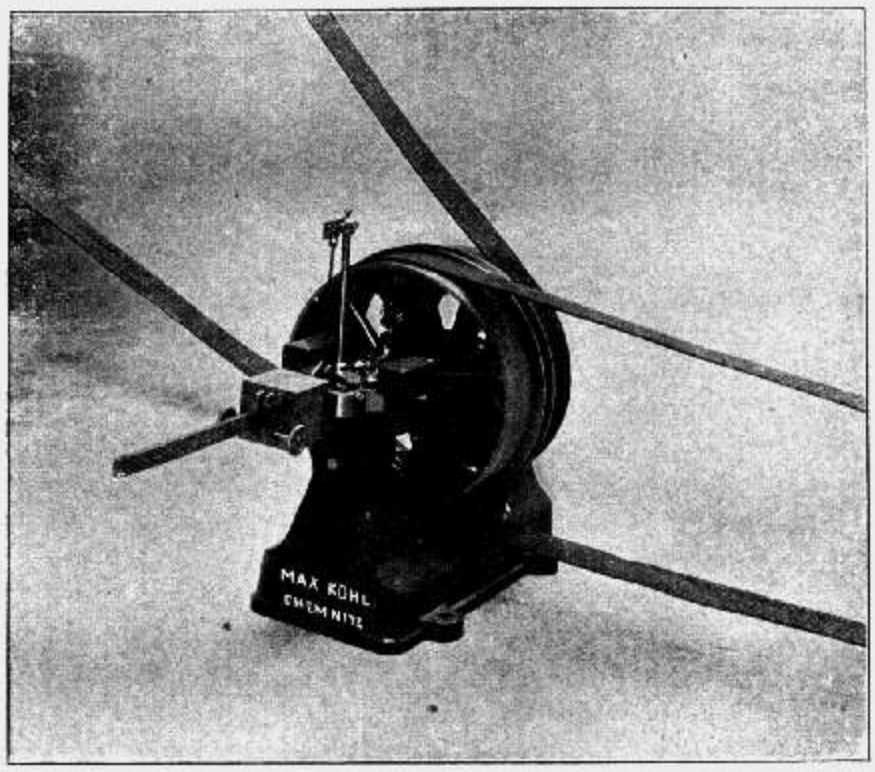
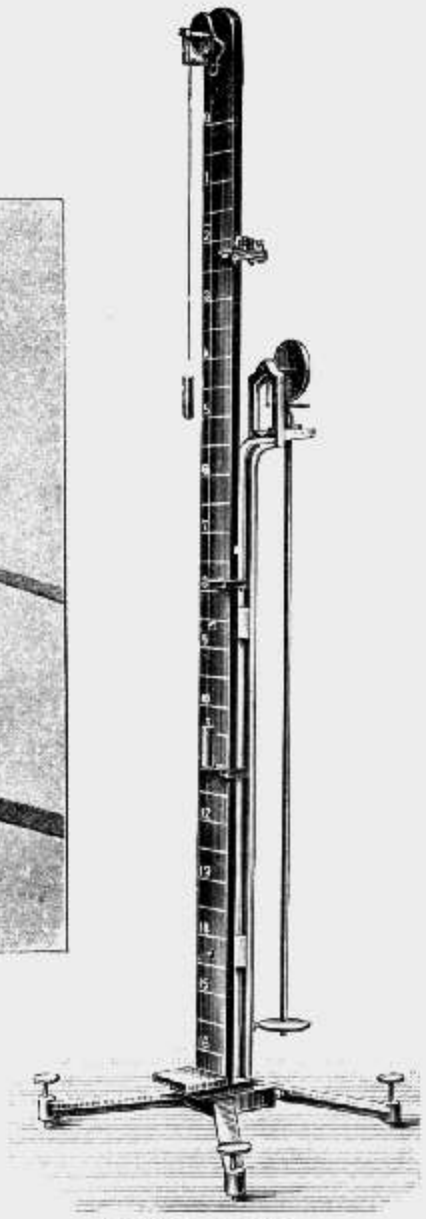


51781. 1 : 15.



51775. 1 : 23.



51782. 1 : 15.

51,777. **2 Fall Cords** (Babinet's) (Bohn, Physikal. Apparate aus d. Schaeffer-Museum, Nr. **25**, p. 19; Kleiber, Lehrb. f. Gymnas., 3rd Edition, Fig. 373) . . . . . £ s. d 0.10.0

Of the two cords one is loaded at a distance of 0, 0.5, 2, 4.5 and 8 m from the end with a wood ball. The cord is suspended in a stepped chamber and allowed to fall. The balls reach the floor simultaneously. The reverse experiment is carried out with the second cord weighted at the same intervals.

51,778. **Fall Pipes** (Newton's), see section dealing with **Air Pumps and Accessories.**

51,779. **Rail Apparatus** (Höfler's), see No. 51,807, p. 258 . . . . . 11. 0. 0

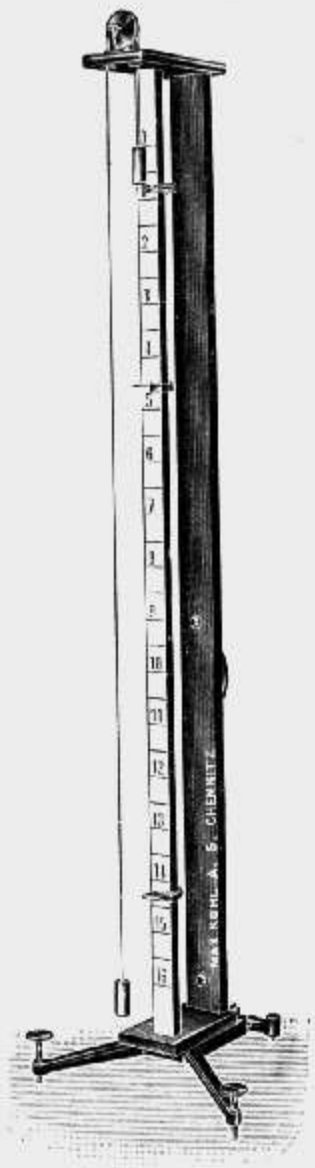
51,780. **Fall Apparatus** (Barrel's) for determining the time of fall of a sphere by allowing a large number of balls to fall immediately after each other (Aldous, Elementary Course of Physics, London, 1900, p. 46, Fig. 22) 4. 0. 0

A ball falling freely actuates the electric releasing device of the next ball at the moment it encounters the end of its path of fall, so that a fresh ball commences to fall as soon as the previous one has traversed the path of fall. The number of balls are calculated which fall from a certain height in a given time, this number being divided into the time: the experiment is then repeated at different heights of fall.

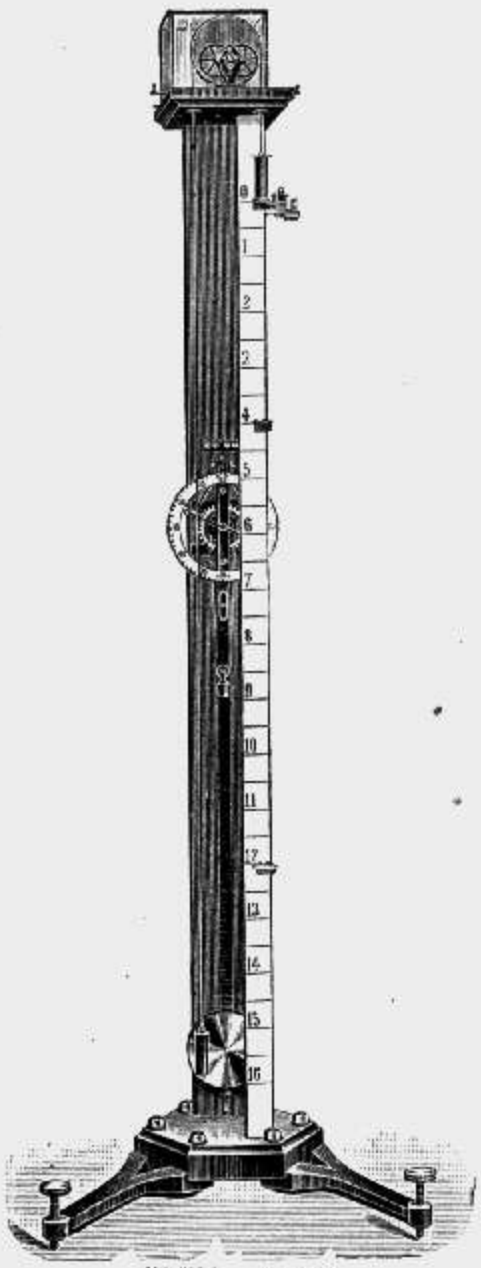
51,781. **Atwood's Fall Machine,** Figure, as suggested by Weinhold (W. D., Fig. 64 [59]), with polished scale board, on firm iron stand with levelling screws, device for releasing the fall weights, catch for the excess weights, and receiving platform: with two fall weights composed of 3 single weights of 70, 98 and 98 grammes; with cord pulley of 50 g moment of inertia; with 4 weights, 3 excess and 3 friction weights. In addition to permitting of the carrying out the demonstration of the laws of fall proper, the machine can be used for all experiments on Force, Mass and Acceleration suggested by Weinhold 3. 0. 0

51,782. — idem, with **seconds pendulum** on the stand, in Cardan's suspension and with audible seconds beat, Figure 4.10. 0

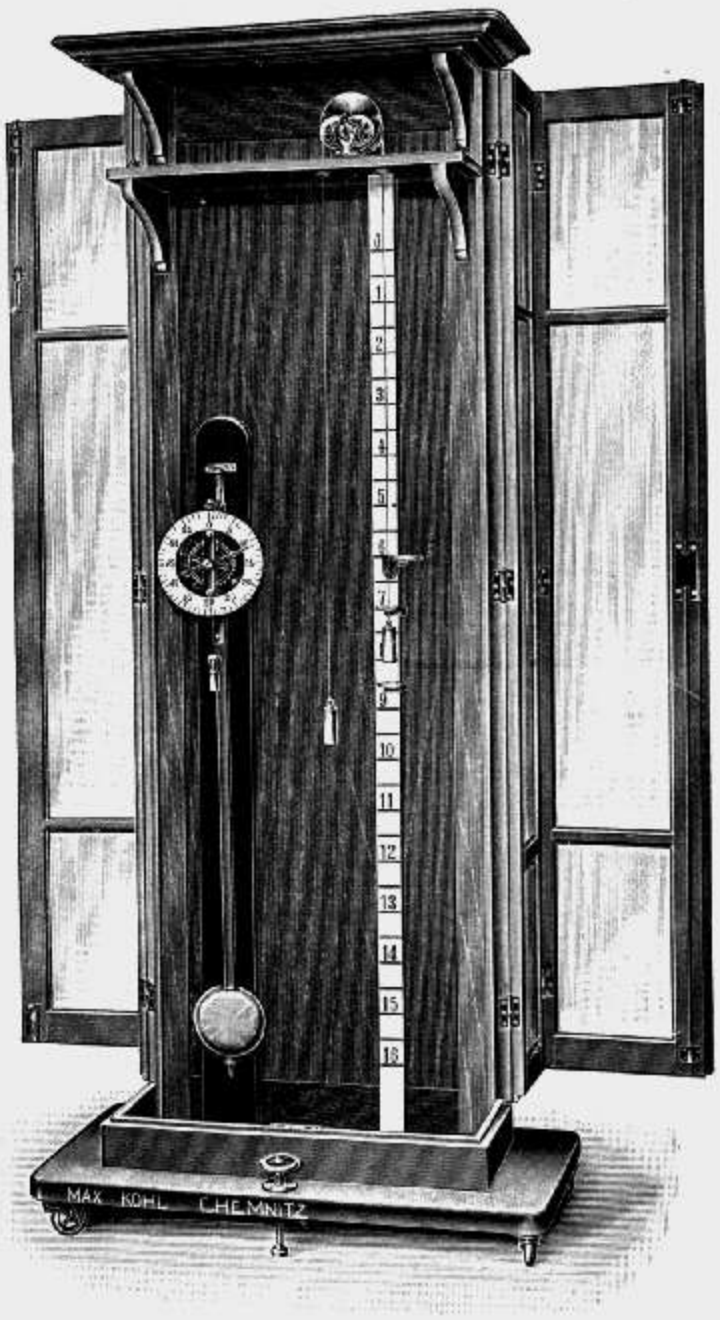
The pendulum is also suitable for explaining the pendulum laws; this remark also applies to the succeeding items.



51 783. 1 : 15.



51 789. 1 : 16.



51 790. 1 : 15.

	£ s. d.
51,783. **Atwood's Fall Machine,** Figure, constructed in the original Atwood form, without pendulum, with polished wood stand; scale divided in 5 cm; total height of machine: 2 m	4.10. 0
51,784. — idem, with a **seconds pendulum** fitted to the stand, in Cardan's suspension and with audible seconds beat	6. 5. 0
51,785. — idem, seconds pendulum with **dial** and projecting pointer, audible beat	9.10. 0
51,786. — idem, with **friction rollers,** without pendulum	10.10. 0
51,787. — idem, with **friction rollers and seconds pendulum** (with audible beat), in Cardan's suspension (Gan.-Man. Figs. 38—45; Gan.-Rein. Fig. 61)	12. 5. 0
51,788. **Electromagnetic Release for the Falling Weights,** Figure, suitable for all preceding machines, very practical . . . . . When this electromagnetic release is fitted the hand release given with the fall machines can be dispensed with. The price of the electromagnetic release is reduced in this case by **8 s.** to **16 s.**	1. 4. 0
51,789. **Large Atwood Fall Machine,** Figure, with polished wood base on massive iron stand fitted with levelling screws, rule of maple wood divided every 5 cm. Total height of machine: 2 m. With friction rollers, seconds pendulum with audible beat, dial and projecting pointer; also with electromagnetic release, with key and 3 flexible leads;	

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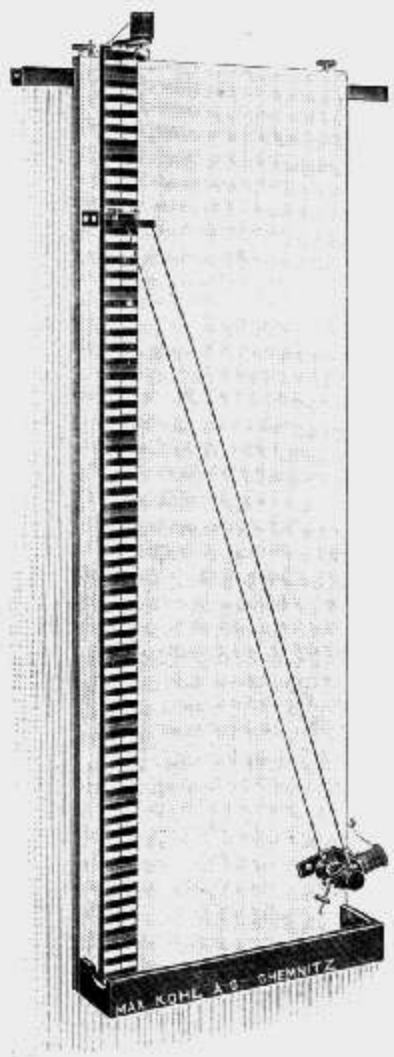
51788. 1 : 3.

51791 and 51726. 1 : 15.



51792. 1 : 12.

cord roller of aluminium 100 g in weight, 2 dropping weights of 70 g, to which two weights each of 98 g can be screwed, 4 weights and 3 excess weights . . . . . £ s. d. 16. 10. 0

The machine is constructed with the very greatest care, and in addition to permitting of the demonstration of the laws of fall proper allows of all the experiments suggested by Weinhold on force, mass and acceleration (W. D., pp. 74 and 75 [68 and 69]), without the use of friction weights.

51,790. **Fall Machine mounted in glazed Cupboard,** Figure, travelling on rubber rollers, otherwise as No. 51,789. **Own new type** 22. 10. 0

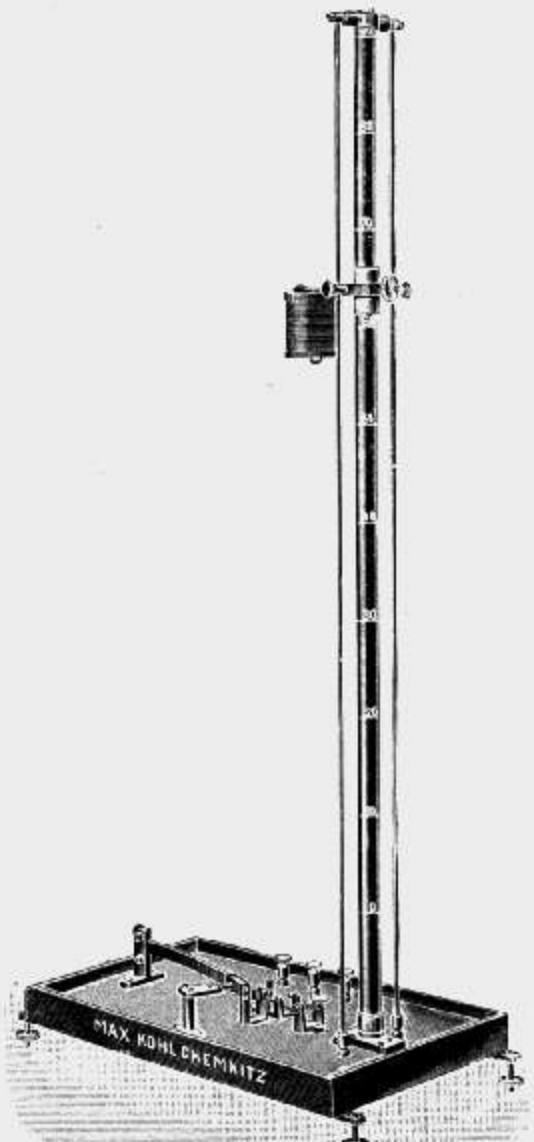
This arrangement does away with the troublesome necessity of placing the machine in the museum cupboard; the machine is always ready for use and easily accessible when the cupboard is opened.

51,791. **Atwood's Fall Machine,** Figure, with levelling screws, on iron wall bracket. The fall posts are easily detachable. Without table, metronome or cell 12. 0. 0

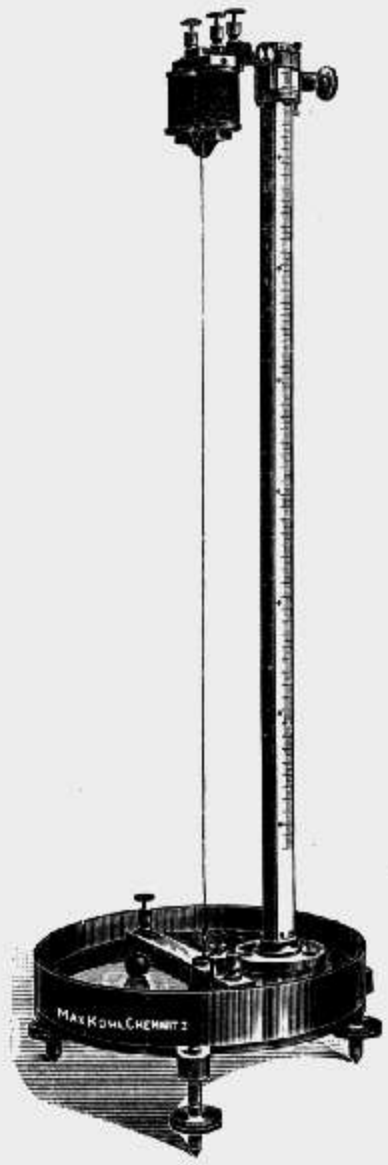
The roller, 100 g in weight, is of aluminium, is most accurately balanced, and runs on friction rollers. The following belong to the apparatus: the two dropping weights of 70 g on to which two 98 g weights can be screwed; also 4 weights and 3 over weights, and electric release. The latter can be operated by means of an electric metronome (see No. 51,726) or a Morse key.

51,792. **Fall Apparatus and Seconds Pendulum,** with simultaneous electric release (as suggested by Edelmann), Figure (Physikal. Ztschr., 1903, p. 413) 2. 15. 0

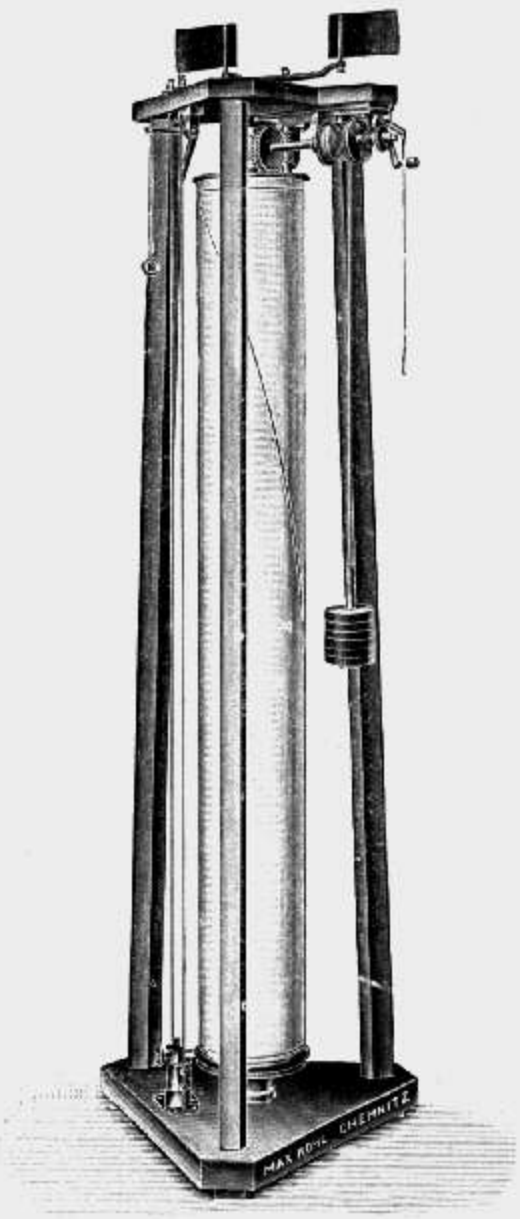
The falling ball and the body of the pendulum are held fast by an electric magnet, being released simultaneously when the circuit is opened. The ball falls exactly on the pendulum body.



51 793. 1 : 13.



51 794. 1 : 7.



51 796. 1 : 16.

51,793. **Fall Apparatus** (Kottenbach's), Figure (Ztschr. f. d. phys. u. chem. U., **18.** 1905, p. 79) . . . . . £ 5. 10. 0

The time of vibration of a slowly vibrating plate spring serves as a measure for the time of fall of an iron ball. In its passage through the position of rest the spring itself releases the ball by means of the electromagnetic release, and at certain heights of fall the ball encounters the spring again in passing through the state of rest, this being annunciated by an electric or mechanical signal.

When ordering kindly state whether **Electric** or **Mechanical Signalling** is desired.

51,794. **Fall Apparatus for Free Fall** (Edelmann's), for use with the v. Beetz Tuning Fork Chronograph, Figure, without Tuning Fork Chronograph (No. 51,730) 6. 5. 0

At the commencement and end of fall a freely falling ball opens two currents divided by an induction apparatus. The induction sparks determine the time-measuring tuning fork curves. Height of fall of ball adjustable from 1—60 cm.

51,795. **Tuning Fork Chronograph** (v. Beetz's), see Fig. 51,730 . . . . . 7. 10. 0

51,796. **Fall Machine** (Morin's), Figure, perfectly constructed, for indicating the parabola of fall, for ascertaining the acceleration and testing the law of velocities (Chwolson, Lehrb. **I**, Fig. 211; Fr. phys. Techn. 1, **2**, Fig. 2234; Gan.-Man. Fig. 33) 18. 0. 0

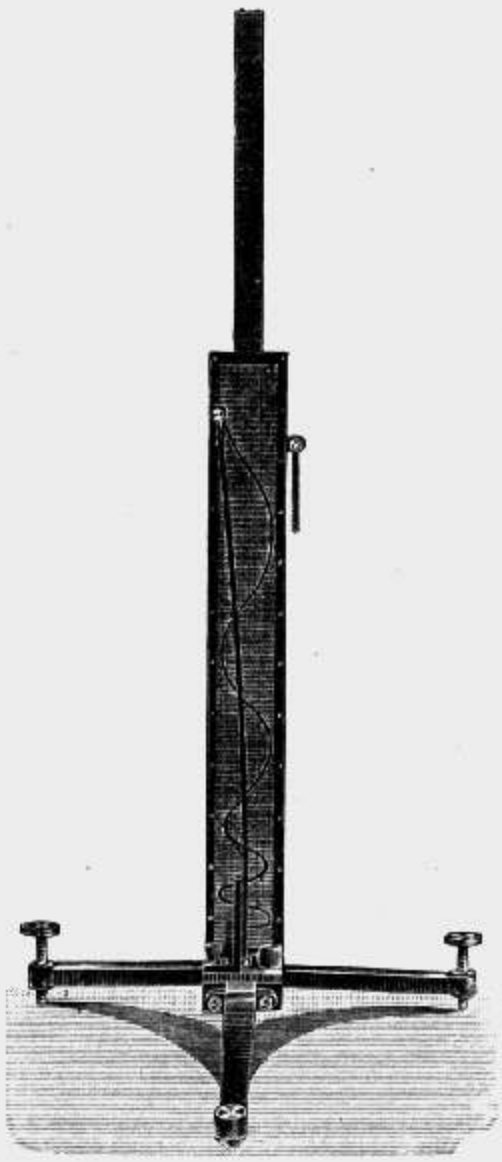
51,797. **Fall Machine** (F. C. G. Müller's) (M. T., Fig. 36), with electromagnetically driven tuning fork, for recording the vibration curve on a blackened glass disc. The tuning fork can also be used by itself 4. 0. 0

51,798. **Fall Machine for Free Fall (Pesograph, Lapsometer)**, Figure (M. P. I, Fig. 83 [81]; Frick phys. Techn. I, **2**, Fig. 3456 [1, Fig. 500]) 13. 0. 0

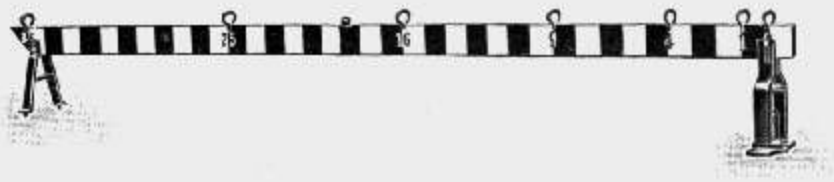
An oscillating pen records the vibration curve on a falling plate covered with paper.

Cl. 3294, 463, 3929.

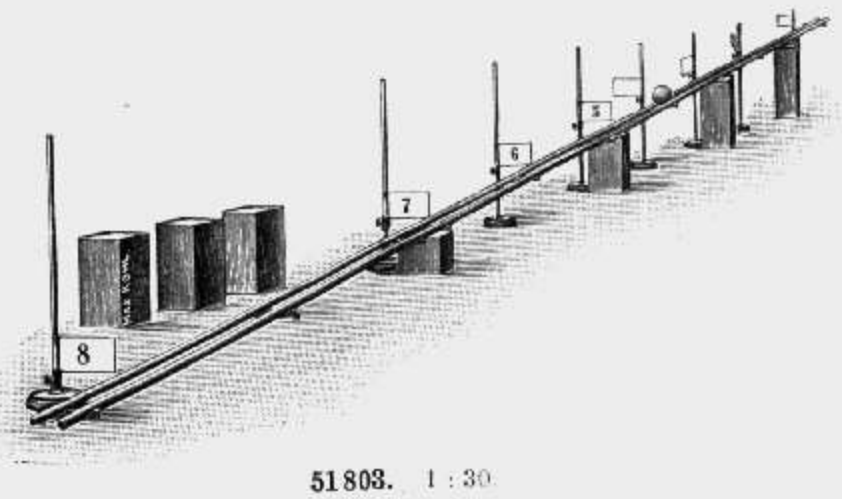
Max Kohl A. G. Chemnitz, Germany.



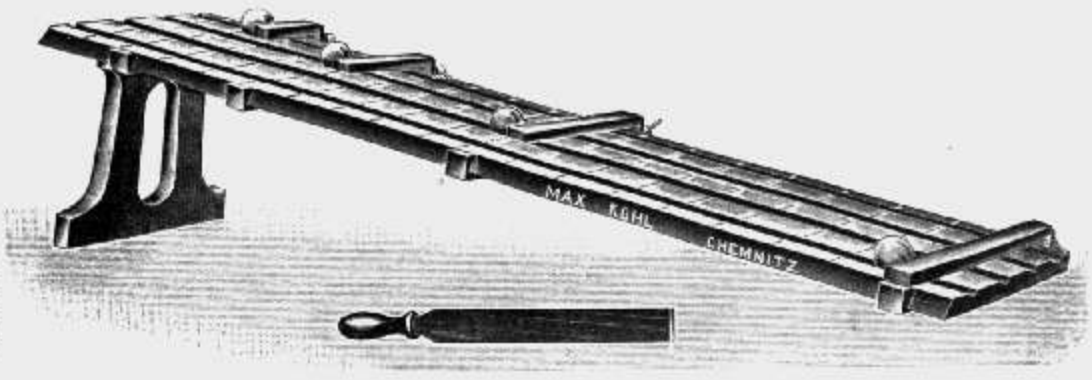
51798. 1 : 8.



51802. 1 : 21.



51803. 1 : 30



51804. 1 : 17.

51,799. **Acceleration Apparatus** (Rendtorff's), combined with an Atwood **Fall Machine** (School Science and Mathematics, Vol. VIII, No. 3, March 1908, p. 228) . . . . . £ 9. 0.0

A falling tuning fork (indicating) records its vibrations on a sooted glass plate. The glass plate is capable of lateral motion so that a number of curves can be described on it in succession. The apparatus is supplied with the accessories which are necessary when it is used as a fall machine.

51,800. **Tension and Acceleration Meter** (Hrabowsky's) (Ztschr. f. d. phys. u. chem. U., **9**, 1896, p. 24; Fr. phys. Techn. **I, 2**, Figs. 3165 and 3166), for graphically demonstrating accelerated motion, for demonstrating the laws of fall, accelerated motion on a horizontal path, equable motion, final velocity, and retarded motion 5.10.0

51,801. **Poggendorff's Balance (Fall Machine)** for determining the force necessary for accelerating a body (Fr. phys. Techn. **I, 2**, Fig. 3275) 1.10.0

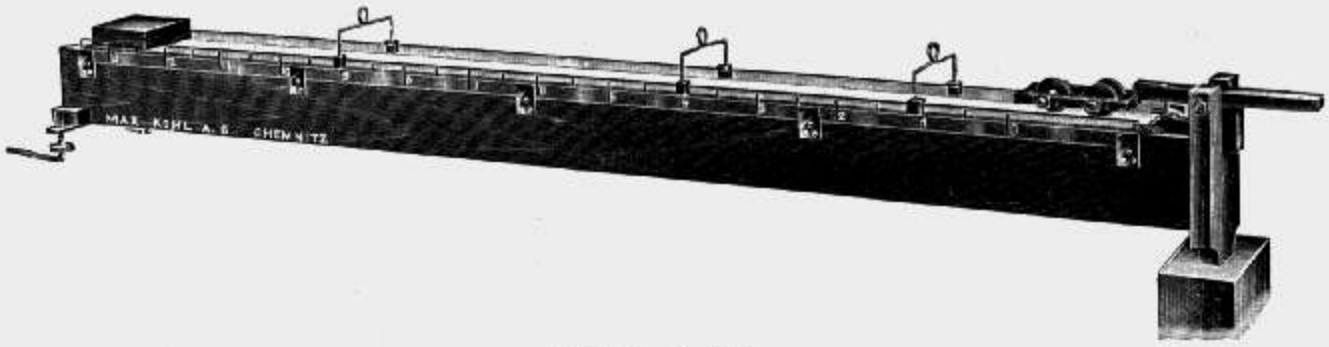
51,802. **Galilei's Inclined Plane** for the descent of bodies (as suggested by Bertram), Figure, 1.90 m long (Fr. phys. Techn. **I, 2**, Fig. 2235, 2236), with variable angle of inclination 1. 8.0

51,803. **Inclined Plane** (W. König's), Figure (Ztschr. f. d. phys. u. chem. U., **7**, 1893/94, p. 4), with 45 mm diameter lignum vitae ball 3. 0.0

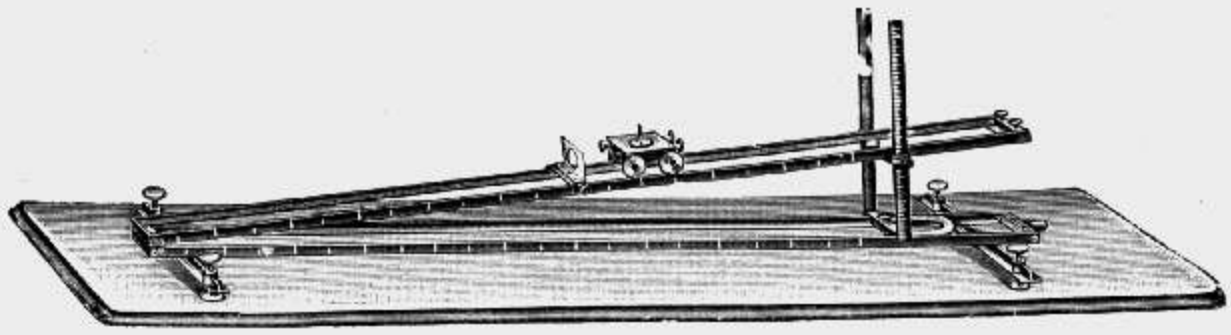
The inclined plane comprises 4 pieces each 1 m long, which can be inserted one in the other, and 1 piece 0.5 m long. A number of wood blocks, supplied with the apparatus, serve to give the plane different inclinations or to set it up "broken", i. e., with the lower part horizontal. Rotary flags on small stands render the passage of the ball through certain points visible at a distance.

51,804. **Quadruple Inclined Plane** (Mach's), Figure, for allowing 4 balls to fall simultaneously (Meyer, Naturlehre, Fig. 107, 4th Edn.) 2.15.0

Four sliding fillets are supplied with the apparatus so that each ball can be stopped at any desired point.



51 805. 1 : 10.



51 807. 1 : 13.

	£ s. d.
51,805. **Inclined Plane** for the descent of bodies (Friedr. C. G. Müller's), Figure, with track of plate glass, 1 ivory ball and 1 small balance (M. T., Figs. 16 a and 35, and p. 60)	4. 0.0
51,807. **Rail Apparatus (Inclined Plane)**, Hoefler's, Figure, for demonstrating the laws of gravitation of the inclined plane; the principle of Inertia, Independence, Reaction, the Sine Oscillations, etc. (Ztschr. f. d. phys. u. chem. U., **7**, 1894, p. 276; Hoefler, Physik, Figs. 1, 6, 36—38 and 52; Fr. phys. Techn. **II, 1**, Figs. 2194, 3104 a, 3167), with 1 small carriage, 1 spring balance of 20 g mass, 1 long carriage, 1 small table and 1 cord guide with pulley	11. 0.0
51,808. **Carriage with Spring Dynamometer** for above, for measuring the friction (Hoefler-Poske, Fig. 25)	0.15.0
51,809. **Apparatus for demonstrating the Fall of a Body through the chord.** Figure, with simultaneous mechanical release for the balls	2. 0.0
51,810. — idem, simple, and without mechanical release (M. P., Fig. 118 [117])	1. 0.0
51,811. **Galilean Escapement Pendulum,** for showing that the final velocity of a falling body is only dependent on the height through which it falls (W. D., Fig. 72 [65]) (fall on curved path) and for confirming the law of Energy (M. T., Fig. 45), see Fig. 52,123 . . .	0.14.0
51,812. **Centrifugal Pendulum,** for proving the energy of motion (Fr. phys. Techn. **I, 2**, Fig. 3174)	1. 4.0
51,813. **Apparatus for the Parallelogram of Path and the Composition of Impact Forces,** Figure, with 2 hammers and 1 glass ball (W. D., Fig. 65 [60]); M. P. **I**, Fig. 98; Fr. phys. Techn. **II, 1**, Fig. 3305)	0.15.0
51,814. **Apparatus for showing the resultant of 2 Directions,** Figure, with 2 spring pistols which can be shot off separately or together. The board is covered with green cloth, being surrounded by a tall beading; with ivory ball	3. 0.0
51,815. **Slab for the Parallelogram of Motions and the projectile path** (Penseler's), Figure	4.10.0
A piece of chalk, carried along in a perpendicular rail, and to which a regular upward motion is given or a downward motion influenced by the acceleration of descent, is simultaneously given a lateral motion by hand, the resultant appearing as a chalk line.	
51,816. **Grimsehl's Apparatus for the Composition of uniform and non-uniform Motions** (Ztschr. f. d. phys. u. chem. U., **17**, 1904, p. 257)	1.15.0
Graduated glass slabs can be slid along a board which is placed in a sloping position. If a glass slab and recording pencil are moved along a definite length in one direction and the pencil is then moved along a divided edge of the glass slab in another direction, the point determined by the parallelogram of forces is reached.	

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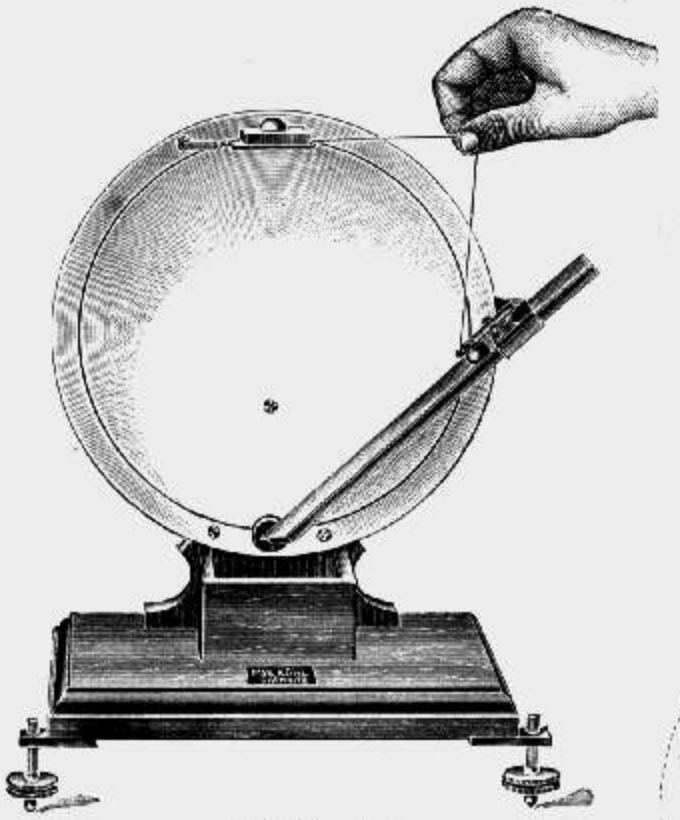
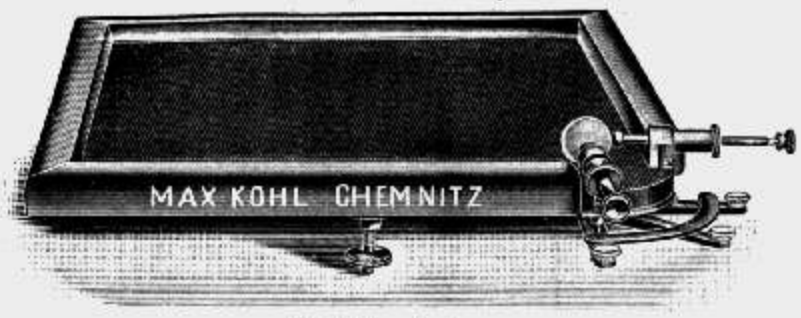
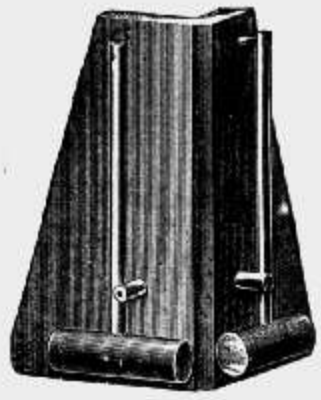


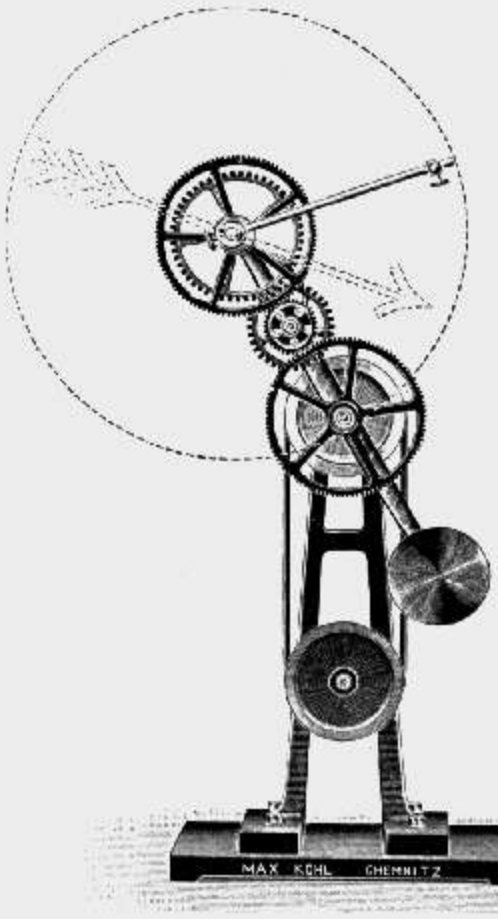
51 809. 1 : 6.



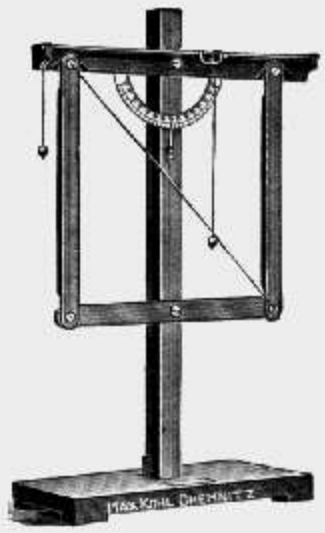
51 814. 1 : 5.



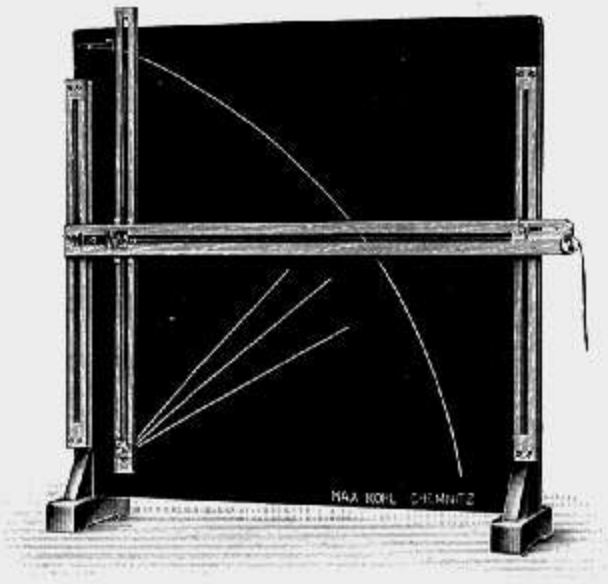
51 813. 1 : 6.



51 817. 1 : 7.



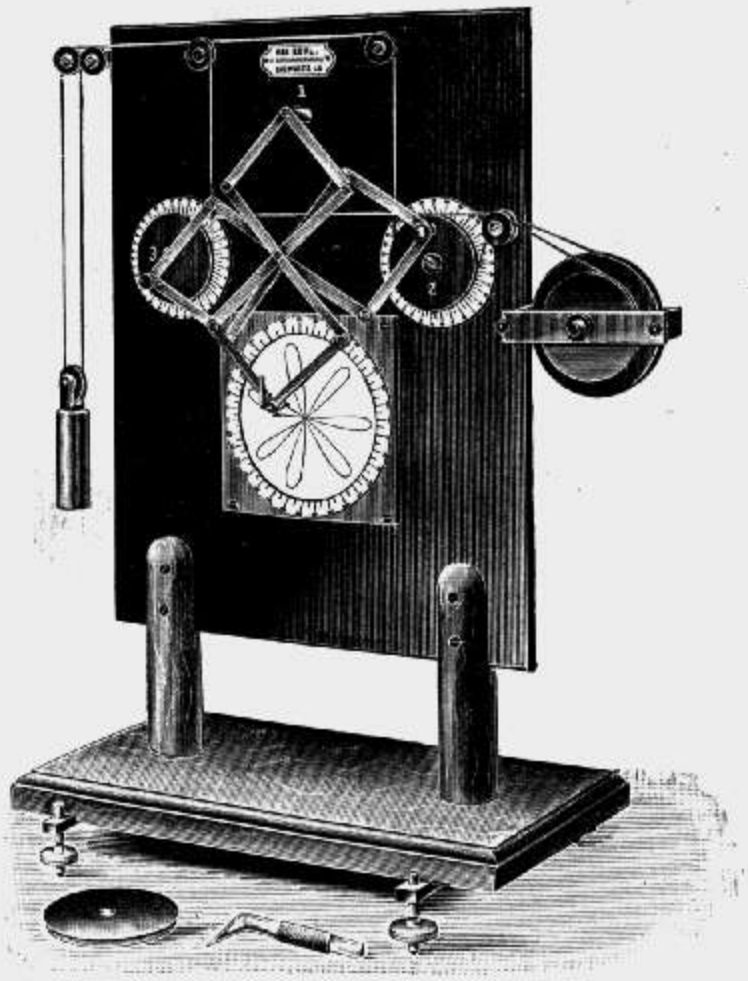
51 821. 1 : 10.



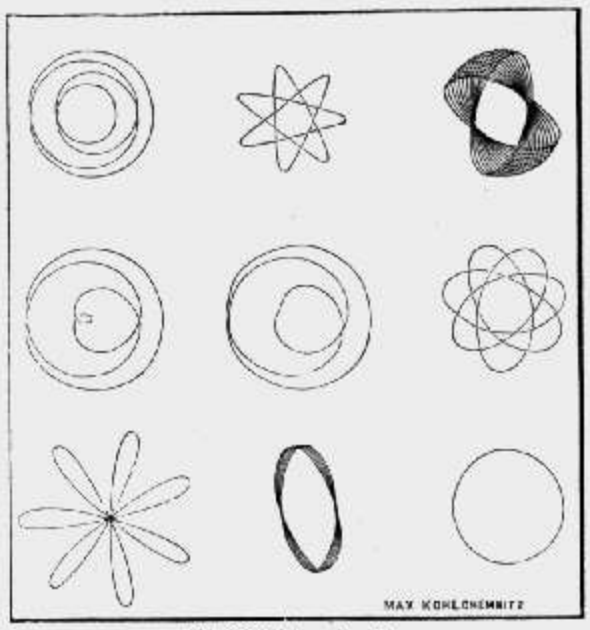
51 815. 1 : 18.

	£ s. d.
51,817. **Apparatus for demonstrating the Composition of two Rotations** (Biernacki's), Figure (Ztschr. f. d. phys. u. chem. U., **19**, 1906, p. 80), large pattern, suitable for explaining Fresnel's explanation of the rotation of the polarisation-plane of light	5. 0.0
51,818. — idem, but smaller	3.10.0
51,819. **Kinegraph** (Engelmeyer's), for recording compound motions, their components and resultants (Ztschr. f. d. phys. u. chem. U., **9**, 1896, p. 134; Fr. phys. Techn. **I, 2**, Fig. 3176)	3. 0.0
51,820. **Hartl's Apparatus for recording the Parallelograms of Motion** (Ztschr. f. d. phys. u. chem. U., **17**, 1904, p. 226; Fr. phys. Techn. **I, 2**, Fig. 3177)	1. 5.0
51,821. **Apparatus for explaining Compound Motions,** Figure (Fr. phys. Techn. **I, 2**, Fig. 2210), with movable stand, so that the diagonals may be set at various lengths, and with graduated arc	2. 5.0

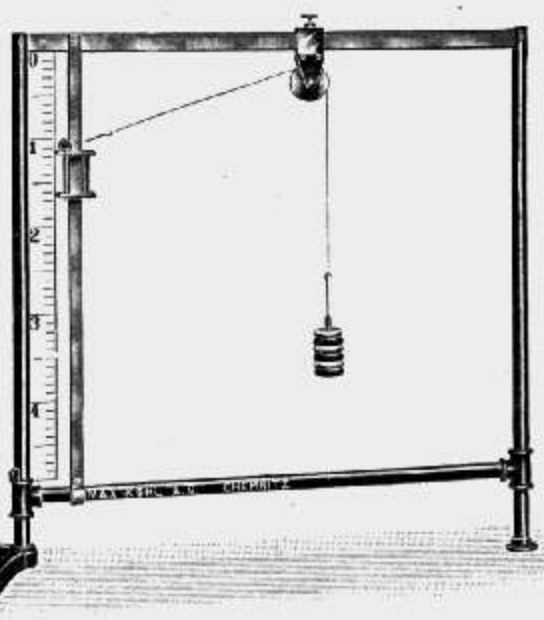
The wing mechanism of theatre stages can be explained with this apparatus.



51 822 A. 1 : 6.



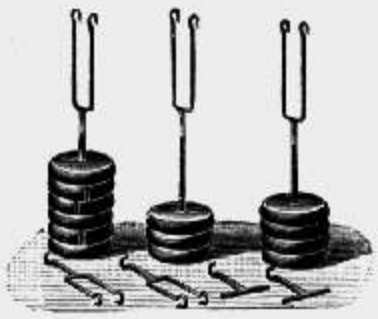
51 822 B. 1 : 6.



51 823. 1 : 10.



51 824 b. 1 : 4.



51 824 c. 1 : 4.

51,822. **Circular Motion Diagraph** (Salcher's), Figs. **A** and **B** (Ztschr. f. d. phys. u. chem. U., **17**, p. 72), for the composition of two uniform circular motions . . . . . £ 10. 0. 0

Fig. B shows some of the curves resulting from the use of the apparatus.

51,823. **Apparatus for demonstrating the Projection Theory (Cosine Theory) of Mechanics** (Grimsehl's), Figure (Ztschr. f. d. phys. u. chem. U., **17**, 1904, p. 262; Höfler-Poske, Oberstufe, Fig. 21) 2. 0. 0

51,824. **Apparatus for the Parallelogram of Forces and the Pendulum Laws** (Weinhold's) (W. D., Figs. 69 A, B, C and 93 [62 A, B, C and 86]) 2. 5. 0

Single prices:

51,824 a. **Oak Stand** (W. D., Fig. 69 B [62 B]), with hooks for pendulums 0. 12. 0

51,824 b. **2 Rollers** on cramps (W. D., Fig. 69 A [62 A]), Figure 0. 15. 0

51,824 c. **13 Double-hook Weights** (W. D., Fig. 69 C [62 C]), each 50 g in weight, with 2 cords, each with 1 T-hook and 1 double hook, Figure 0. 15. 0

51,824 d. **3 Brass Balls and 1 Wood Ball** on double cords (W. D., Fig. 93 [86]), for explaining the laws of the pendulum 0. 3. 0

51,825. **Parallelograms** for above, of pasteboard, graduated (W. D., p. 83 [75]) . . . . . Each 0. 0. 7

51,826. **Aluminium Ring** and **3 Silk Threads** with hooks for Varignon's experiment on the parallelogram of forces (M. T., Figs. 9—12) 0. 1. 0

51,827. **Wood Rod,** Figure, for the parallelogram of forces (M. T., Fig. 11; Ztschr. f. d. phys. u. chem. U., **15**, 1902, p. 9) 0. 0. 10

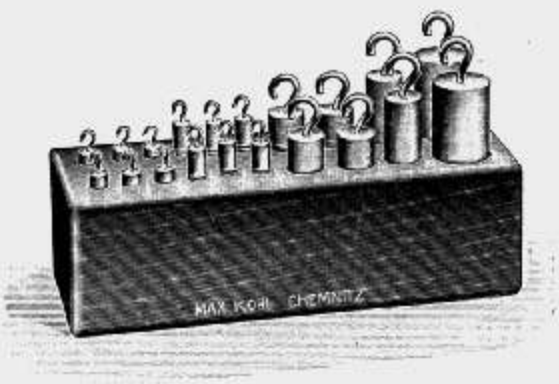
Cl. 475, 476, 477, 478, 5411.

Max Kohl A. G. Chemnitz, Germany.

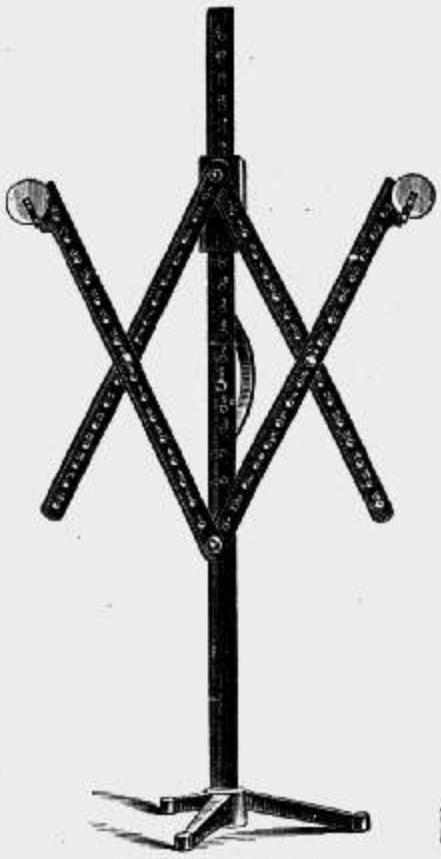
Max Kohl A. G. Chemnitz. Germany.



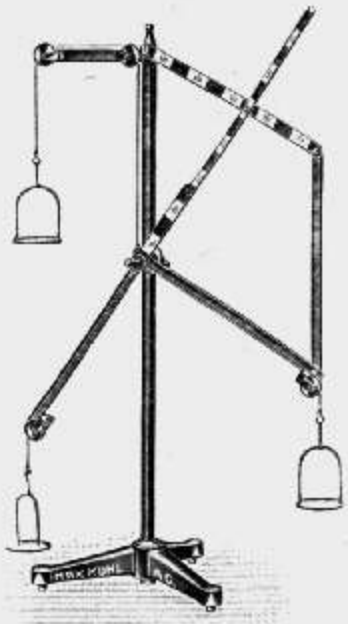
51 827. 1 : 6.



51 828. 1 : 5.



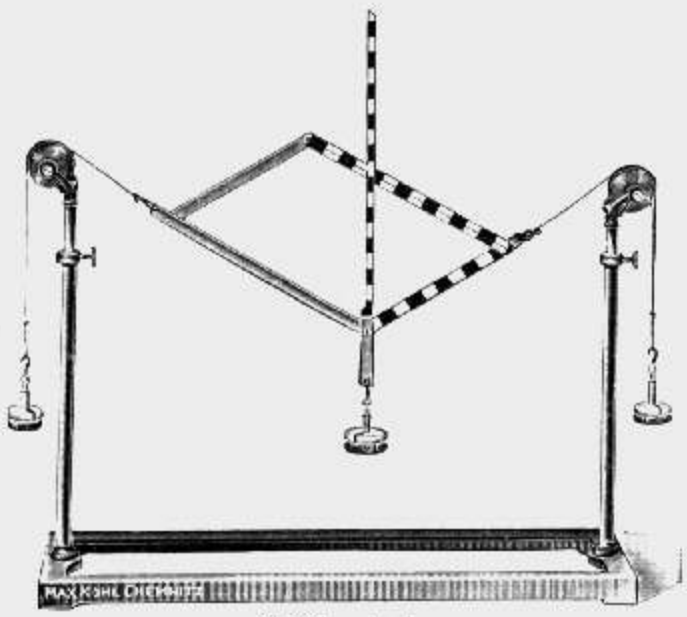
51 829. 1 : 10.



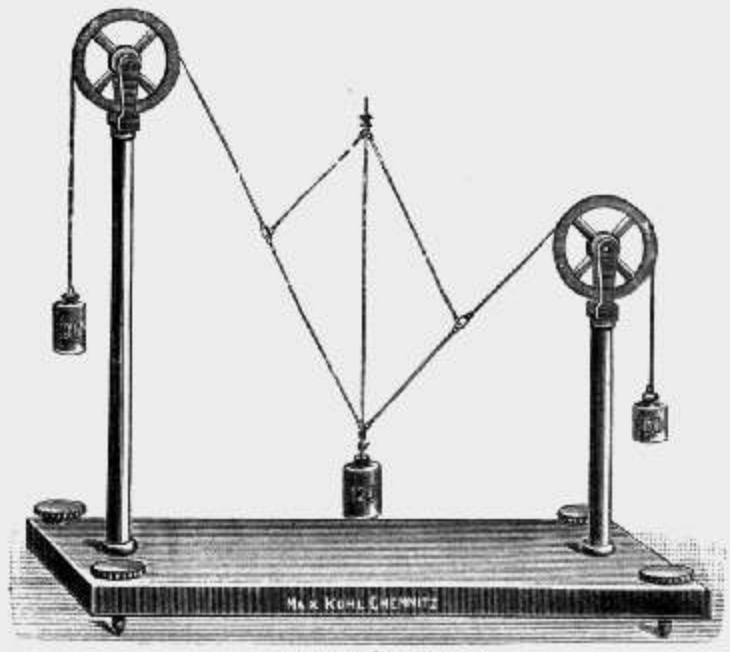
51 830. 1 : 10.



51 832 B. 1 : 9.



51 831. 1 : 5.



51 832 A. 1 : 10.

51,828. **1 Set Hooked Weights,** Figure (as suggested by Friedr. C. G. Müller) (M. T., p. 30), 6 of 10 g each, 6 of 20 g, 4 of 100 g, 2 of 200 g and 2 of 500 g . . . . . £ 1. 8.0

51,829. **Parallelogram** of **Forces Apparatus** (Frick's) (Fr. phys. Techn. **I, 2**, Fig. 2152 [**I**, Fig. 107]), without weights 1.12.0

(For weights, see 51,824 c.)

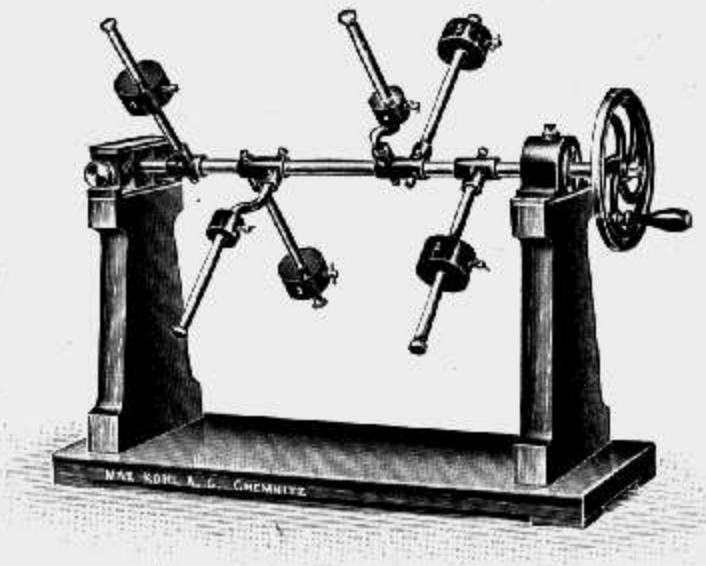
51,830. — idem (Bertram's), Figure, entirely of metal (Fr. phys. Techn. **I, 2**, Fig. 2154 [**I**, Fig. 114]), without weights 2. 0.0

51,831. — idem, constructed entirely of metal, in the form shown in Fig. 51,831 . . . 2.15.0

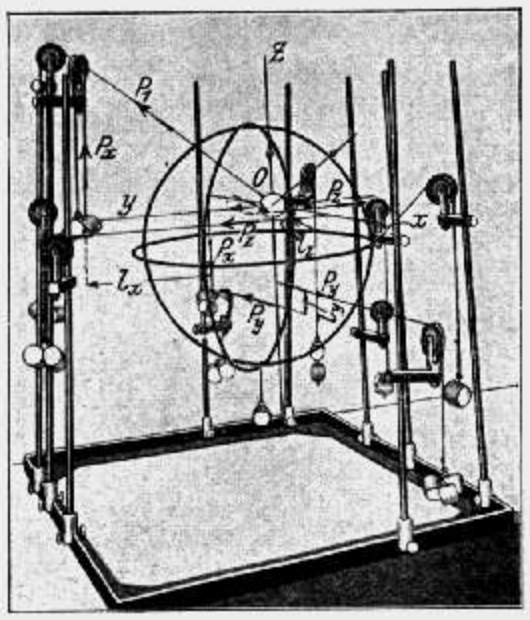
If suitable weights be suspended from the ends of the cords of the apparatus, the parallelogram assumes such form that its sides and diagonals are proportional to the suspended weights.

51,832. **Parallelogram of Forces Apparatus** (S'Gravesande's), Fig. A, with a number of metal bars of various lengths, for obtaining parallelograms of different sizes, with 18 weights, Fig. B, suitable for the apparatus, in one wood block (Fr. phys. Techn. **I**, 2, Fig. 2150) 4.16.0

Cl. 4518, 6023
4975, 479, 483,
3297, 482.



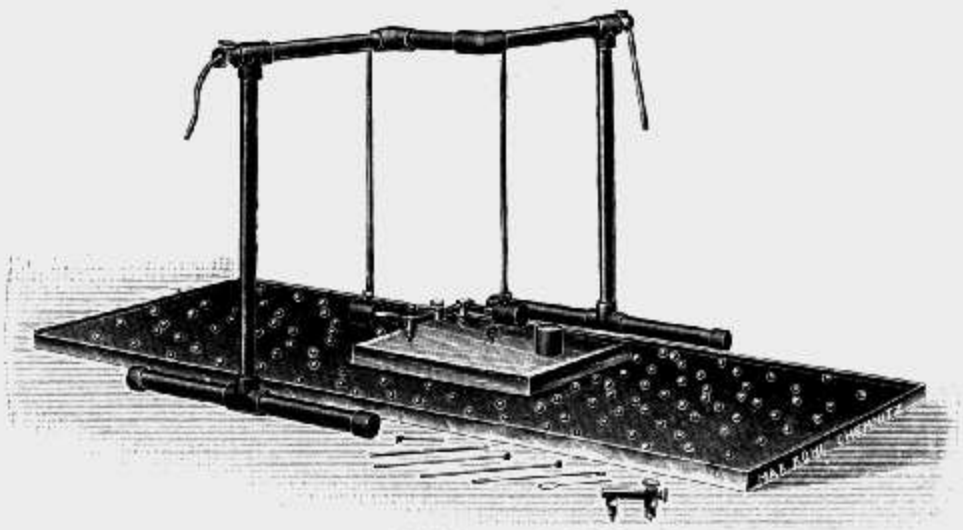
51 834. 1 : 12.



51 833. 1 : 16.



51 832 a. 1 : 11.



51 835. 1 : 12.

	£ s. d.
51,832 a. **Force Table** (Millikan's), with 3 spring balances, Figure	2. 0.0
51,833. **Model (No. 1) for combining forces in space,** as suggested by Prof. E. Meyer, Figure (Z. d. V. d. I., **53**, 1909, pp. 1301 and seq., No. 1, and text-sheet 13, Figs. 1—3) .	8. 0.0
51,834. **Model (No. 21)** for the equalisation of rotating Masses, Figure (Prof. E. Meyer's) (Z. d. V. d. I., **53**, 1909, pp. 1301 et seq., No. 21, and text-sheet 16, Figs. 56 and 57), for demonstrating the equalisation of locomotive driving axles and the discovery of errors in steam turbines and turbo-generators	10. 0.0
51,835. **Cannon (Grimsehl's)**, Figure, for demonstrating the action of a couple on a freely movable body (Ztschr. f. d. phys. u. chem. U., **17**, 1904, pp. 21 et seq.), with plate glass base, clothcovered; 2 cannons, 2 shots, stand, steel balls, etc.	5.10.0
The action of the couple of forces is demonstrated by the recoil which the centre of gravity of the system of masses undergoes when the double cannon is fired off, the masses being formed by the cannon, a board and a counterpoise. This board rests on steel balls and can be moved in any direction horizontally. Instead of using the double cannon, the single cannon No. 51,837 can be set up on the board for the experiment with single forces.	
51,836. **Couple of Forces Water Wheel** (Grimsehl's) (Ztschr. f. d. phys. u. chem. U., **17**, 1904, p. 322), for demonstrating the independence of the action of one or more couples on their position relative to the axis of rotation of the body, and for comparing the action of various large couples	3. 0.0
51,837. **Reaction Cannon** (Grimsehl's), for demonstrating the action of individual forces on a movable body (Ztschr. f. d. phys. u. chem. U., **17**, 1904, p. 327); to be used in conjunction with the accessories to No. 51,835	0. 5.0
51,838. **Projectile Apparatus** (Löwy's) (W. D., Fig. 66 [61]), Figure	0.17.0
The apparatus is employed for proving that a body thrown in a horizontal line is simultaneous with the fall of one falling freely.	

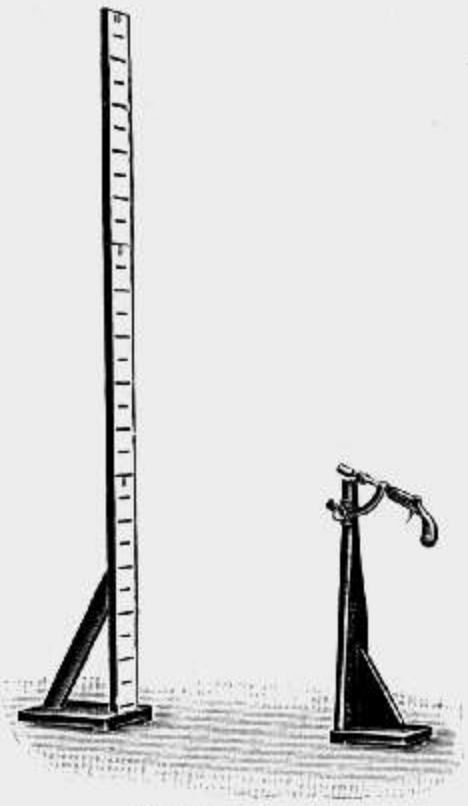
Cl. 5545, 5631, 5582, 4112.

Max Kohl A. G. Chemnitz, Germany.

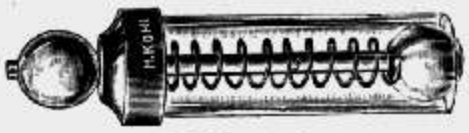
Max Kohl A. G. Chemnitz, Germany.



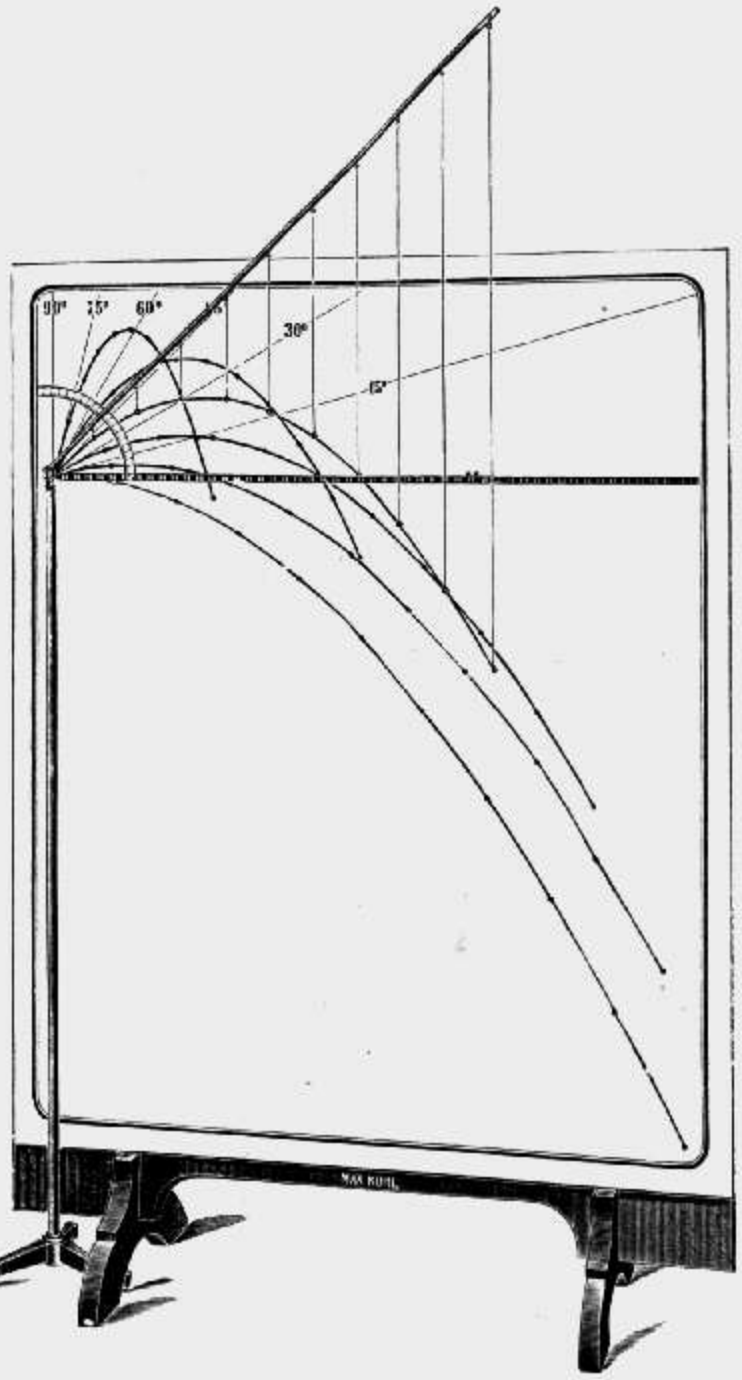
51 836. 1 : 10.



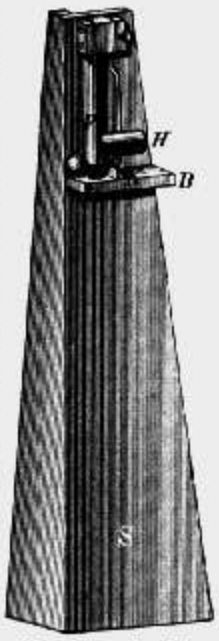
51 841. 1 : 20.



51 840. 1 : 2.



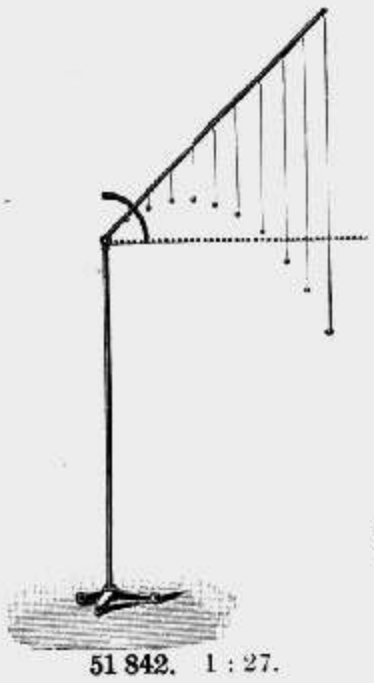
51 843. 1 : 14.



51 838. 1 : 10.



51 839. 1 : 5.



51 842. 1 : 27.

51,839. **Projectile Apparatus** (Hartl's), with spring, for fixing to the wall, Figure (Ztschr. f. d. phys. u. chem. U., **2**, 1888/89, p. 81) . . . . . £ s. d. 0.18.0

51,840. **Fall Pistol (Projectile Pistol)**, Hartl's, Figure, for holding in the hand (Ztschr. f. d. phys. u. chem. U., **7**, 1893/94, p. 246; Fr. phys. Techn. **I**, **2**, Figs. 3173 and 3180; M. T., p. 63) 0. 6.0

51,841. **Pistol, Target and Stand, with Rubber Ball,** as suggested by Grimsehl, Figure, for studying the trajectory (Ztschr. f. d. phys. u. chem. U., **17**, 1904, p. 265) 2. 5.0

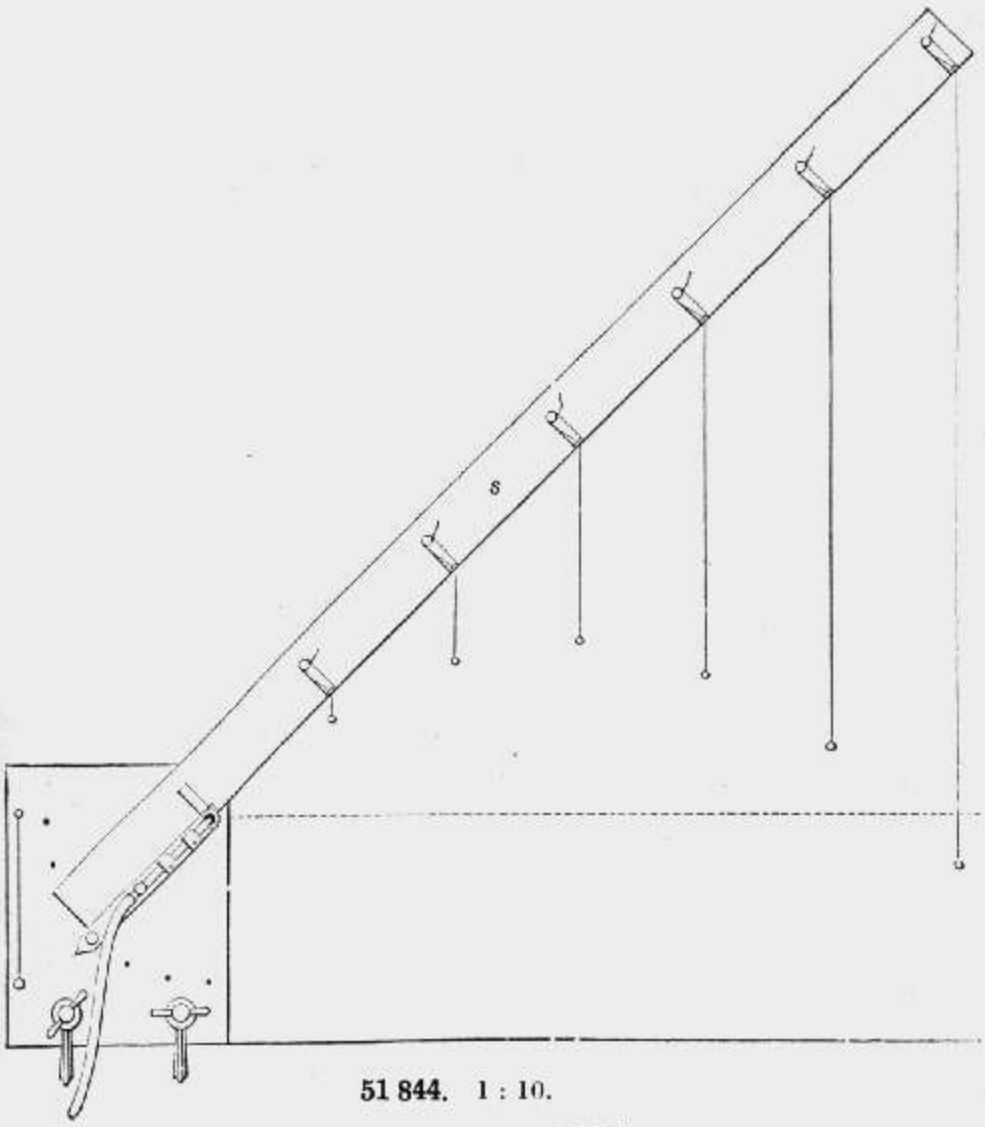
As to the employment of the pistol for determinations of mass, see No. 51,770, p. 252.

51,842. **Apparatus** (Hagenbach's), Figure, for explaining the influence of the angle of elevation on the horizontal range (W. D., p. 80 [72]) 1.10.0

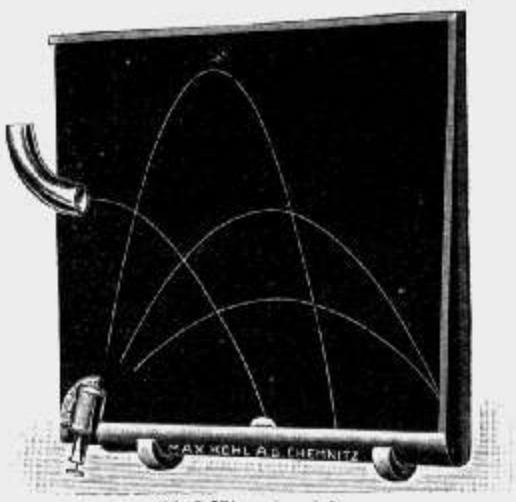
The curves of the projected body are demonstrated by pendulums corresponding to the lengths 1, 4, 9, 16, etc., these pendulums being fixed to a rod at equal distances apart. The rod can be rotated in a vertical plane and forms a variable angle with the divided horizontal bar, the angle being read off on a graduated arc.

51,843. — idem, with diagrams ready drawn for angles of elevation of 0°, 15°, 30°, 45°, 60° and 75°, Figure 3. 0.0

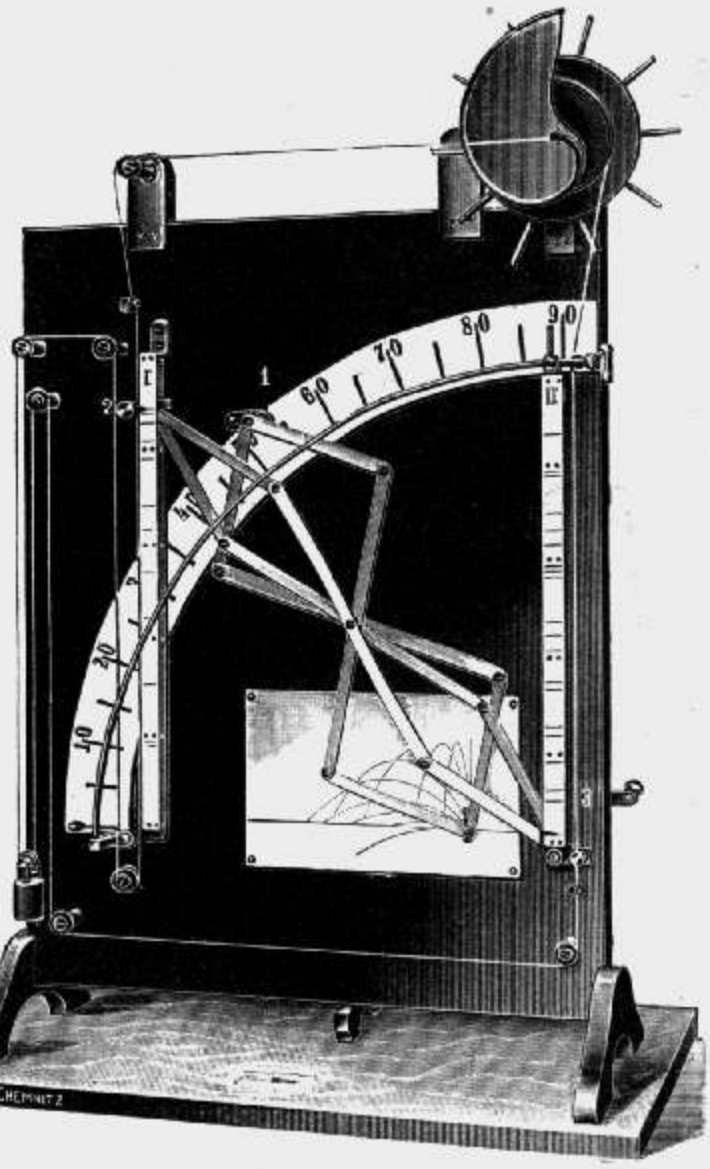
The diagrams can, contrary to the illustration, be rolled together, so that the apparatus can easily be moved about, occupying but little space when folded up.



51 844. 1 : 10.



51 847. 1 : 18.



51 848. 1 : 10.

51,844. **Water Jet Projectile Apparatus,** combined with **Hagenbach's Projectile Parabola,** as suggested by Weinhold (W. D., Fig. 68), Figure . . . . . £ 1.16.0

51,845. **Water Jet Projectile Apparatus** (Friedr. C. G. Müller's) (M. T., Fig. 37) 4. 0.0

* 51,846. **Lantern Slide of the Trajectory of a Krupp 24-cm Gun** (M. T., Fig. 38) 0. 1.6

51,847. **Apparatus for showing the Projection Parabola** (Ducrue's), Figure (Fr. phys. Techn. **I, 2,** Fig. 3185; Bohn, Physikal. App. No. 28, p. 25) 1.15.0

The missle, a chalk ball, rolls out of an adjustable bent tube, or is cast out of a straight tube by means of a spring, leaving the parabola traversed on a dead-black board.

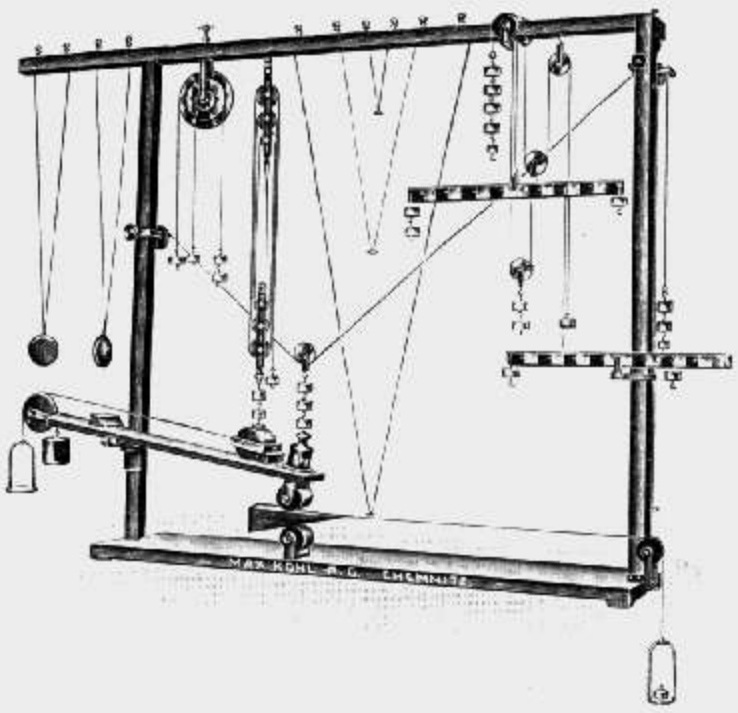
51,848. **Projectile Diagraph** (Salcher's), Figure (Ztschr. f. d. phys. u. chem. U., **17,** 1904, page 60) 12. 0.0

The essential part of the apparatus is formed of a universal parallelograph consisting of 4 bars of equal length and 4 of half this length, linked together. No matter how the stand is extended, the 4 external points 1, 2, 3 and 4 always define a parallelogram.

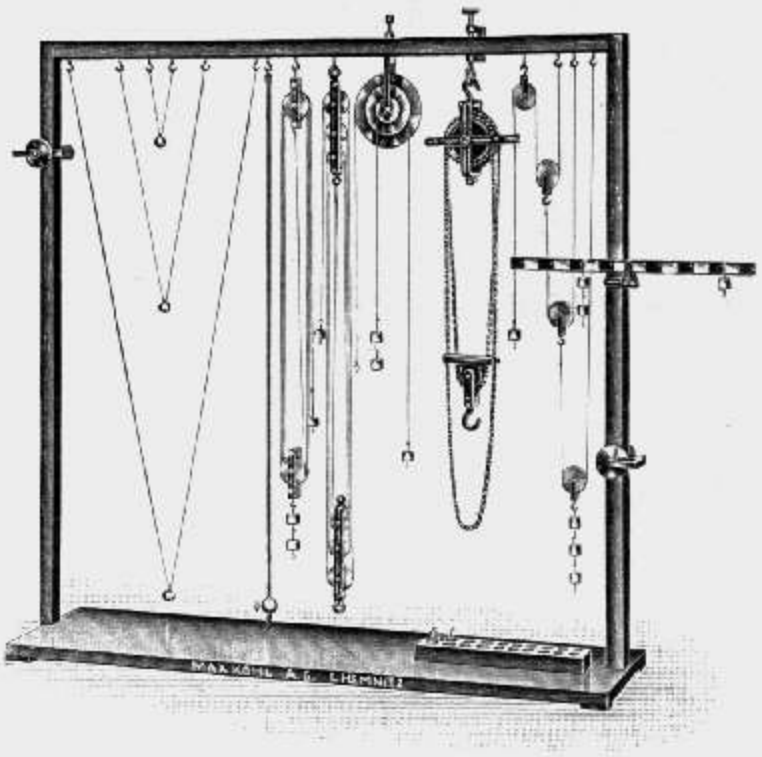
* Can be used with the projection apparatus.

Cl. 3750, 6021, 474.

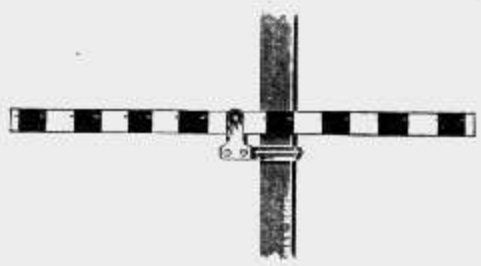
Max Kohl A. G. Chemnitz, Germany.



51 850. 1 : 16.



51 851. 1 : 15.



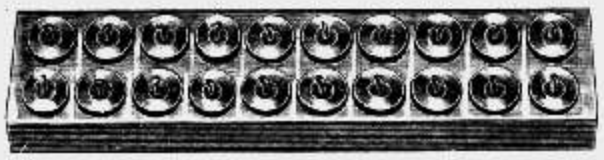
51 851 b. 1 : 8.

Mechanics of Solids (Statics and Dynamics).

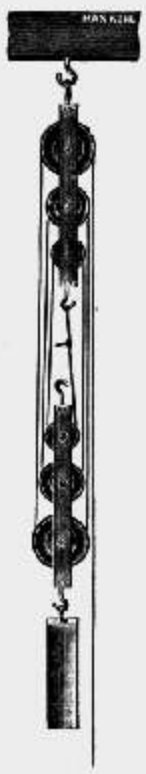
	£ s. d.
51,850. **Collection of Apparatus for demonstrating the Laws of Mechanics,** Figure . . .	9. 0. 0

The following are included in the above price: 1 Oak Frame, 1 m high and 1 m wide; 1 Inclined Plane; 1 Wedge Apparatus; 2 Weigh Pans; 2 Aluminium Levers with steel axes and steel pins passing through, one firmly fixed, the other arranged for suspending; 1 Set Pulley Blocks with 2 blocks and 3 pulleys arranged in series; 1 Tackle with 3 pulleys; 1 Arbor Wheel with cramp; 2 Disc-shaped Pendulums of equal length, hanging in various planes, with swivel for adjusting the length; 3 Lenticular Pendulums of 90, 40 and 10 cm length, with swivels for adjusting; 3 Pulleys with cramps (W. D., Fig. 69 A [62 A]); 1 Loose Pulley, of aluminium, with steel axis, brass bow and with 1 hook; 1 Set of Weights with iron weights of 50 g to 5 kg; 1 Set of Double-cheek Weights, each with 20 weights of 100 g and of 50 g.

51,851. **Collection of Apparatus for demonstrating the Laws of Mechanics,** Figure, consisting of the following apparatus, these pieces of apparatus being also supplied singly at the prices given: a, b, d 1, d 2, e, f, g 1, h—m	5.18.0
(a) **Frame, of oak,** 1 m high, 1 m wide, with small hooks screwed in (W. D., Fig. 69 B [62 B])	0.12.0
(b) **1 Lever,** of aluminium, with steel axis and with steel pins passing through at equal intervals apart, lacquered in two colours, with metal bow, on cramp, Figure	0. 8.0
(c) **Pulleys,** aluminium, with steel axis and brass bow:	
1) With 1 hook . . . . . Each	0. 2.0
2) With 2 hooks . . . . . Each	0. 2.6



51851l. 1 : 4.



51851d1. 1 : 6.



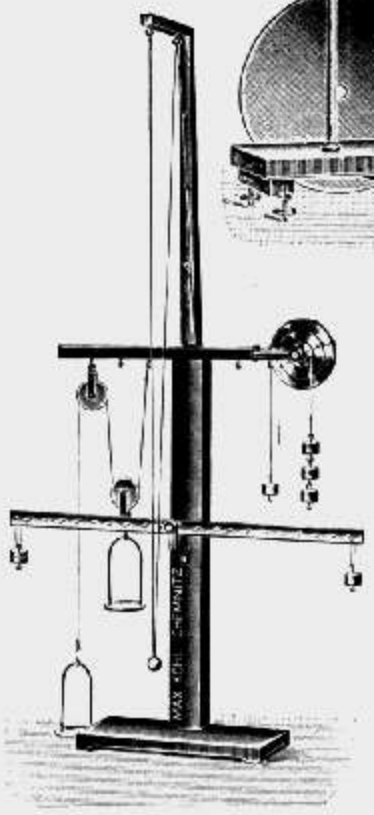
51851d2. 1 : 6.



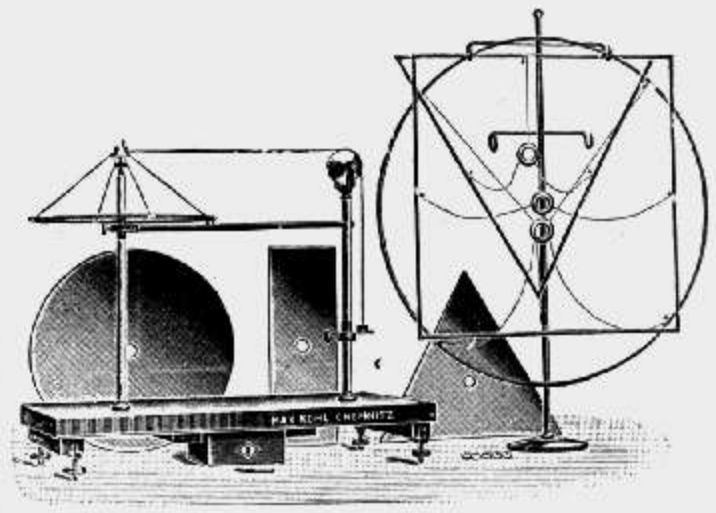
51851f. 1 : 10.



51851g. 1 : 4.



51853. 1 : 12.



51854. 1 : 12.



51851m. 1 : 6.

	£ s. d.
(d) **Tackle** with aluminium pulleys, with steel axis, in brass frame:	
1) **2 Pulley Blocks**, each with 3 pulleys, arranged one behind the other, Figure (M. T., p. 33)	0.12.0
2) **2 Pulley Blocks**, each with 3 pulleys, arranged alongside each other, Figure	0.15.0
(e) **Power Tackle**, 4 aluminium pulleys	0. 9.0
(f) **Differential Tackle**, Figure, 50 kg carrying capacity, with cast-iron pulley and chain, self-locking	0.18.0
(g) **Arbor Wheel**, Figure, with 3 discs mounted on one axis, the diameters of the discs being as 1 : 2 : 3, of aluminium, with steel axis, in iron clamp:	
1) 90 mm diameter	0. 9.0
2) 120 mm diameter	0.10.0
(h) **2 Brass Pulleys on iron cramps**, with conical pivots, for the parallelogram of forces, Fig. 51,851, p. 265 (W. D., Fig. 69 A [62 A]), each **7 s. 6 d.**	0.15.0
(i) **3 Brass Pendulums** and **1 Wood Pendulum**, on double threads; ratio of lengths 1 : 4 : 9	0. 3.0
(k) **Pendulum of variable length**, round steel rod with suspension and adjustable brass ball	0. 4.0
(l) **Set of Weights**, comprising 20 weights of 50 g each, provided with hooks on both sides, mounted in wood block, 10 of the weights being nickelled and 10 black varnished, Figure	0.10.0
(m) **Hook with cramp**, Figure, for suspending heavy objects, electromagnets and the like	0. 3.0

51,853. **Stand with Apparatus** for demonstrating the Laws of Mechanics, Figure . . . 2. 0.0

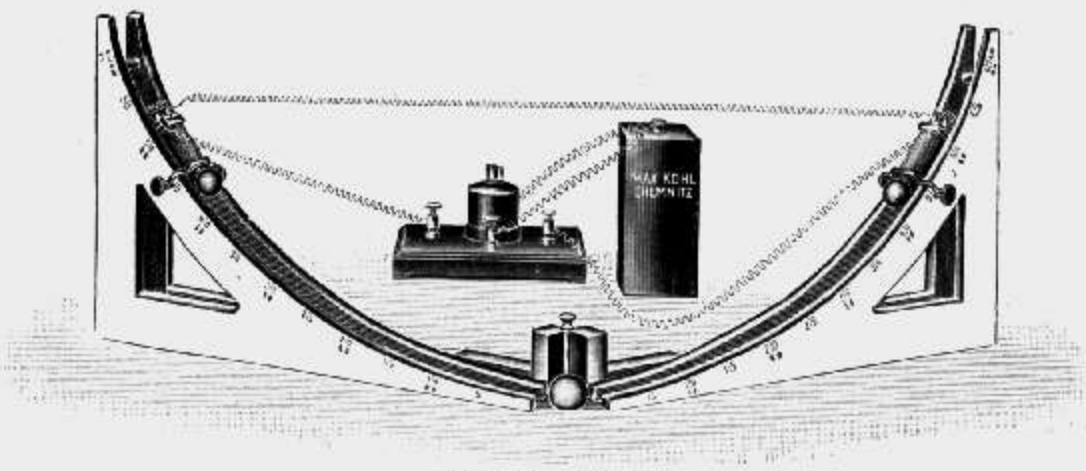
1 Stand (wood), polished, with hooks; 1 Lever with steel axis in metal bow, with steel pins passing through at equal intervals apart; also 1 loose and 1 fixed pulley in metal bow; 1 Arbor Wheel with 3 sheaves of ratio 1 : 2 : 3; 2 Balance Pans; 1 Pendulum of variable length (brass ball on double thread); 6 Weights of each 50 g with hooks on both sides.

51,854. **Universal Apparatus for demonstrating the Laws of Mechanics** (as suggested by Friedr. C. G. Müller), Figure (Ztschr. f. d. phys. u. chem. U., **14**, 1901, p. 71; M. T., Fig. 33) 6. 0.0

Comprising: 1 Stand; 1 Suspension Device; 1 Ring made of 4 mm thick brass wire, 50 cm diameter; 2 Similar Rings, 25 cm diameter; 1 Square and 1 Equilateral Triangle, made of the same sort

For Hartl Indicating Balances with Accessories for experiments in Statics and Mechanics, see Nos. 51597—51601, p. 240. Cl. 491, 604, 487, 488, 489, 490, 3625, 4012.

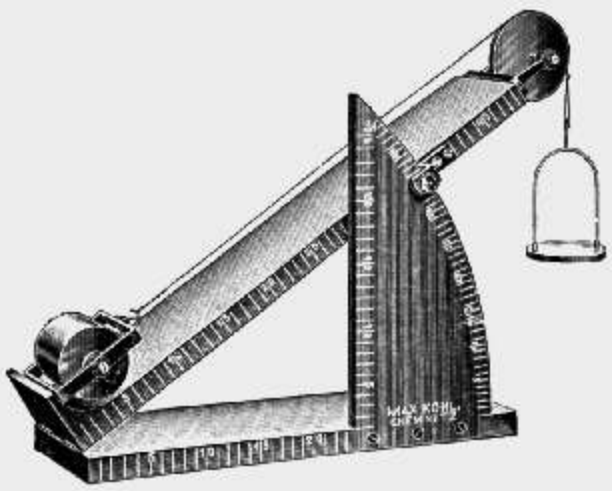
Max Kohl A. G. Chemnitz, Germany.



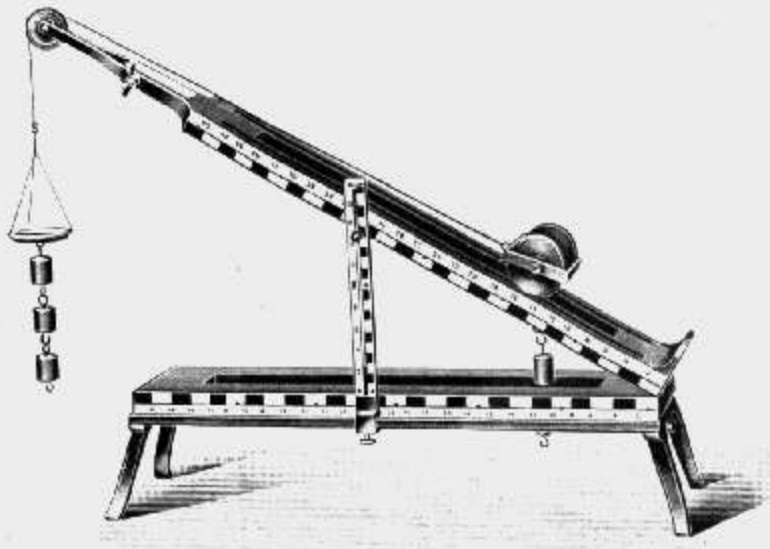
51 856. 1 : 12.



51 859. 1 : 5.



51 860. 1 : 8.



51 862. 1 : 8.

Max Kohl A. G. Chemnitz, Germany.

of wire, both having 40 cm length of side; 1 Circular Disc of 30 cm diameter, of sheet aluminium; 1 Equilateral Triangular Disc of 30 cm side and 1 Rectangular Disc 10 × 30 cm; 1 Driving Weight of 10 g, 1 of 5 g, 2 of 2 g, 2 of 1 g; 12 Paper Weights; 1 spare tip, spare thread.

The following can be demonstrated with the apparatus: 1) the Fundamental Principles of Mechanics; 2) the Laws of uniformly accelerated and retarded Motion; 3) Moments of Inertia; 4) the Laws of periodic Oscillations.

£ s. d.

51,856. **Cycloidal Double Railway** (Thierfelder's), Figure, for demonstrating the swinging motion of the Cycloidal Pendulum, of the Parallelogram of Directions and the Impact Action, with 3 steel balls, 2 electromagnets, cell, switch on terminal board and connecting leads (Ztschr. f. d. phys. u. chem. U., **21**, 1908, p. 244) 4.10.0

The railway consists of two hinged parts which can be set up at any angle relative to each other. The electromagnets can be moved along the cycloidal track, being actuated simultaneously by a switch.

51,857. **Demonstration Apparatus for the Statics and Dynamics of Rigid Bodies** (Töpler's) (Ztschr. f. d. phys. u. chem. U., **1**, 1887/88, p. 137; Fr. phys. Techn. **I, 2**, Figs. 3278 to 3281) 17.10.0

For proving the hypothesis of the plane polygon of forces, of equilibrium and of the centre of parallel forces, of the equilibrium of couples of force and any forces on the flat or in space, of the principle of virtual velocities, of the equilibrium of forces on a body rotating on a fixed axis or movable in a fixed direction; of the centre of momentum of motion, of progressive motion, of the action of the couple on the freely moving body, and of uniformly accelerated and oscillating Rotary Motion.

51,858. **Accessories for explaining the Centre of Gravity** (Eugen Meyer's) (Ztschr. d. V. d. I., Vol. 53, 1909, p. 1301, No. **14**, and text-sheet **16**, Fig. 14) 3.15.0

51,859. **Apparatus for proving the Law of the Inclined Plane** (Frick's) (Fr. phys. Techn. **I, 2**, Fig. 2206 [Fig. 121]), Figure 0.12.0

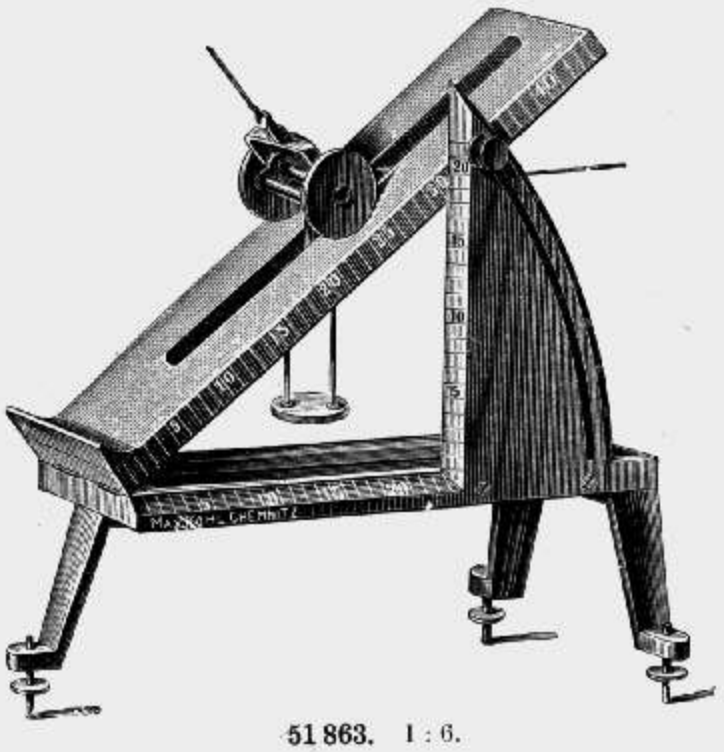
The two rollers are in equilibrio, since their weights are as the lengths of the inclined planes pertaining thereto.

51,860. **Inclined Plane,** simple, with metal roller, balance pan, graduated arc and height rule, Figure 1.16.0

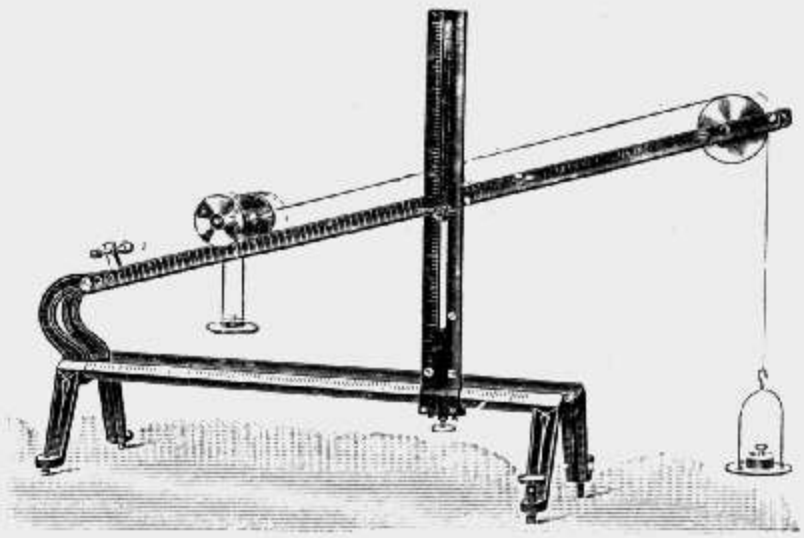
51,861. — idem, with **iron feet,** as Fig. 51,863 . . . . . 2. 0.0

51,862. **Inclined Plane,** Figure, of wood, with metal feet, 250 g roller, with 1 tared balance pan and 6 hooked weights each of 50 g (Fr. phys. Techn. **I, 2**, Fig. 2202) 2. 5.0

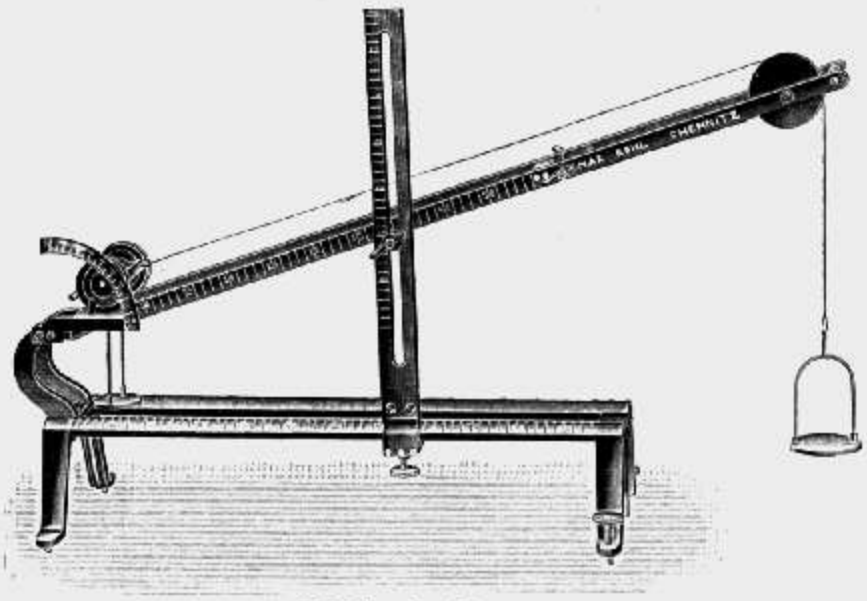
This apparatus has a plain, 2-colour centimetre graduation.



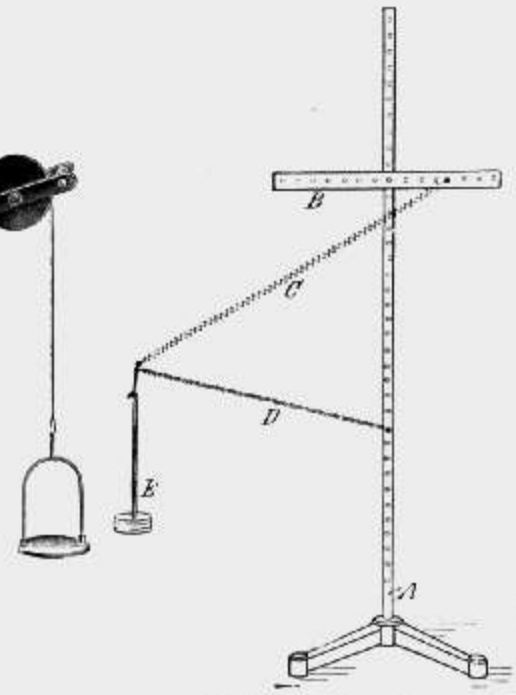
51 863. 1 : 6.



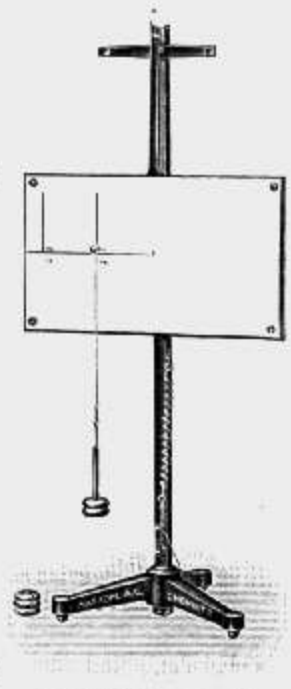
51 868. 1 : 10.



51 869. 1 : 10.



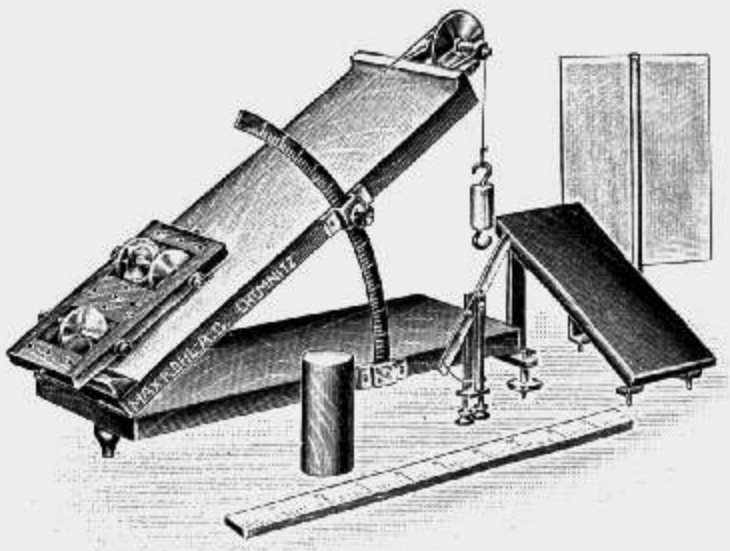
51 876 A. 1 : 10.



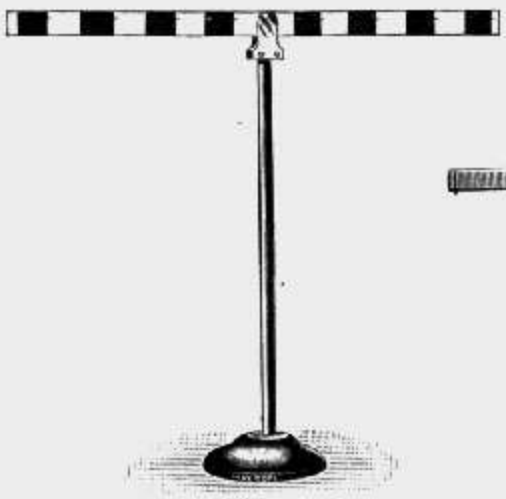
51 876 B. 1 : 10.

	£ s. d.
51,863. **Inclined Plane** (Weinhold's) (W. D., Fig. 71 [64]), with polished oak stand, carriage and loading pan weighing together 500 g, with 2 tared balance pans of each 50 g . This inclined plane must only be used in conjunction with frame No. 51,851 a and pulleys No. 51,851 b.	3. 0.0
51,864. — i d e m, simpler wood pattern	2.14.0
51,865. **Inclined Plane,** as No. 51,863, but with a **pulley** on the upper end. Constructed in this manner the apparatus can be used independently	3. 6.0
51,866. — i d e m, simpler wood pattern	3. 0.0
51,867. **Plate Glass Slab, Sliding Body** and light **Balance Pan,** for experiments on sliding friction (W. D., p. 137 [116]) . . . . . The dull polished glass plate is laid upon the inclined plane so as to afford a uniform bearing surface for the sliding body. The sliding body is of hard wood, and drawing paper is gummed on 3 different sized surfaces, two other surfaces being provided with small hooks.	0. 6.0
51,868. **Inclined Plane** (Bertram's), F i g u r e, **entirely of iron** (M. P. **I**, Fig. 267, 268 [264, 265]; Fr. phys. Techn. **I, 2,** Figs. 2203 and 2204 [I, Figs. 122 and 123]) . . . . . The bow carrying the guide pulley for the cord can be adjusted so that the force can be applied both parallel to and horizontal with the inclined plane.	4. 0.0
51,869. — i d e m, **with graduated arc,** F i g u r e	4.10.0
51,870. **Inclined Plane** (Friedr. C. G. Müller's), F i g u r e, of wood, with graduated arc, precision roller, small carriage (M. T., p. 36 and Fig. 16) and the following auxiliaries Attachment with inclined plane for proving the action of the components of force in propellers, windmills, sailing vessels (M. T., Fig. 17); Sail Attachment (M. T., p. 37); Wood Wedge (M. T., p. 38);	3.15.0

Max Kohl A. G. Chemnitz, Germany.



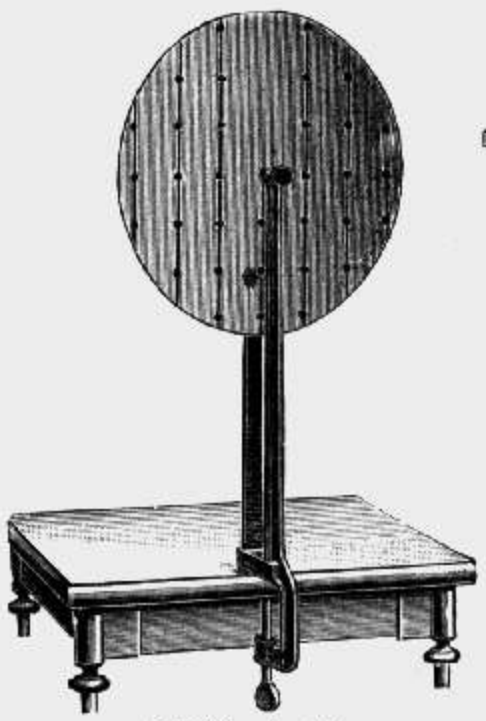
51 870. 1 : 9.



51 878. 1 : 8.



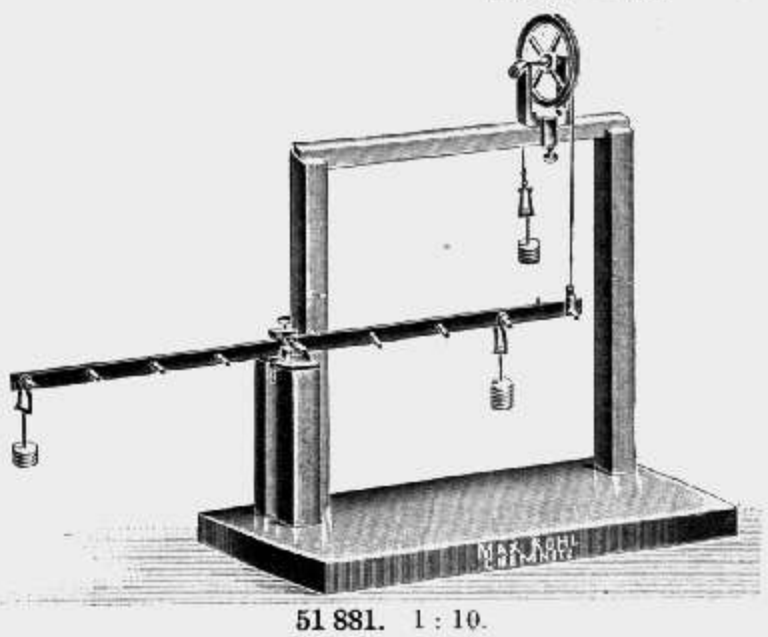
51 880. 1 : 9.



51 877. 1 : 10.



51 879. 1 : 12.



51 881. 1 : 10.

Max Kohl A. G. Chemnitz, Germany.

Couple of Forces Attachment (M. T., Fig. 22); Wood Blocks of 100 g for sliding friction; 1 each respectively Slate, Sheet Metal and Plate Glass Slabs; 2 Sets of Wheels (M. T., Fig. 55); 1 Wood Roller (M. T., p. 94). £ s. d.

51,876. **Apparatus** (Grimsehl's), Figs. A and B, for demonstrating the tensive and compressive strain in a solid, and for deriving the momentum theorem (Ztschr. f. d. phys. u. chem. U., **16**, 1903, p. 260) 2. 5. 0

51,877. **Apparatus** for showing the Invariability of the static momentum on shifting the origin of force in the direction of force, Figure (W. D., Figs. 73 A, B, C [66, A, B, C]) 0. 18. 0

51,878. **Equal-arm Lever,** of aluminium, with steel axis and steel pins passing through, lacquered in two colours, on stand, Figure 0. 10. 0

51,879. **Equal-arm Lever,** of metal, on iron stand, heavy type, Figure (W. D., Fig. 74 [67]). Without weights 0. 12. 0

For weights, see No. 51,824 c, p. 260, or No. 51,904, p. 273.

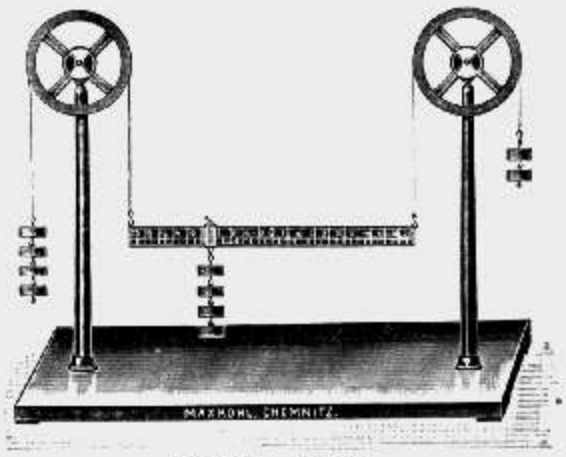
51,880. **2 Metal Levers on metal stands,** Figure, with 10 weights, specially suitable for explaining the cooperation of parallel forces and for upwardly directed forces, and for determining the bearing pressure 3. 0. 0

Only one lever is shown in the illustration.

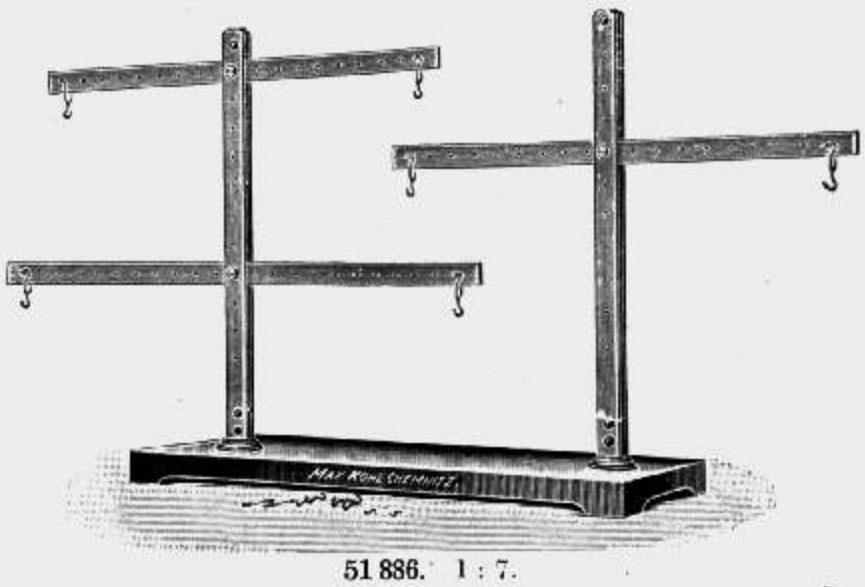
51,881. **Metal Lever, in frame,** with pulley, Figure, also for forces directed upwards, with weights (Fr. phys. Techn., 7th Edn., **I**, **2**, Fig. 2095) 3. 0. 0

51,882. — idem, **without** weights 2. 5. 0

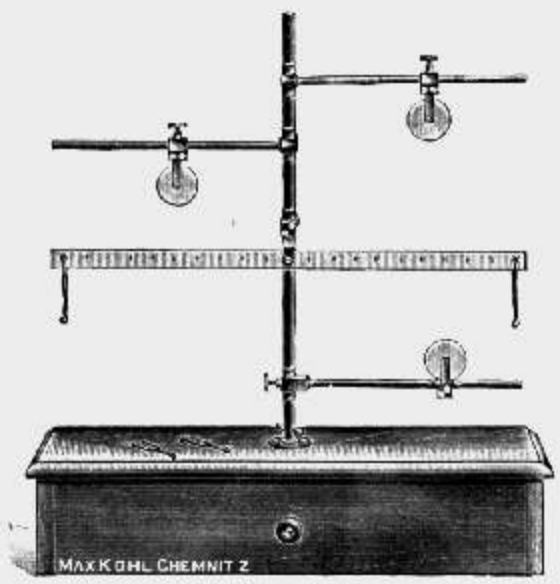
For weights, see No. 51,824 c, p. 260.



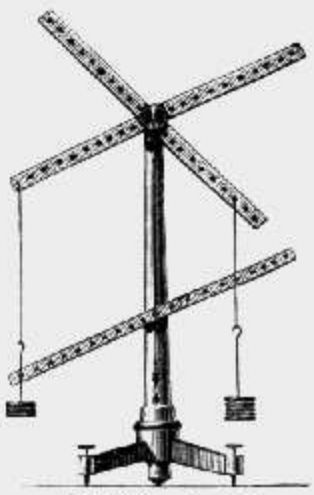
51 883. 1 : 12.



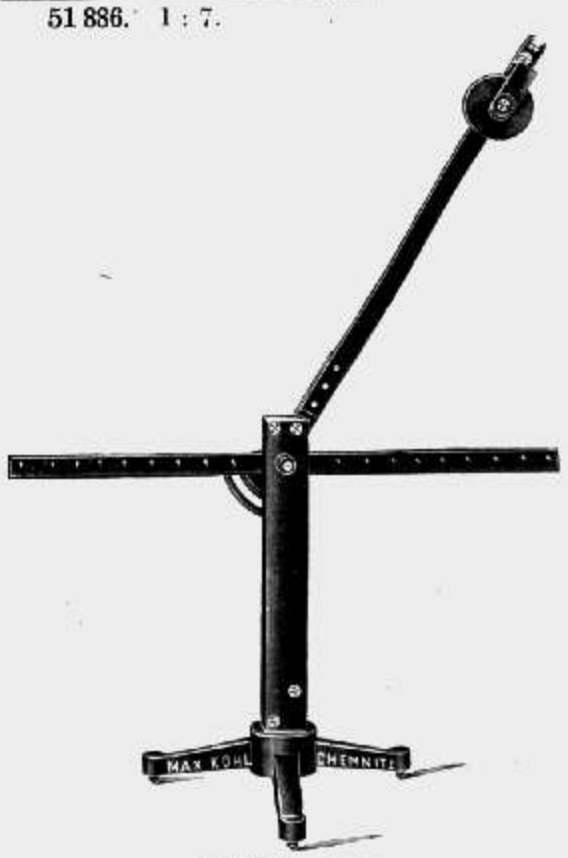
51 886. 1 : 7.



51 884. 1 : 10.



51 888. 1 : 12.



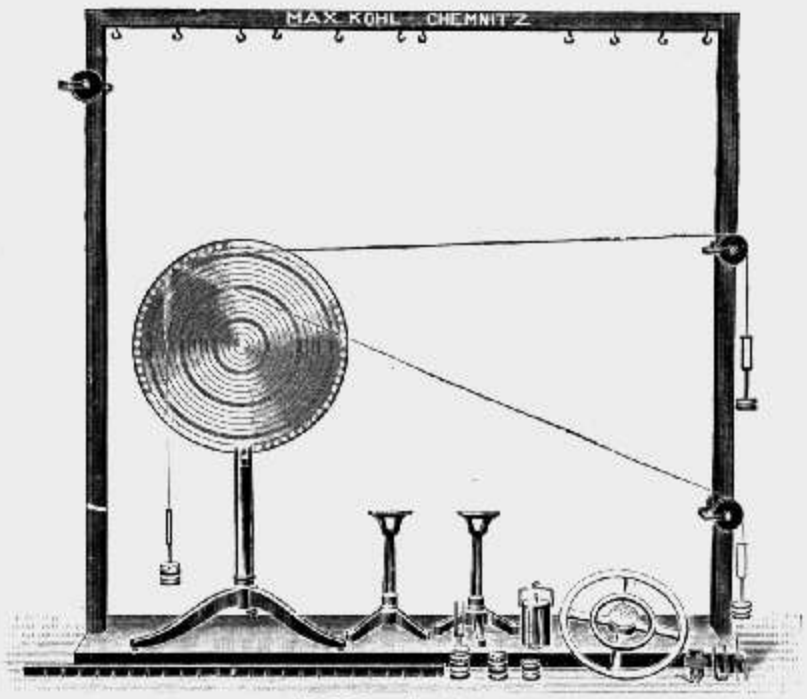
51 889. 1 : 4.

	£ s. d.
51,883. **Lever Apparatus,** for demonstrating the cooperation of parallel forces, Figure, with 12 weights in wood block (Fr. phys. Techn. **I, 2,** Fig. 2101)	3. 5.0
51,884. **Lever Stand,** Figure, for forces directed upwards and downwards; stand with lever, 3 arms and 3 pulleys, on box, with drawer . . . . . For weights, see No. 51,824 c, p. 260, or No. 51,904.	2.15.0
51,886. **Apparatus for explaining the Different Levers and the Balance** (Frick's), Figure (Fr. phys. Techn. **I, 2,** Fig. 2096 [1, Fig. 91]), of metal (without weights)	2. 5.0
51,887. — idem, **of wood**	1. 4.0
51,888. **Angle Lever,** Figure (W. D., Fig. 76 [69]), of metal, stand with levelling screws. Price, excluding weights	1. 8.0
51,889. **Lever Apparatus** (Bertram's), Figure, for explaining the balance beam, entirely of metal	1.16.0
51,891. **Apparatus for the Theory of the Moments of Torsion and the Conditions of Equilibrium,** as suggested by Hartl, Figure (Ztschr. f. d. phys. u. chem. U., **14,** 1901, p. 321) 1 Wood Frame, 1 Stand with Circular Discs, 1 Cardboard Disc with polygon of forces on both sides, 1 Lever, 1 Arbor Wheel, 2 C. I. Supports, 4 Hooked Weights each with 4 50 g and 1 25 g weight for adding, 2 Hooked Weights of 20 g; 3 Pulleys on cramps; 1 Equilibrising Weight with hook; Tareads with equilibrised hooks.	7.10.0
51,892. **Arbor Wheel** (Friedr. C. G. Müller's) (M. T., p. 42), the two wheels are mounted on one shaft with a space between	0.12.0
51,893. **Precision Pulleys** (Friedr. C. G. Müller's), Figure (M. T., Fig. 8). Price per two	1.10.0

Cl. 502, 506, 3300, 504, 3301.

Max Kohl A. G. Chemnitz, Germany.

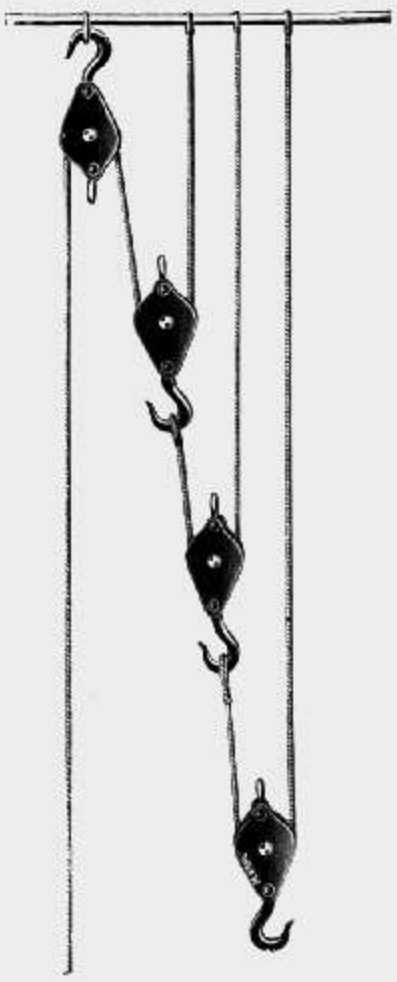
Max Kohl A. G. Chemnitz, Germany.



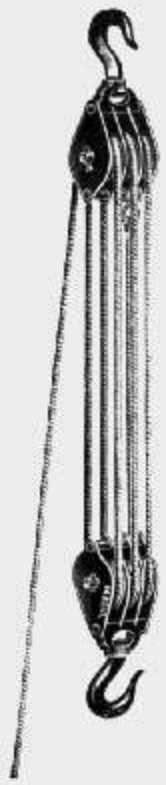
51 891. 1 : 14.



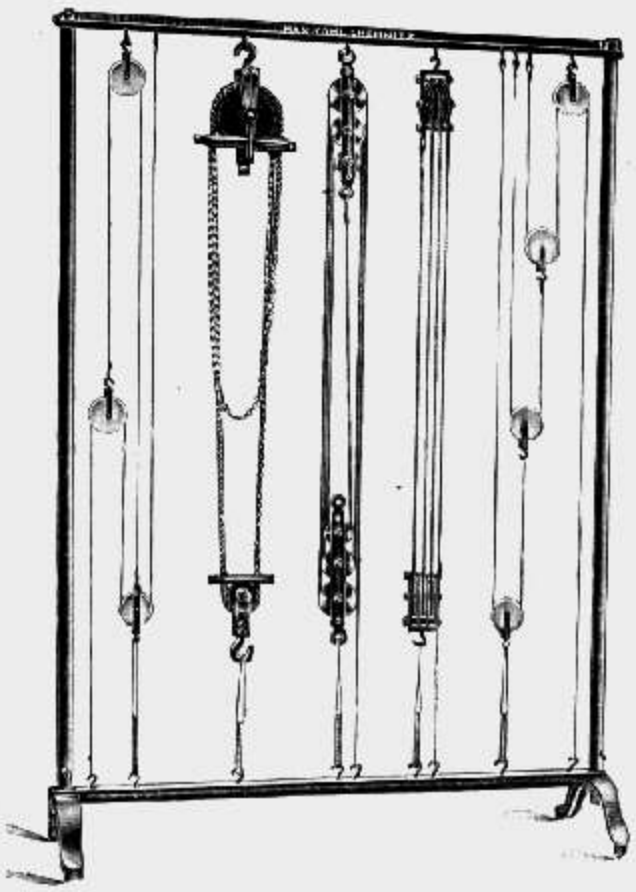
51 893. 1 : 3.



51 895. 1 : 11.



51 896. 1 : 11.

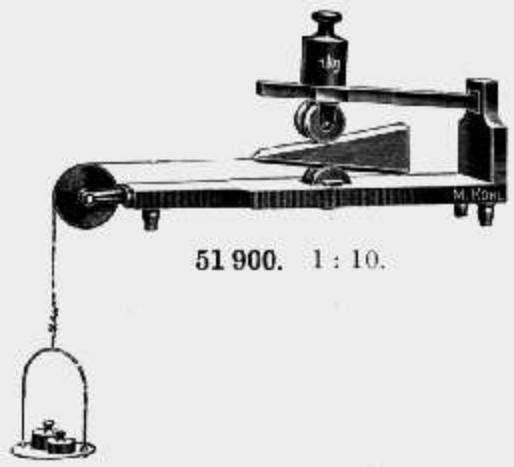


51 894. 1 : 12.

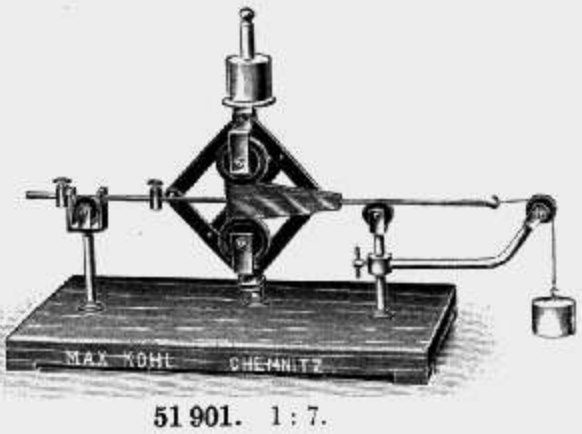
	£ s. d.
51,894. **Tackle Frame,** of iron, Figure, strongly constructed, with outfit . . . . . 1 Frame; 1 set Tackle, consisting of 2 blocks each with 3 pulleys in series; 1 set Tackle of two blocks of each 3 pulleys placed in parallel; 1 set Differential Tackle, of metal; 6 loose Pulleys for forming the power tackle and other combinations of pulleys.	4. 0.0
51,895. **Power Tackle** with 4 iron pulleys, Figure, massively constructed	0.18.0
51,896. **Tackle** with 2 iron blocks, each with 3 pulleys in parallel, Figure, massively constructed	0.18.0
51,898. **Differential Tackle,** massively constructed, lifting power 100 kg, also adapted as a model for instruction in mechanics, cf. Fig. 51,851 f	2. 0.0
51,899. **6 Loose Pulleys,** of iron, for setting up the power tackle and other combinations of pulleys. Each **4 s. 0 d.**	1. 4.0

See also Pulleys, Tackle, etc. on pp. 265 and 266, and Screw Tackle No. 50,116, p. 21.

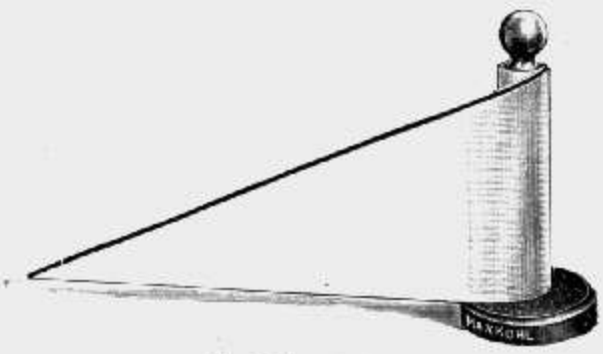
Cl. 3302, 4544, 507, 508, 509.



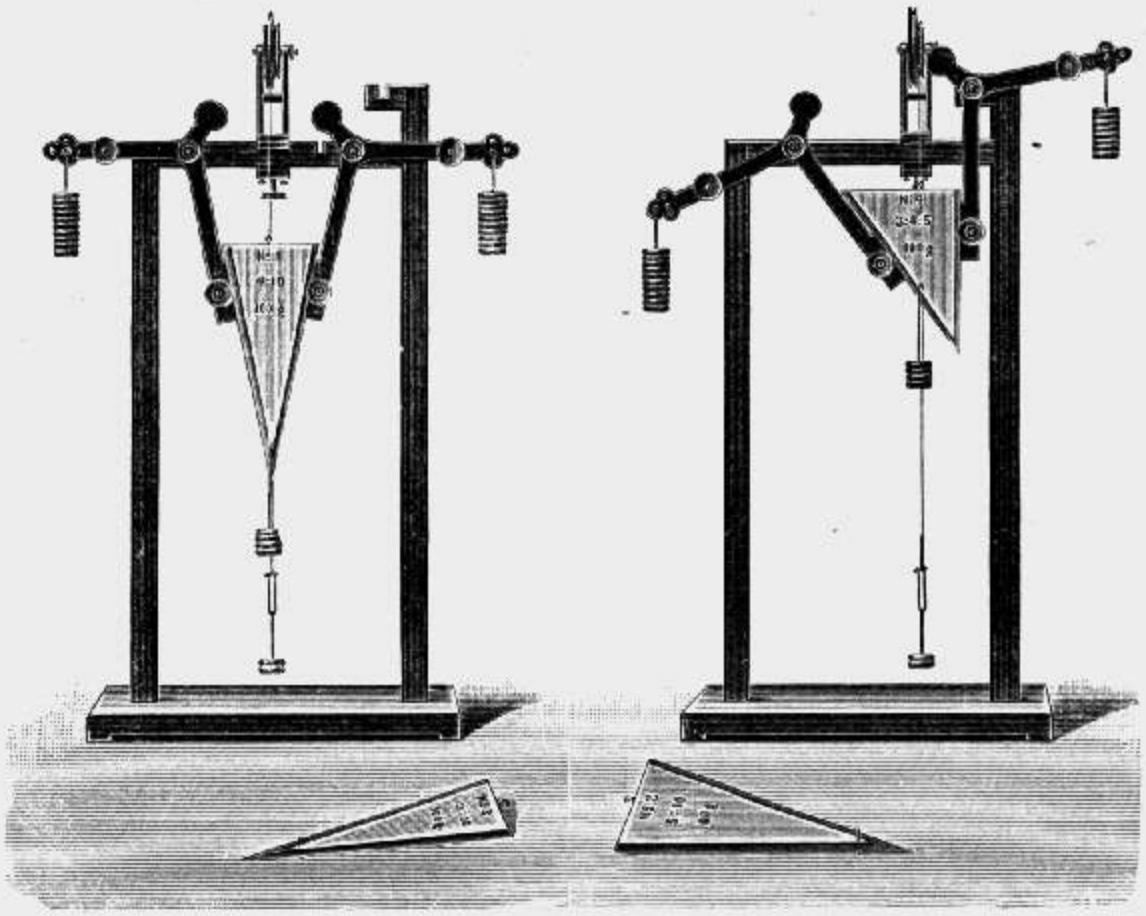
51 900. 1 : 10.



51 901. 1 : 7.



51 905 1 : 4.



51 902. 1 : 10.

51,900. **Wedge Apparatus** (Frick's), F i g u r e (Fr. phys. Techn. **I, 2**, Fig. 2216 [I, Fig. 127]), with 3 different wedges and 1 balance pan . . . . . £ 1. 4.0

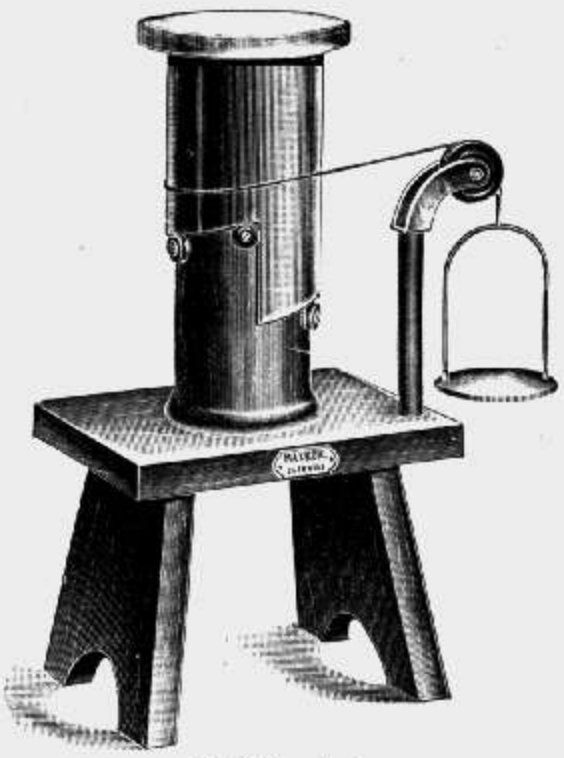
51,901. — i d e m, **of brass and iron,** F i g u r e, with wedge-guide (Fr. phys. Techn., p. 721) 3. 0.0

51,902. — i d e m (Hartl's), F i g u r e, for demonstrating the pressure exerted by both sides of the wedge on the resistance-surfaces, with arrangement for equalising the iron weight of the wedge and for showing the influence of sliding friction (Ztschr. f. d. phys. u. chem. U., **5**, 1892, p. 282, Fig. 1). Price, without weights 4. 0.0

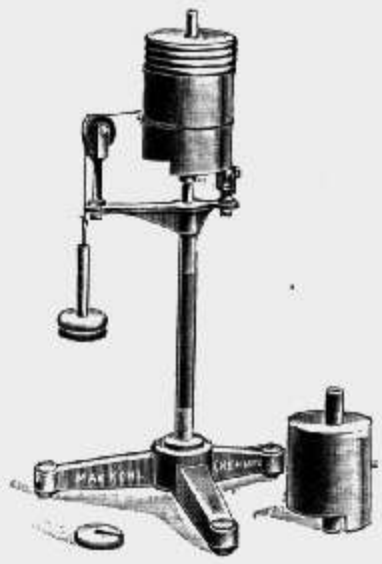
There are given in: 3 equal-limb wedges of ratio 3 : 10, 4 : 10 and 5 : 10 of back to side, and one unequilateral, rectangular wedge with ratio of sides 3 : 4 : 5.

Cl. 510, 5096, 3307, 511.

Max Kohl A. G. Chemnitz, Germany.



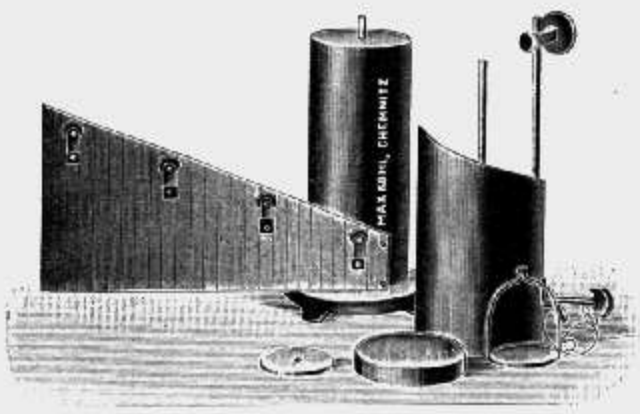
51 906. 1 : 6.



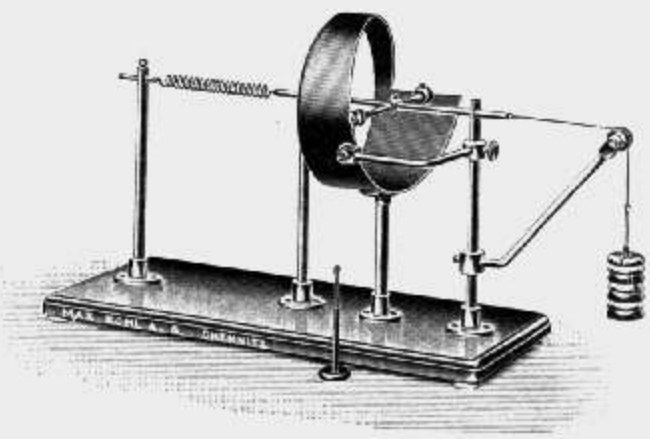
51 908. 1 : 6.



51 909 A. 1 : 5.



51 909 B. 1 : 9.



51 910. 1 : 10.



51 911. 1 : 9.

	£ s. d.
51,904. **26 Double-hook Weights** for Hartl's Wedge Apparatus	1. 6.0
These weights can also be used for the experiments on levers, for the parallelogram of forces, etc.	
51,905. **Wood Cylinder, with paper surface,** Figure, for showing the formation of the screw line (Fr. phys. Techn. **I, 2,** Fig. 2013)	0. 3.0
51,906. **Screw Apparatus** (Frick's) for demonstrating the action of the screw, Figure (Fr. phys. Techn. **I, 2,** Figs. 2219, 2220 [I, Fig. 130]), without weights	2. 0.0
51,907. — idem, on stand, cf. Fig. 51,908, with loading weights and with one screw .	2. 0.0
51,908. — idem, with 2 screws of different pitch, Figure	2.10.0
51,909. **Screw Apparatus** (Hartl's), Figs. A and B, for the formation of the helical line and the mode of action of the screw (Ztschr. f. d. phys. u. chem. U., **15**, 1902, p. 318)	2.15.0
The cylinders forming the female thread are fixed to a base comprised of wood fillets, it being possible to unwind the base.	
51,910. **Screw Apparatus** (Grimsehl's), Figure, for explaining the action of physical forces on the modus operandi of the screw (Ztschr. f. d. phys. u. chem. U., **17**, 1904, p. 132)	3. 5.0
51,911. **Equilibrium Apparatus,** for explaining stable, unstable and indifferent equilibrium (Fr. phys. Techn. **I, 2,** Fig. 2108)	0.12.0
By placing the spheres upwards or downwards stable or unstable equilibrium can be produced.	

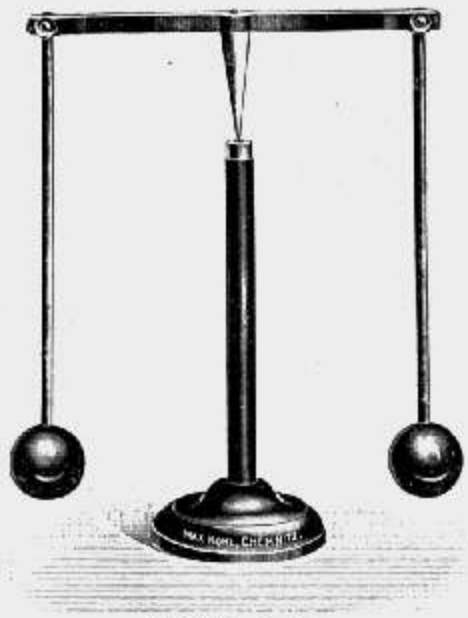
Models of Screws: see Section "Models of Machines and Machine Elements".



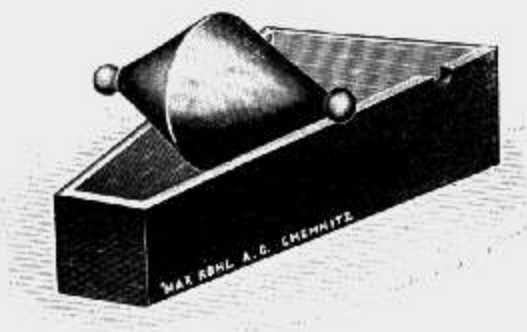
51 912. 1 : 9.



51 913. 1 : 9.



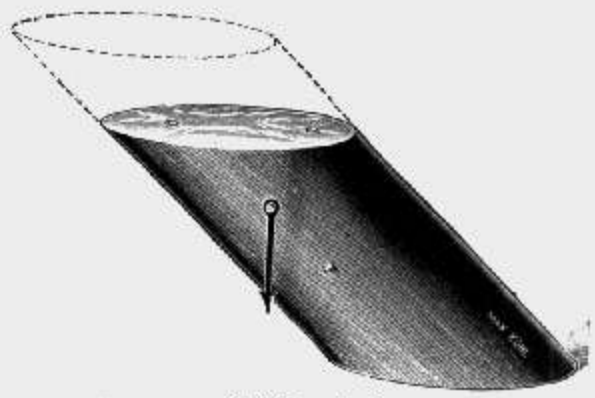
51 914. 1 : 7.



51 919. 1 : 6.



51 921. 1 : 4.



51 922. 1 : 5.

51,912. **Apparatus** (Frick's) **for Stable Equilibrium** (Fr. phys. Techn. **I, 2,** Fig. 2107 [I, Fig. 96]), Figure . . . . . £ 0.10.0

51,913. — idem, in the form shown in Fig. 51,913 (M. T., p. 44) 0.14.0

51,914. **Apparatus** (Bock's). Figure, **for demonstrating the position of the centre of gravity of a mass according as the individual parts are firmly or loosely combined** (Fr. phys. Techn. **I,** Fig. 97; M. P. **I,** Fig. 186) 1. 0.0

If the pendulums are loosened, their origins of force are shifted to the points of suspension, and the centre of gravity is accordingly situated above the point of support; the apparatus collapses.

51,915. **3 Spheres, 1 Plane and 2 Arched Plates** for demonstrating stable and unstable equilibrium (Kleiber, Lehrb. d. Phys., Fig. 36) 0. 4.0

51,916. **3 Cones with Stands** for the same purpose (Kleiber, Lehrb. f. Gymnas., Fig. 36) . 0.18.0

51,917. **Solid and hollow Half-cylinder** (M. T., p. 45) 0. 4.0

51,918. **Solid and hollow Semi-circle** (M. T., p. 45) 0. 4.0

51,919. **Double Cone on Inclined Stand,** Figure (Fr. phys. Techn. **I, 2,** Fig. 2114 [I, Fig. 98]) 0. 9.0

51,920. **Rolling Cylinder** (Fr. phys. Techn. **I, 2,** Fig. 2116) 0. 7.0

51,921. — idem (Friedr. C. G. Müller's), Figure, with lead pencil for recording the cycloidal path of the centre of gravity (M. T., Fig. 28) 0. 3.0

51,922. **Leaning Tower,** of two parts, with plummet (M. P. **I,** Fig. 187 [185]), Figure 0. 9.0

The tower remains standing as long as the centre of gravity is situated perpendicularly over the base.

51,924. **2 Triangles on 1 Stand,** Figure, for explaining the position of the centre of gravity 0. 8.0

51,925. **Equilibrium Figures,** of sheet metal: triangle, rectangle, trapeze, segment, semi-circle, ellipse, ring, with stand 0.11.0

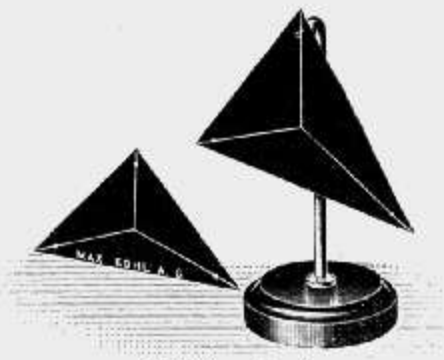
51,926. **Equilibrium Figures,** of brass, Figure, with centre of gravity constructed on them: circle, triangle, square, trapezoid and pentagon, with cap for setting on a stand fitted with a point (Fr. phys. Techn. **I, 2,** Fig. 2105), **with stand** 0.16.0

51,927. **3 Centre of Gravity Figures,** of sheet zinc, with holes on the edges, for suspending, and 3 Centre of Gravity Figures, of wire (M. T., p. 44) 0. 6.0

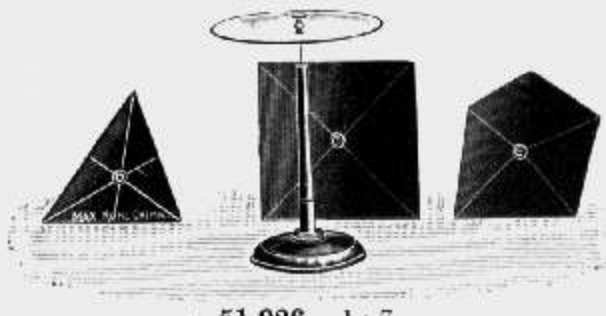
51,928. **Stability Apparatus** (Weinhold's) (W. D., Fig. 77 [70]), Figure 1.10.0

Cl. 590, 591, 592.
5779, 4525, 3313.

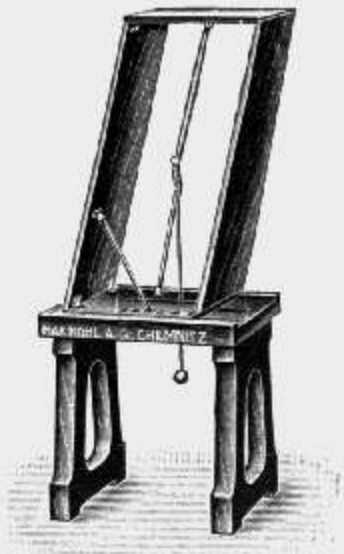
Max Kohl A. G. Chemnitz, Germany.



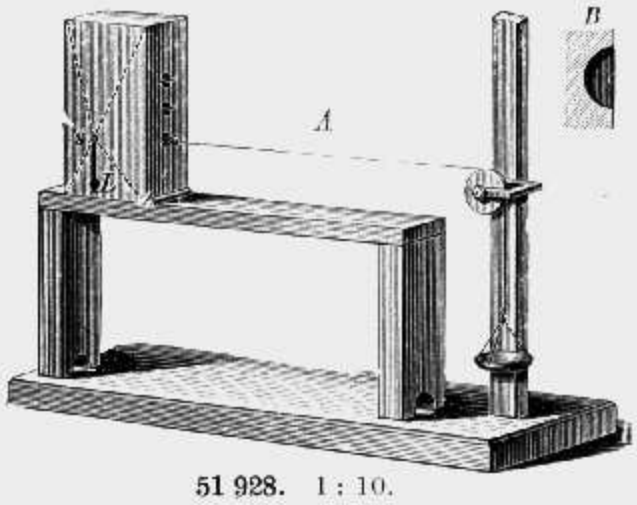
51 924. 1 : 6.



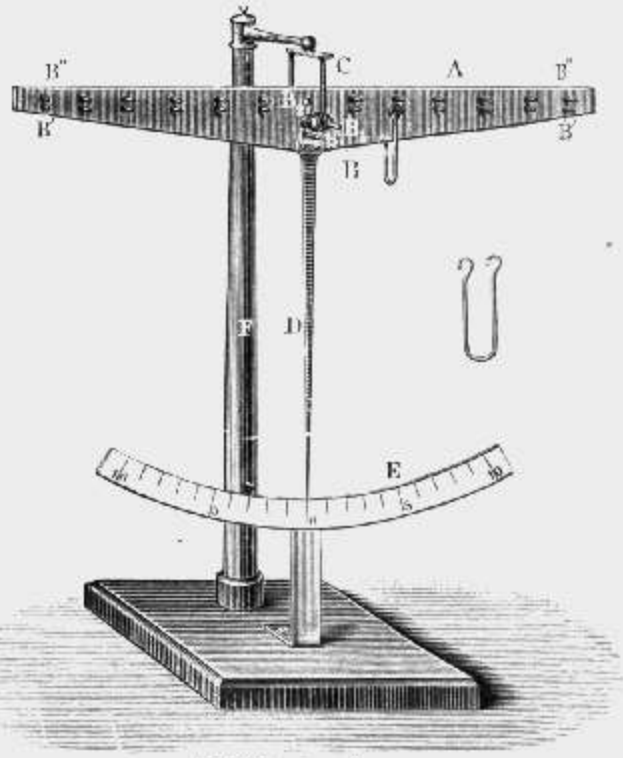
51 926. 1 : 7.

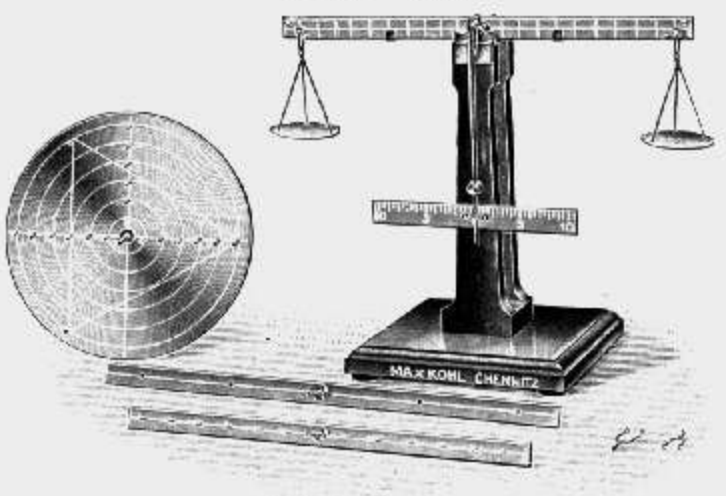


51 930. 1 : 8.



51 928. 1 : 10.





51 932. 1 : 10.

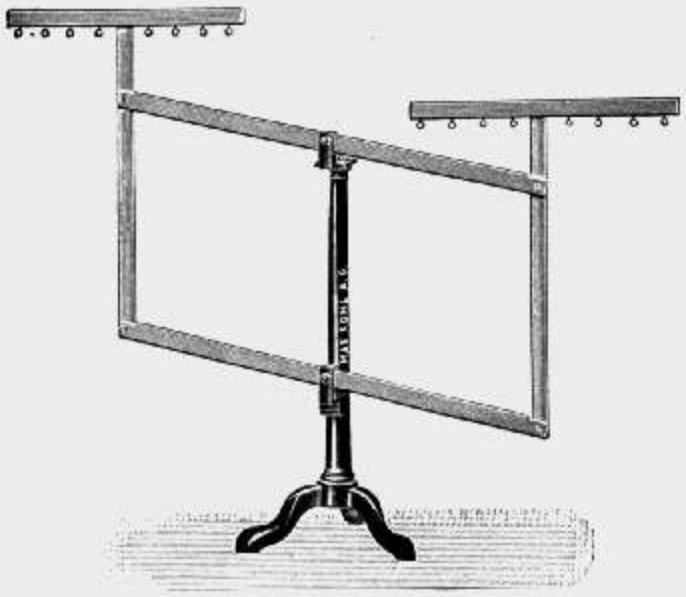
51 935. 1 : 8.

	£ s. d.
51,929. **Board with 3 Prismatic Blocks** of various heights for stability experiments (Kleiber, Lehrb. d. Phys., Fig. 37)	0. 9.0
51,930. **Stability Parallelepiped** (Lichtenecker's), Figure, consisting of a prism with variable angle of inclination, with centre of gravity plummet	0.18.0
51,931. **Stability Prism** (Friedr. C. G. Müller's), with adjustable centre of gravity (M. T., Fig. 29)	1. 4.0
51,932. **Lever Stand** (Friedr. C. G. Müller's), with auxiliaries for explaining the rod-shaped lever, the disc-shaped lever, the centre of gravity of the lever balance and the pointer balance (M. T., Figs. 20, 21, 23, 27, 30) . . . . . 1 Stand with 2 rod-shape levers, 1 disc lever, 1 balance beam with pointer, scale, 2 balance pans and 2 rider weights.	3.10.0

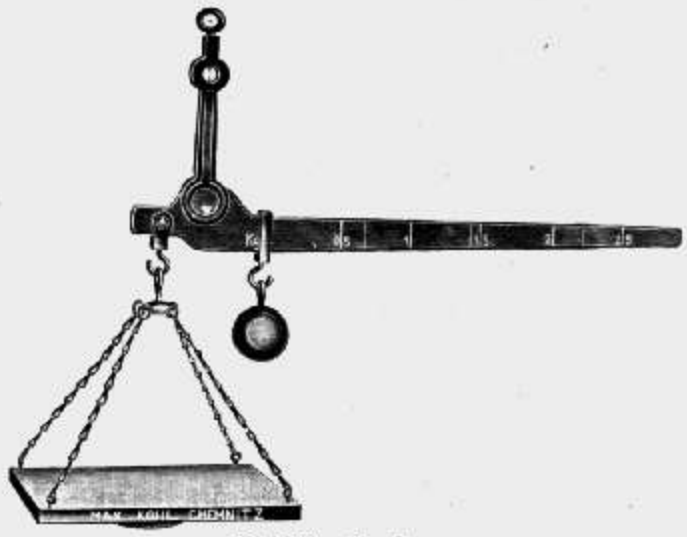
Hooked Weights: see No. 51,828.

51,933. **Arbor Wheel** (Friedr. C. G. Müller's), suitable for previous lever stand (M. T., p. 42)	0. 3.0
51,934. **Model of a Balance Beam** (Weinhold's) (W. D., Figs. 78—81 [71—74]), with iron pillar, beam of ebony, 2 double hooks of 1 and 5 grams and a small rider.	1. 4.0
51,935. — idem, Figure, with pointer and scale (W. u. E. phys. Prakt., Fig. 27) .	1.10.0

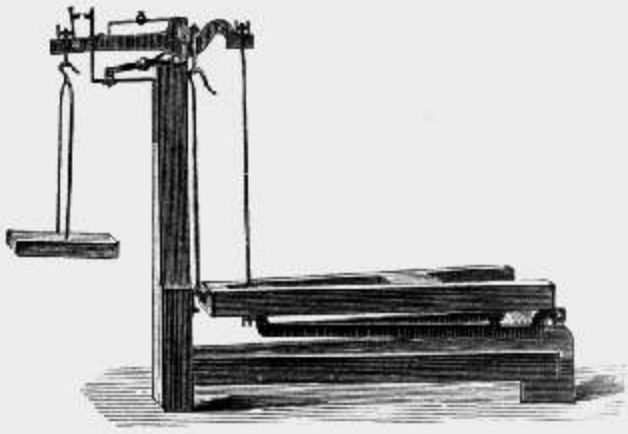
For **Finished Balances** ready for Demonstration Purposes (also suitable for demonstrating the balance beam), **Hydrostatic, Chemico-technical Balances, Sets of Weights,** etc., see pp. 231—244.



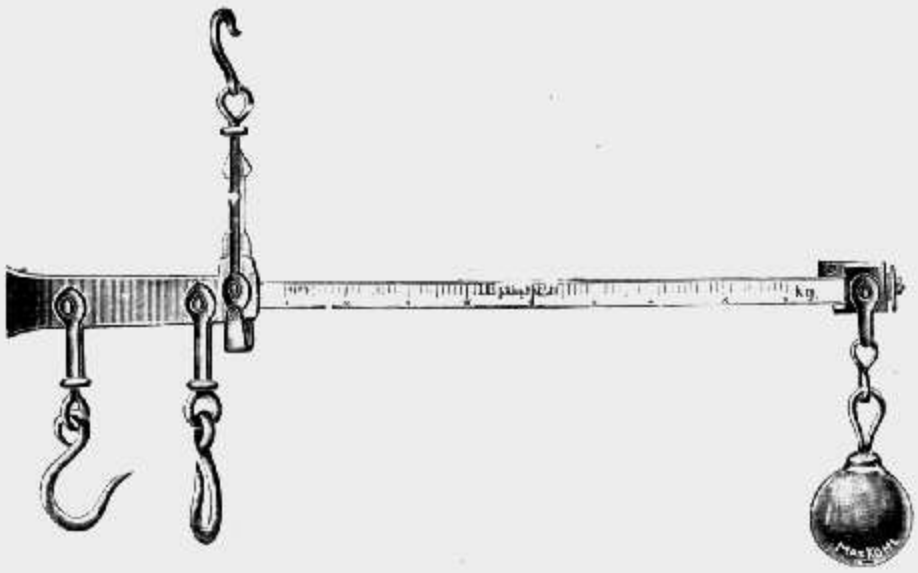
51 936. 1 : 8.



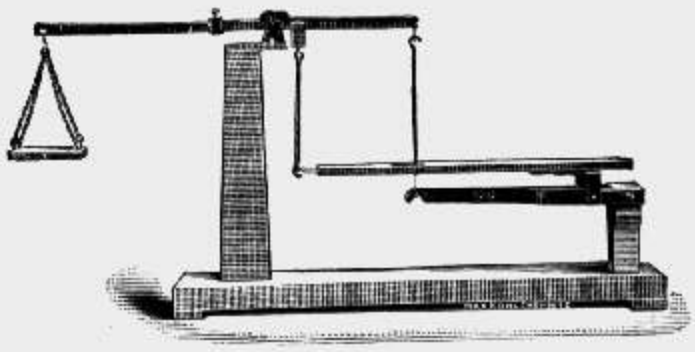
51 937. 1 : 8.



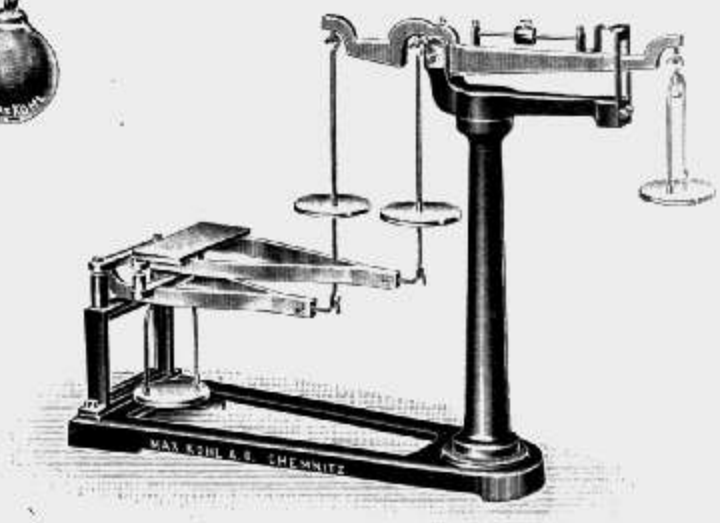
51 940. 1 : 7.



51 938. 1 : 10.



51 939. 1 : 8.



51 941. 1 : 9.

	£ s. d.
51,936. **Model of a Roberval Weigh-bridge,** Figure	1. 5.0
51,937. **Model of a Roman Balance,** Figure, beam of wood with steel axis, clip and jockey weight of metal, with weigh pan	0.18.0
51,938. **Roman Balance,** Figure, for carrying 25 kg, with 2 hooks, entirely constructed of iron, with steel knife edges, calibrated and suitable for practical use	0.16.0
51,939. **Model of a Platform Weighing Machine,** Figure (Trapeze balance after Quintenz)	1.10.0
51,940. — idem, different form, Figure	1.10.0
51,941. — idem, entirely of metal, with balance pans on the rods for explaining the different lever conditions, Figure	2. 2.0
51,942. **Centrifugal Railway,** with wood ball, Figure (Fr. phys. Techn. **I, 2,** Fig. 3188)	0.11.0
51,943. **Centrifugal Railway,** with small loading carriage, Figure	1.10.0

Cl. 5523, 3852, 598, 600, 593, 5597.

Max Kohl A. G. Chemnitz, Germany.

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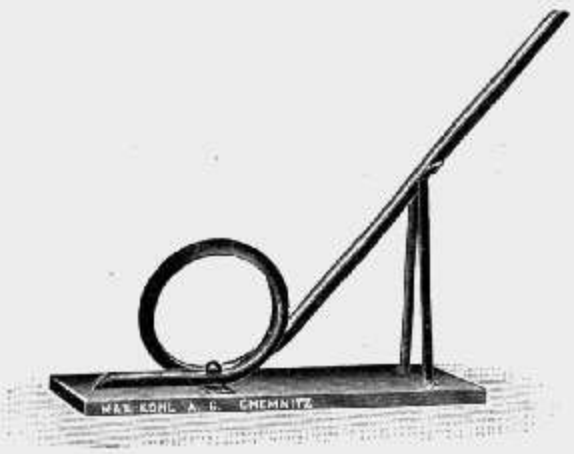
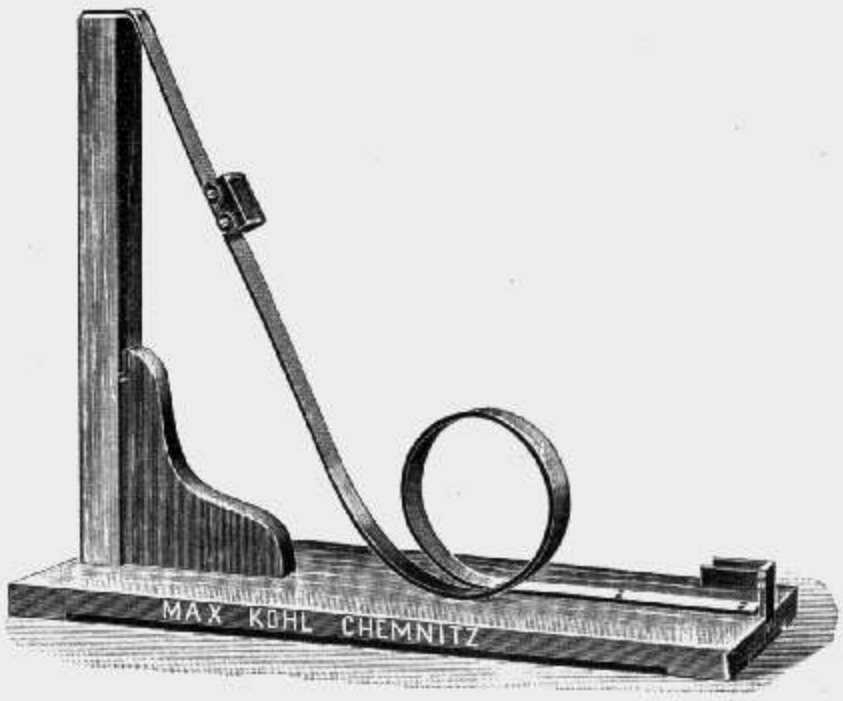
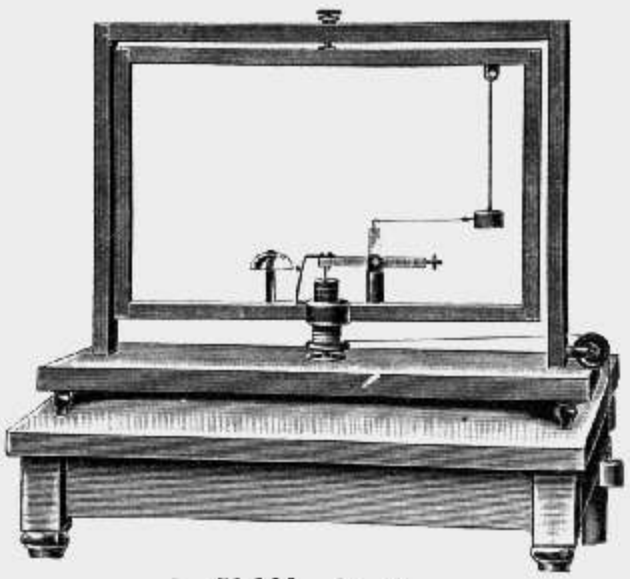


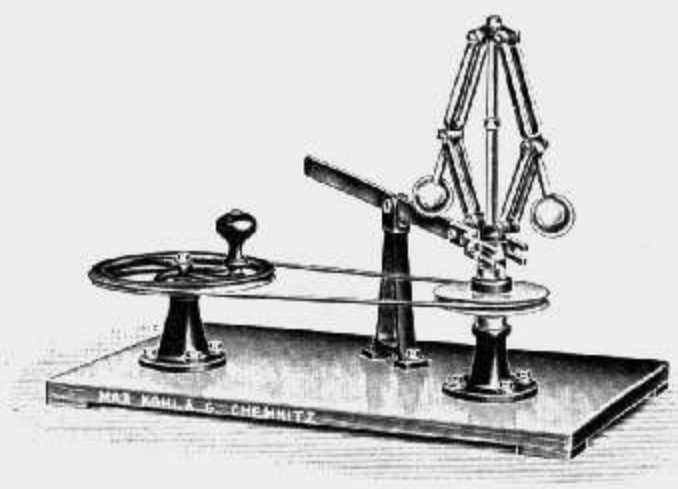
51 942. 1 : 13.



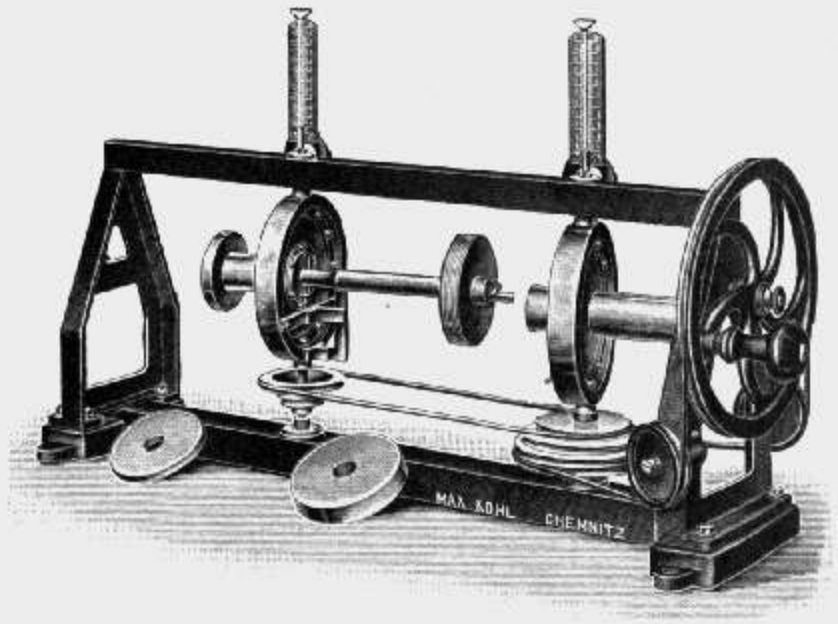
51 943. 1 : 10.



51 944. 1 : 11.



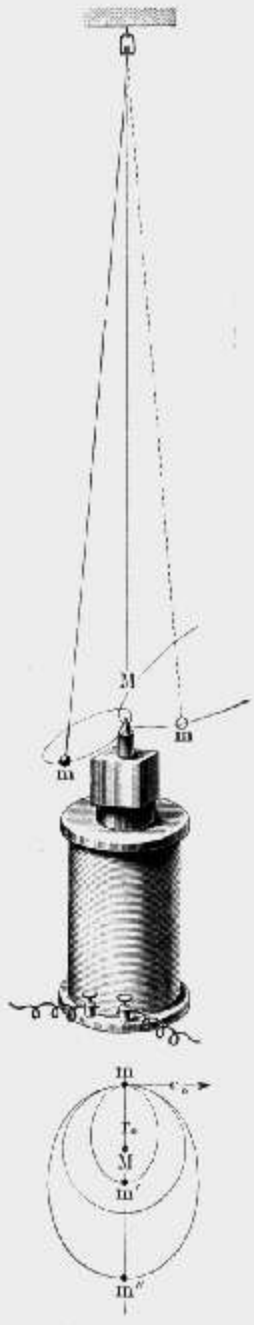
51 946. 1 : 12.



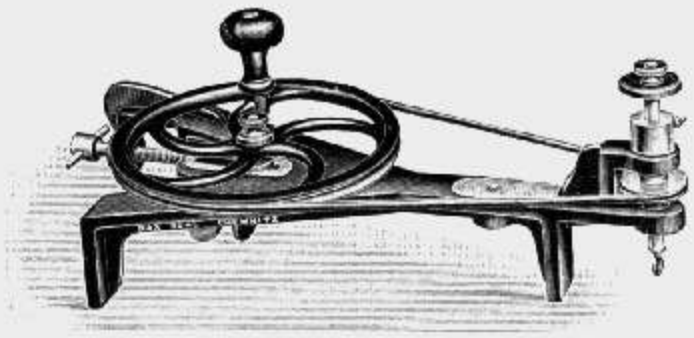
51 945. 1 : 10.

	£ s. d.
51,944. **Apparatus** (Schleiermacher's), Figure, for showing that the centrifugal force is inversely proportional to the square of the speed (M. P., 9th Edn., **I**, Fig. 135; Fr. phys. Techn. **I, 2**, Fig. 3267 (I, 446])	2.15.0
51,945. **Centrifugal Force Apparatus** (Bruno's), Figure, for introduction to the relations between Force, Mass and Acceleration (Vierteljahresberichte des Wiener Vereins zur Förderung des physikal. u. chem. Unterrichts, **X**, **4** (1905); Ztschr. f. d. phys. u. chem. U. **19**, 1906, p. 299)	21. 0.0
An accurately measuring apparatus for determining the centrifugal force.	
51,946. **Regulator Model** (as suggested by Prof. Eugen Meyer), Figure, for proving the surface law, specially suitable for demonstrating the increase of angular velocity with decreasing moment of inertia (Z. d. V. d. I., 1909, p. 1301 et seq., No. 15, Fig. 45 on text-sheet 16)	9. 0.0
51,947. **Centrifugal Apparatus** for 2 samples (M. T., p. 72), with glasses and screw clamps	1. 2.0

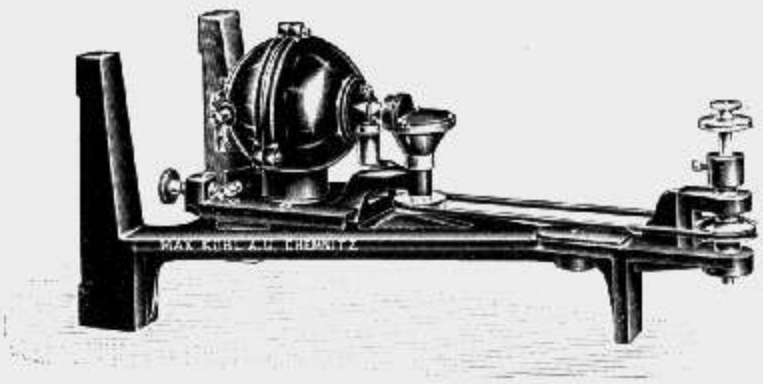
Cl. 5735, 3316, 642, 5554, 5050.



51948. 1 : 5.



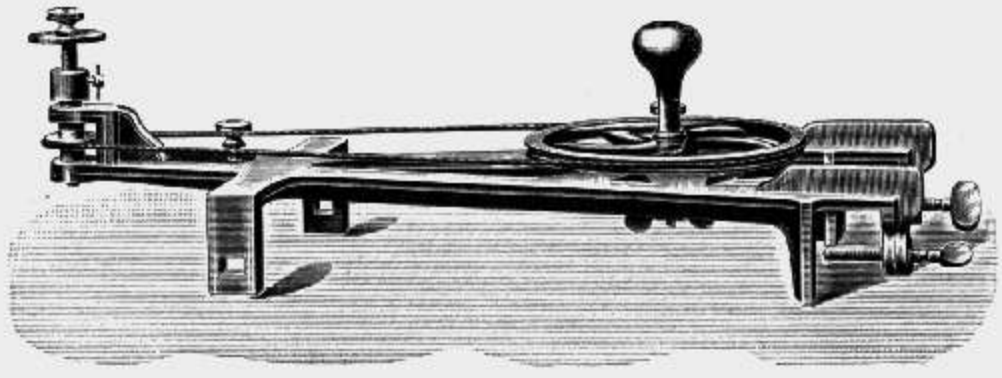
51949 A. 1 : 9.



51952. 1 : 8.



51949 B, 52043. 1 : 6.



51959. 1 : 8.

51,948. **Central Force Electromagnet and Iron Ball,** the latter arranged for suspension, Figure (M. P. **I**, Fig. 125) . . . . . £ s. d. 1. 15. 0

If the pendulum is moved from the position of rest and then simply released, it swings to and fro in a straight line; if it is submitted to a slight lateral motion, it describes an ellipse, the most distant focus of which lies over the point of the magnet. If the lateral motion is stronger, circular motion results, and if still greater, elliptic motion again takes place, and the tip of the magnet lies below the nearest focus.

Whirling Tables and Accessory Apparatus.

The machines have a massive iron frame, and they can be used both horizontally and vertically; in the latter case they are screwed on to the table. The rotating parts are most carefully constructed; the axis being most accurately machined and ground in so as to run quite true. Each of the pieces of auxiliary apparatus made by us fits every machine which we construct. If we are required to fit apparatus to whirling tables constructed by other makers, it is desired that the axis may be sent us, if the apparatus have only to be fitted to the axis. The frame is bored through laterally from the axis, this boring being provided with a thread for taking various devices on either side. There are supplied with the machines a disc with pin for inserting in the axis of the whirling table and with nut for fixing siren-discs, colour-discs, a stroboscopic cylinder, or the like to the lower end of the axis; also a hook at the lower end of the axis for suspending pendulums, etc.

Special attention may be directed to the larger Machines Nos. 51,959 et seq., which can be screwed horizontally to the table and thus admit of being employed in many different ways.

In order to show the many-sided uses of the whirling tables, the following apparatus, taken from all branches of physics, can be used with the tables, and we would remark specially that they mostly replace isolated apparatus, and are therefore much cheaper than the latter.

Cl. 5067, 5336, 5581, 4865, 644.

Max Kohl A. G. Chemnitz, Germany.

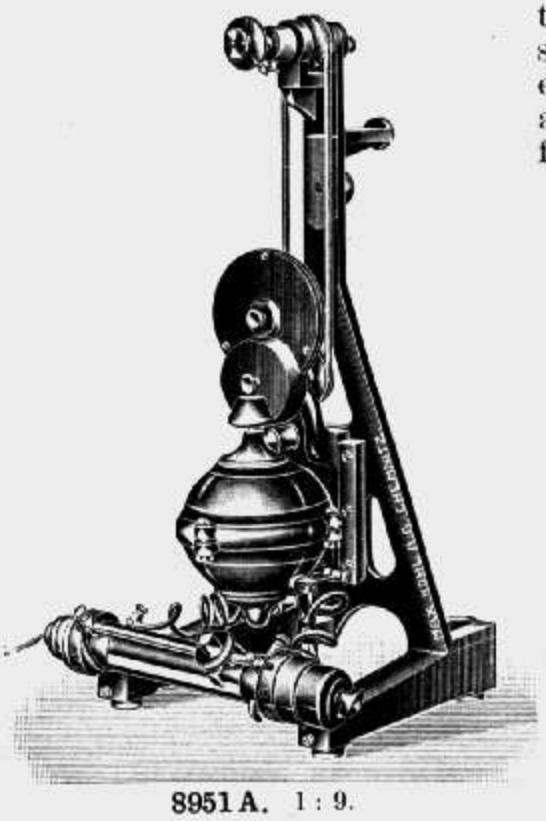
62nd Notice.

NEW! Whirling Table NEW!
with Electric Motor Drive and Double Wheel Gearing.

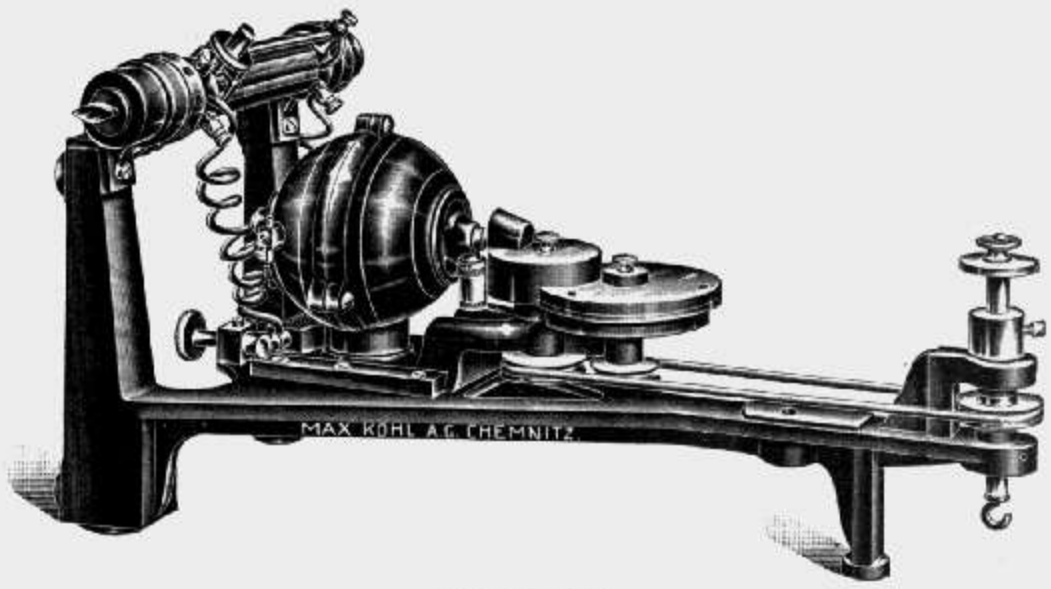
A. For Direct Current.

In the construction of this new pattern Whirling Table care has been taken that the revolutions of the machine can be altered within the widest limits without the power applied to the axis diminishing appreciably. In the case of hand-driven Whirling Tables the speed and power can be chosen at will. If, however, the whirling table is driven by an electric motor, it generally runs at too great a speed for most experiments. If the speed of the motor is decreased by inserting a resistance, the power applied to the axis is correspondingly reduced, and, in addition, the speed is influenced in various manners by friction. A satisfactory mode of driving is therefore unobtainable in this manner. These conditions are considerably ameliorated by our fitting the machine with a simple intermediate gearing which considerably decreases the speed of the motor. The machine, however, was only rendered perfect by fitting it with a **double** gearing. There are thus **two driving pulleys** running at different speeds at our disposal. The speed of the two pulleys is as 1 : 4.

The gearing of the motor axis on the first driving pulley is 3 : 10. The speed of the motor can be further regulated within wide limits by a controlling resistance. By selecting this arrangement it is possible to vary the speed of the whirling table between 30—1100 r. p. m. From numerous exhaustive experiments we have found that these limits suffice for all experiments. The wheels are constructed partly of "Vulcanfibre" with a view to reducing noise to a minimum.



8951 A. 1 : 9.



8951 B. 1 : 6.

The whirling table has a massive iron frame and can be used both vertically and horizontally. Fig. 8951 A shews the whirling table arranged vertically, ready for use and for taking a colour disc, siren discs, or the like; while Fig. 8951 B shews the machine placed horizontally. The rotating parts are constructed in the best possible manner; the axis is very carefully machined and ground in so as to run true. The arrangement of the axis and the fixing of the auxiliary apparatus are the same as before. Auxiliary apparatus already available fit this machine without any alteration.

The frame is bored out laterally to the axis, and is tapped for taking different devices on either one side or the other. A disc with pins for inserting in the axis of the machine, and with nut for fixing siren discs, colour discs, a stroboscopic drum, or the like, also a hook fitted to the lower end of the axis, for suspending pendulums, etc., are given in with each whirling table.

The **Electric Motor** is fixed to the frame of the whirling table by means of a slider. The slider can be moved by a screw, thus allowing the driving cord to be tightened or loosened. The regulating resistance, a switch and a plug box are firmly fixed on the frame. This arrangement combined everything necessary for working and the machine can be connected at once to the electric supply: it is only necessary to set up the machine where it is desired to use it, connect the current lead fitted to it to the electric supply with the aid of the plug contact, and the Whirling Table is ready for use. No further wire connections require to be made beforehand. The weight of the motor renders the machine so firm that it is only in exceptional cases necessary to screw it down to the lecture table. In order to ensure the machine a firmer position and to prevent scratching the lecture table, it is fitted with rubber feet.

Max Kohl A. G. Chemnitz, Germany.

The manipulation of the Whirling Table fitted with electric motor has been found to be most advantageous since the experimenter has both his hands free and does not require to remain in the immediate neighbourhood of the machine in order to explain the phenomena being demonstrated, but can even go to the blackboard.

The arrangement of this machine presents the further advantage that the motor can be used, without removing it from the stand, for driving the influence machine or other apparatus, and this at any speeds. Fig. 8951/60 435 shews an influence machine being driven.

The Whirling Table fitted with motor drive is manufactured in two sizes: Fig. No. 8951 shews the smaller pattern, which is sufficient for most experiments.

Whirling Tables with D. C. Electric Motor Drive, Figs. 8951 A and B and 8951/60 435; **small Pattern,** with electric motor, compound wheel gearing, regulating resistance, switch, plug contact and 2 metres flexible.

With D. C. Motor	Of HP	1/16	1/8	1/16	1/8
	Pressure, Volts	110	110	220	220
	List No.	**8951**	**8952**	**8953**	**8954**
	Price, £	**7. 0. 0**	**8. 0. 0**	**7. 10. 0**	**8. 10. 0**

If the pressure is different from above the prices are varied accordingly.

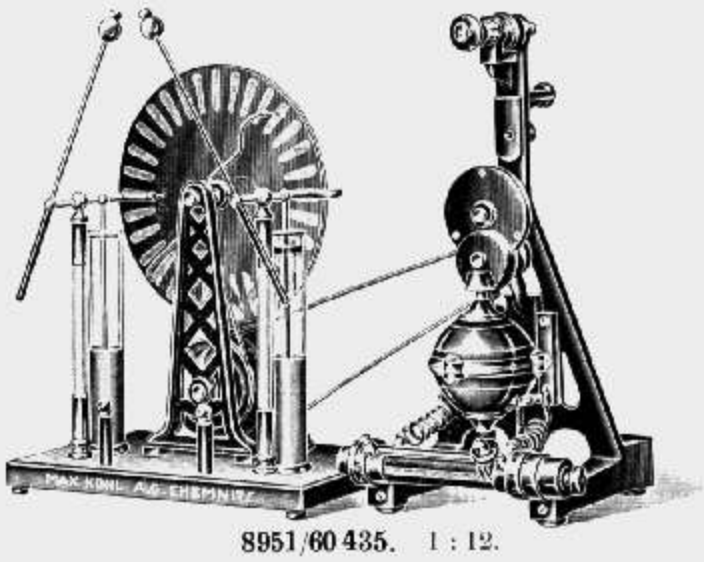
Large Whirling Tables with D. C. Electric Motor Drive, with electric motor, compound wheel gearing, regulating resistance, switch, plug contact and 2 m flexible, for connecting up to **Direct Current.**

With D. C. Motor	Of HP	1/16	1/8	1/16	1/8
	Pressure, Volts	110	110	220	220
	List No.	**8961**	**8962**	**8963**	**8964**
	Price, £	**8. 0. 0**	**9. 0. 0**	**8. 10. 0**	**9. 10. 0**

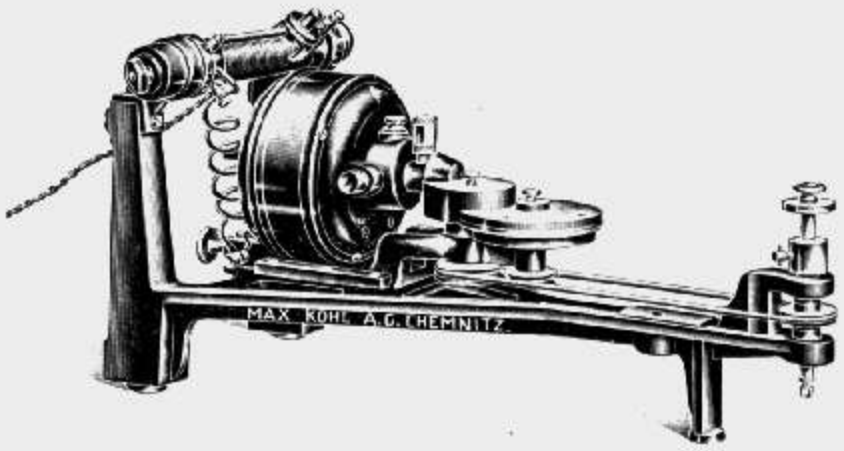
The prices are proportionately changed when the pressure varies.

B. For Alternating and Three-phase Current.

From the point of view of construction the Whirling Tables having Alternating Current Motors do not differ in any way from those for Direct Current. The special nature of the A. C. motors does not, however, allow quite such a wide degree of variation in speed as the D. C. motor. For this reason and, more especially, because in the case of the A. C. motors, the power decreases with diminution in speed, it is desirable to give the preference to a Whirling Table with D. C. motor in all cases in which Direct Current is available or can be easily provided.



8951/60 435. 1 : 12.



8965. 1 : 8.

Fig. 8965 shews a Whirling Table driven by Alternating Current. The speed can be varied from about 80—1000 r. p. m.

On three-phase networks A. C. motors are also used, being connected up to one phase only. This is permitted by most electricity works in view of the low efficiency of the motor in question.

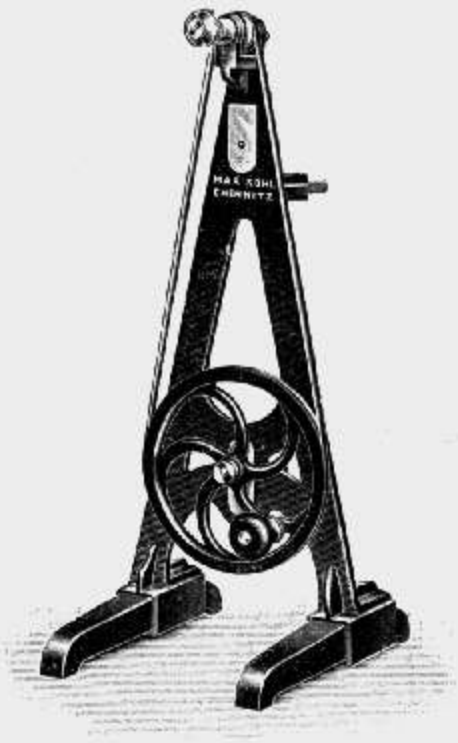
Whirling Tables with A. C motor drive, Fig. 8965; **small Pattern,** with electric motor, compound wheel gearing, regulating resistance, switch, plug contact and 2 metres flexible, for connecting up to an A. C. network or to **one** phase of a three-phase supply.

With **A. C. Motor,** Frequency 50 (100 pole alternations per second)	Of HP	1/10	1/10
	Pressure, Volts	110	220
	List No.	**8965**	**8966**
	Price, £	**9. 10. 0**	**10. 0. 0**

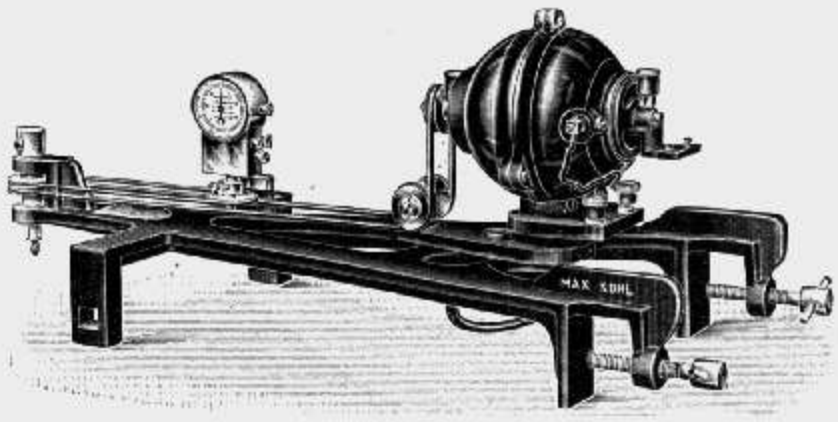
Large Whirling Tables with A. C. Motor Drive, with electric motor, compound wheel gearing, regulating resistance, switch, plug contact and 2 metres flexible, for connecting up to an A. C. network or to one phase of a three-phase supply.

With **A. C. Motor** Frequency 50 (100 pole alternations per second)	Of HP	1/10	1/10
	Pressure, Volts	110	220
	List No.	**8967**	**8968**
	Price, £	**10. 10. 0**	**11. 0. 0**

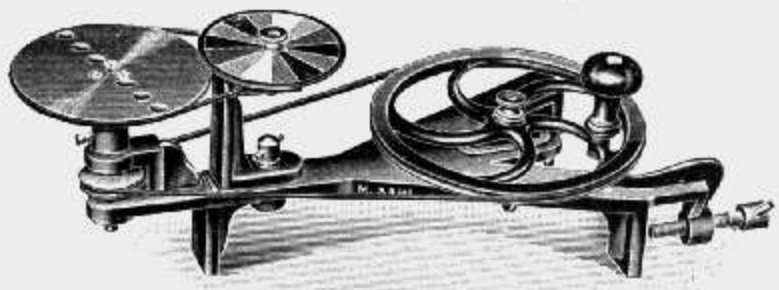
Max Kohl A. G. Chemnitz, Germany.



51 960. 1 : 11.



51 962, 51 971. 1 : 10.



51 969, 51 949, 51 975, 52 035. 1 : 7.

51,949. **Whirling Table,** for hand drive, Figs. A and B, small pattern (W. D., Fig. 75 A; Fr. phys. Techn. **I**, 2, Fig. 3195) . . . . . £ 1.15.0

51,950. — idem, with 3-stage Pulley (M. T., p. 66) . . . . . £ 2. 2.0

Whirling Tables, driven by Electric Motor, Figure, small pattern, with plug contact and 2 m flexible.

With **D. C. Motor** and Regulator-Starter	of HP	1/16	1/8	1/16	1/8
	Pressure	110	110	220	220 Volts
	List No.	**51,951**	**51,952**	**51,953**	**51,954**
	Price £	**6. 10. 0**	**8. 0. 0**	**6. 15. 0**	**8. 5. 0**
With **A. C. Motor,** Frequency 50~, without Starter	of HP	1/16	1/8	1/16	1/8
	Pressure	110	110	220	220 Volts
	List No.	**51,955**	**51,956**	**51,957**	**51,958**
	Price £	**6. 15. 0**	**8. 5. 0**	**7. 0. 0**	**8. 10. 0**

If pressure and current differ from above the prices vary to correspond.[1])

51,959. **Large Whirling Table,** Figure, with massive frame, length: 80 cm, width: 37 cm, with two screw clamps on the frame for firmly clamping the machine in a vertical position. A clamp for clamping the table in a horizontal position is given in . . . £ 3. 0.0

51,960. — idem, with wide feet, Figure, for standing upright on the table instead of clamping; can also be used horizontally . . . . . £ 3. 5.0

Large Whirling Table, with Electric Motor Drive, Figure, length: 80 cm, width: 37 cm, with 2 screw clamps on the frame for firmly clamping in a vertical position; a screw clamp for horizontal clamping is given in.

With D. C. Motor, without Tachometer, but with Regulator Starter	of HP	1/16	1/8	1/16	1/8
	Pressure	110	110	220	220 Volts
	List No.	**51,961**	**51,962**	**51,963**	**51,964**
	Price £	**7. 15. 0**	**9. 5. 0**	**8. 0. 0**	**9. 10. 0**
With A. C. Motor, Frequency 50~, without Tachometer or Starter	of HP	1/16	1/8	1/16	1/8
	Pressure	110	110	220	220 Volts
	List No.	**51,965**	**51,966**	**51,967**	**51,968**
	Price £	**8. 0. 0**	**9. 10. 0**	**8. 5. 0**	**9. 15. 0**

If the current and voltage differ from those given the prices undergo a corresponding alteration.[1])

The illustration no longer shows the actual construction: the transmission of motion from the horizontal to the vertical axis is effected by a bevel gear system with gearing on the low speed and with a simple cord drive.

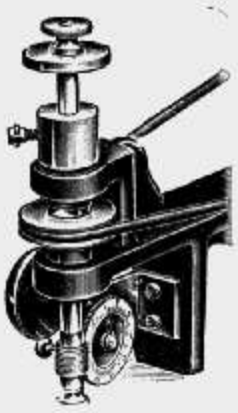
51,969. **Cord Gear,** for rapidly rotating **Colour Discs** and the like, suitable for whirling tables Nos. 51,949—51,958 and 51,959—51,968, cf. Fig. 51,969; without colour discs or whirling table . . . . . £ 1. 0.0

The illustration shows that the larger cord pulley of Apparatus No. 51,975 is used as well. This apparatus is not included in the preceding price.

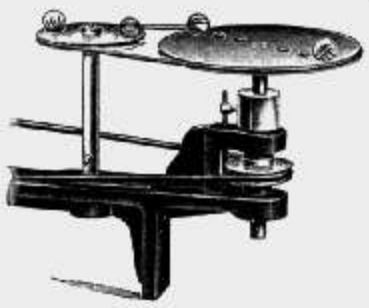
[1]) Existing whirling tables with A. C. motors can be used on 3-phase networks by using only two leads.

Cl. 5207, 5064, 4179.

Max Kohl A. G. Chemnitz, Germany.



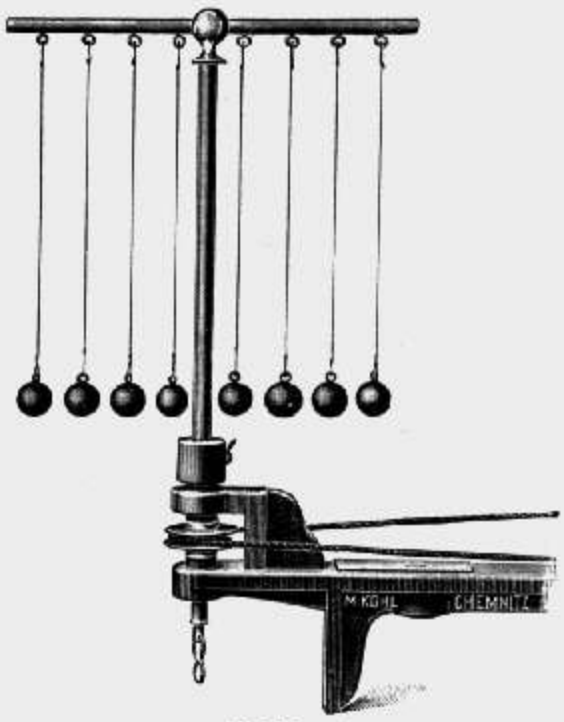
51970. 1 : 5.



51975. 1 : 7.



51976. 1 : 8.



51980. 1 : 5.



51972. 1 : 8.



51982. 1 : 7.



51977. 1 : 10.



51978. 1 : 7.

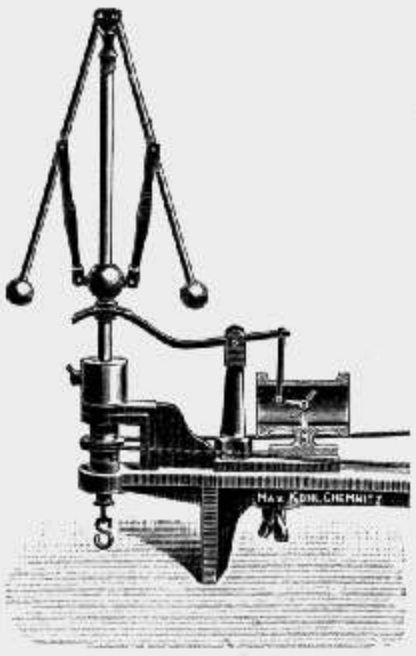


51979. 1 : 10.

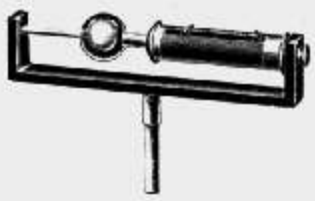
Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
51,970. **Counting Mechanism,** Figure, fitted to the preceding whirling tables; after every 100 revs. this device rings a bell	0.15.0
The above price only holds good when the counter is ordered at the same time as the whirling table. If required afterwards, the price is increased.	
51,971. **Tachometer,** Fig. 51,962, fitted to the whirling table; this instruments always shows the momentary r. p. m.	6.15.0
51,972. **Electric Motor,** Figure, rotating on base with floor stand, with attachment for using it as a whirling table; with cord pulley for driving stirrers, electrolytic stands, etc. For 110 volt D. C., $^1/_8$ HP	7. 0.0
51,973. — idem, for **220 volt D. C.**	7. 5.0
Prices quoted on application for other kinds of current and voltages.	
51,974. — idem, with belt pulley instead of the cord pulley . . . . . **Extra**	0. 5.0
51,975. **Centrifugal Apparatus,** Figure, for showing: (1) that the centrifugal force increases with the speed of rotation, and that it is greater with the same speed and with large radius of rotation than with small; (2) that the centrifugal force at the same speed is greater the smaller the radius of rotation (W. D., Fig. 82 B [75 B]; Fr. phys. Techn. **I, 2,** Fig. 3219)	0.18.0
51,976. **2 Cylinders of Wood and Cork,** in iron frame, Figure (W. D., Fig. 76), Double-star Apparatus	0. 6.0
51,977. **2 Brass Balls,** Figure, whose masses are as 1 : 2, in iron frame (Fr. phys. Techn. **I, 2,** Fig. 3216)	0. 7.0
51,978. **Cup and Ball** (August's): Glass cup with balls of equal diameter but different weights, Figure (W. D., p. 101 [93]; Fr. phys. Techn. **I, 2,** Fig. 3220; M. T., p. 71) . . .	0. 6.0
51,979. — idem, with semi-circular trough, Figure (W. D., p. 101 [93]; Fr. phys. Techn. **I, 2,** Fig. 3221)	0. 7.0

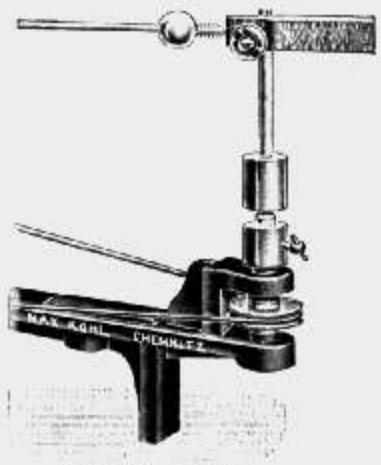
Ci. 5401, 5394, 5397, 5742, 3317, 4687, 5324, 5718, 5323.



51983. 1 : 6.



51985. 1 : 6.



51987. 1 : 6.



51990. 1 : 10.



51996. 1 : 6.



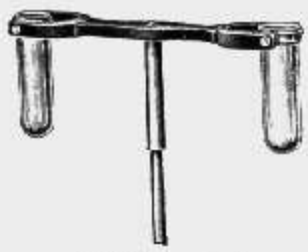
51993. 1 : 8.



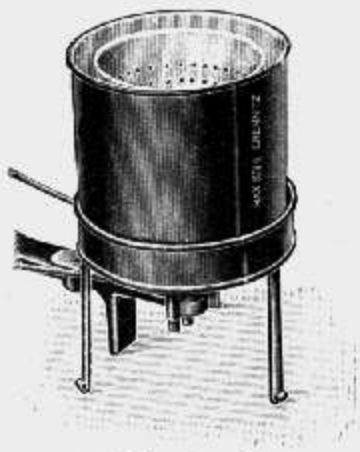
51997. 1 : 6.

Max Kohl A. G. Chemnitz, Germany.

		£ s. d.
51,980.	**Whirling Apparatus with 8 Spherical Pendulums,** for showing that the centrifugal force increases with speed of rotation, and is higher when the radius of rotation is large than when small, the time of run being the same in both cases	0.10.0
51,981.	**Pendulum Race** (Fuchs'), with double-cord pendulums of various lengths, the balls of which are always raised to the same height (Ztschr. f. d. phys. u. chem. U., **16**, 1903, p. 343; Fr. phys. Techn. **I**, **2**, Fig. 3222)	0.10.0
51,982.	**Watt's Pendulum,** Figure (W. D., p. 101 [93])	0.11.0
51,983.	**Watt's Ball Governor,** with a complete throttle flap valve, in section, Figure (M. T., p. 71)	1. 8.0
51,984.	**Angle Lever Apparatus** (Fr. phys. Techn. **I**, **2**, Fig. 3203 [I, Fig. 426])	0.16.6
51,985.	**Spring Balance,** for showing the strength of centrifugal force, Figure (Fr. phys. Techn. **I**, 2, Fig. 3200)	0.15.0
51,986.	— idem, Hartl's, for **measuring** the centrifugal force (Ztschr. f. d. phys. u. chem. U., **10**, 1897, p. 123; Fr. phys. Techn. **I**, **2**, Fig. 3204)	2.10.0
51,987.	**Centrifugal Balance,** Figure	0.18.0
51,988.	— idem (Friedr. C. G. Müller's) (M. T., Fig. 39), with variable centrifugal mass and rule for measuring the radius of swing	1.12.0
51,989.	**Emery Disc for hardness tests:** can also be used for grinding small tools (M. T., p. 51)	0. 6.0
51,990.	**Flattening Ring,** Figure (W. D., p. 102 [93])	0. 7.0
51,991.	**Sphere of Glycerine Clay,** with suspension (W. D., Fig. 84 [77]; M. T., p. 71) . .	0. 6.0
51,992.	**Apparatus** for showing the oblateness of a sphere of oil and Saturn's ring . . . . This apparatus is well adapted for showing the flattening of plastic rotating bodies.	1. 0.0
51,993.	**Glass Vessel for Mercury and Coloured Water,** Figure (Fr. phys. Techn., 6th Edn., **I**, Fig. 546; M. T., p. 70)	0. 4.0
51,994.	**Glass Balloon** for hanging on the lower end of the axis . . . . . The vessel is filled with water and closed with a sheet of cardboard, the air-pressure preventing its escape. On rotating the balloon the cardboard can be taken away without any of the water escaping.	0. 4.0
51,995.	**Cylindrical Attachment,** with rule: can be used as a tachometer (M. T., p. 69) . .	0. 5.0
51,996.	**Angle with 2 obliquely placed tubes** for mercury and coloured water, Figure (Fr. phys. Techn., 6th Edn., **I**, Fig. 545; M. T., p. 70)	0. 7.6
51,997.	**Siphon,** with marking rings, Figure (M. T., Fig. 41)	0. 9.0
51,998.	**Attachment with 3 disconnected tubes** (M. T., Fig. 42)	0.12.0



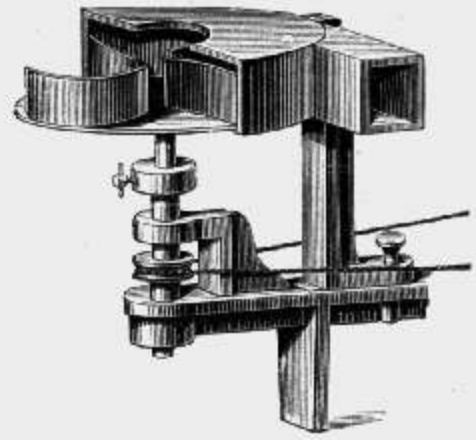
51 999. 1 : 7.



52 000. 1 : 10.



52 002. 1 : 6.



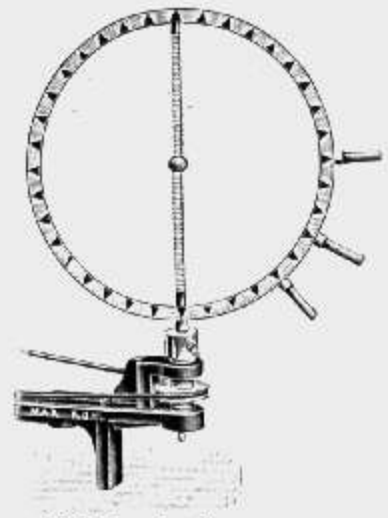
52 003. 1 : 5.



52 008. 1 : 12.



52 009. 1 : 5.

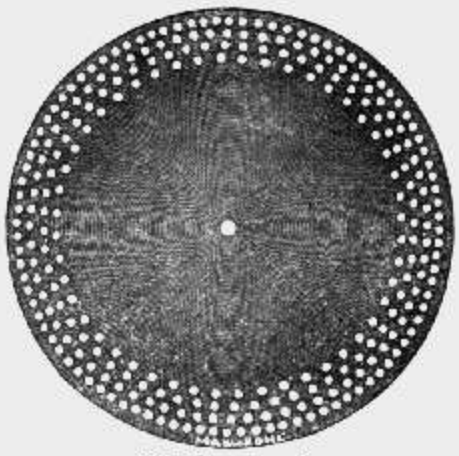


52 015. 1 : 8.

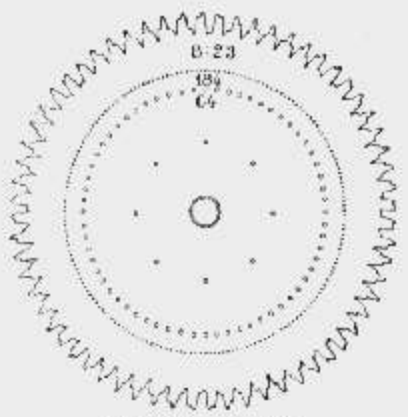
	£ s. d.
51,999. **Apparatus** (Bertram's) for clearing cloudy liquids by rotation, Figure (M. T., p. 72) The 2 glass vessels are placed horizontally during rotation.	0.10.0
52,000. **Model of a Draining and Drying Apparatus,** on the centrifugal principle, Figure	0.15.0
52,001. — idem, (Hartl's), with glass protecting cylinder (Ztschr. f. d. phys. u. chem. U., **10,** 1897, p. 125; M. T., p. 72)	1. 5.0
52,002. — idem, consisting of glass globe and wire netting, Figure	0.12.0
52,003. **Model of Ventilator,** Figure (W. D., Fig. 86 [79]), with vane wheel	0.11.0
52,004. — idem, better construction, one wall glazed	1. 5.0
52,005. **Centrifugal Pump** and **Centrifugal Blower** (Hartl's) (Ztschr. f. d. phys. u. chem. U., **10,** 1897, p. 125)	2.15.0
52,006. **Wind Vane and Wind Wheel** (Friedr. C. G. Müller's), for demonstrating the **Propeller Fan;** the wind vane is to be placed on the whirling table and sets the ventilator in motion (M. T., p. 38)	0. 9.0
52,007. **Apparatus for Stable and Unstable Axes** (Hartl's), masses adjustable, for varying the centre of gravity and moment of mass (Ztschr. f. d. phys. u. chem. U., **10,** 1897, p. 122; Fr. phys. Techn. **I, 2,** Fig. 3224, 3225)	2. 0.0
52,008. **Apparatus for Free Axes,** Figure (W. D., Fig. 87 [80])	0.12.0
52,009. **Bohnenberger's Machine,** Figure, improved by Poggendorff, for placing on the whirling table (M. T., p. 72)	1. 7.0
52,010. **Apparatus** (Sire's) **for showing, that rotational motions can generate successive motions,** consisting of a top suspended as a pendulum: for the whirling table (Fr. phys. Techn. **I, 2,** Fig. 3252)	1.10.0
52,011. — idem, Koppe's (Ztschr. f. d. phys. u. chem. U., **4,** 1890, p. 77; Fr. phys. Techn. **I, 2,** Fig. 3253)	0.18.0
52,012. **Ring with Hook,** for suspending from the lower end of the axis by a cord (W. D., Fig. 88 [81]; M. T., Fig. 44)	0. 1.9
52,013. **Rod with Hook,** also for suspension	0. 1.3
52,014. **Pendulum** with dissymmetrical system of masses (M. T., Fig. 40)	0. 4.0

Cl. 5756, 5838, 5729, 855, 5727, 5327, 4965.

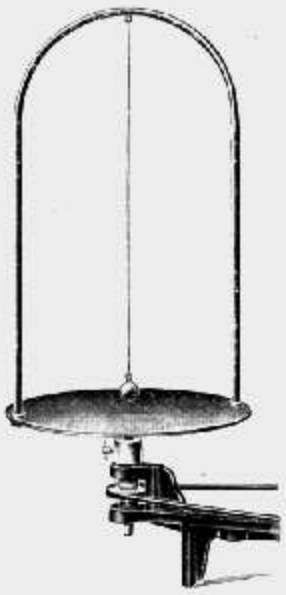
Max Kohl A. G. Chemnitz, Germany.



52021. 1 : 5.



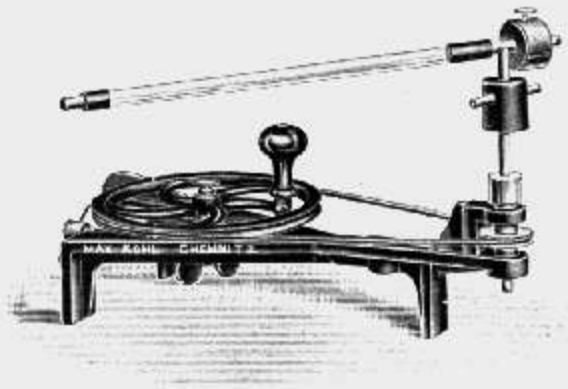
52025. 1 : 10.



52017. 1 : 9.



52028. 1 : 8.



52030. 1 : 9.

Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
52,015. **Apparatus** (Eisenlohr's) **for showing that the rotation of the plane of oscillation of Foucault's pendulum is proportional** to the sine of the geographical latitude; for placing on the whirling table (W. D., Fig. 95 [88])	1. 5.0
52,016. **Pendulum Ball,** painted half black and half yellow, for proving the conservation of the plane of oscillation, Foucault's experiment (W. D., p. 117 [108]), for hanging on the lower end of the axis of the whirling table	0. 1.6
52,017. **Pendulum for Foucault's Experiment,** Figure, with stage and suspension clip .	1. 0.0
52,018. **5 Stroboscopic Discs,** with black and coloured moving images	0. 6.0
52,019. **Stroboscopic Cylinder** (Quincke's) with 1 set paper strips, for demonstrating pendulum oscillations, longitudinal and transverse oscillations, vibrations of ether particles, the reflection of cord undulations, vibrations of strings and air strata in pipes, the vibrations of liquid particles and of successive transverse waves	0.14.0
52,020. **Strips alone**	0. 6.0
52,021. **Siren-Disc,** of metal, with 4 rows of holes, giving the major chord when blown, Figure, without whirling table	0. 5.0
52,022. — idem, with 8 rows of holes, giving the major or minor common chord, or, if specially desired, the chromatic scale	0. 7.0
52,023. — idem, with 4 rows of holes pierced obliquely	0. 9.0
52,024. **Wave Siren-Disc** (König's), in disc form	0.15.0
A wave line, formed by the algebraic addition of 4 sine curves, receives a current of air from a slotted aperture, the air being made to vibrate as if 4 tones were sounded simultaneously. The human ear then separates this compound form of vibration into its constituents in such manner that prima, third, fifth and octave are separately heard.	
52,025. **Wave Siren-Disc** (König's), large pattern, of brass, Figure, in various tone ranges **Each**	3. 6.0
52,026. **Siren-Disc** (Oppelt's)	0.16.0
52,027. **Siren-Disc** (Appunn's)	3. 6.0
For complete data regarding siren-discs, see Acoustics Section.	
52,028. **Savart's Toothed Wheels,** 4 wheels mounted on one axis, giving a chord. Wheels of zinc, Figure.	0. 9.0
52,029. — idem, with brass wheels	0.12.0
52,030. **Apparatus for proving Doppler's principle,** Figure, as suggested by van Gulik (Ztschr. f. d. phys. u. chem. U., **14**, p. 288), without whirling table	0.13.0



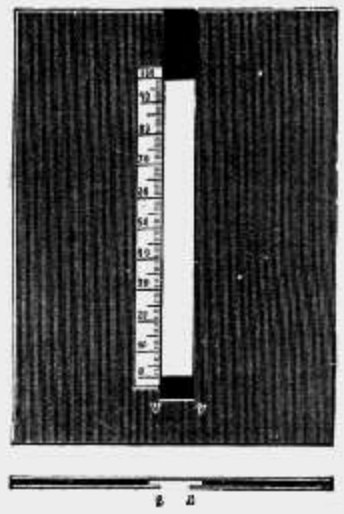
52 031. 1 : 7.



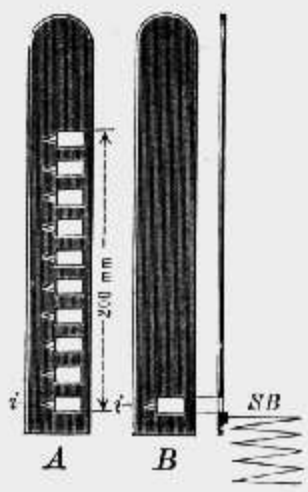
52 038. 1 : 6.



52 040. 1 : 6.



52 041 A. 1 : 6.



52 041 B. 1 : 6.



52 045. 1 : 7.



52 046. 1 : 10.

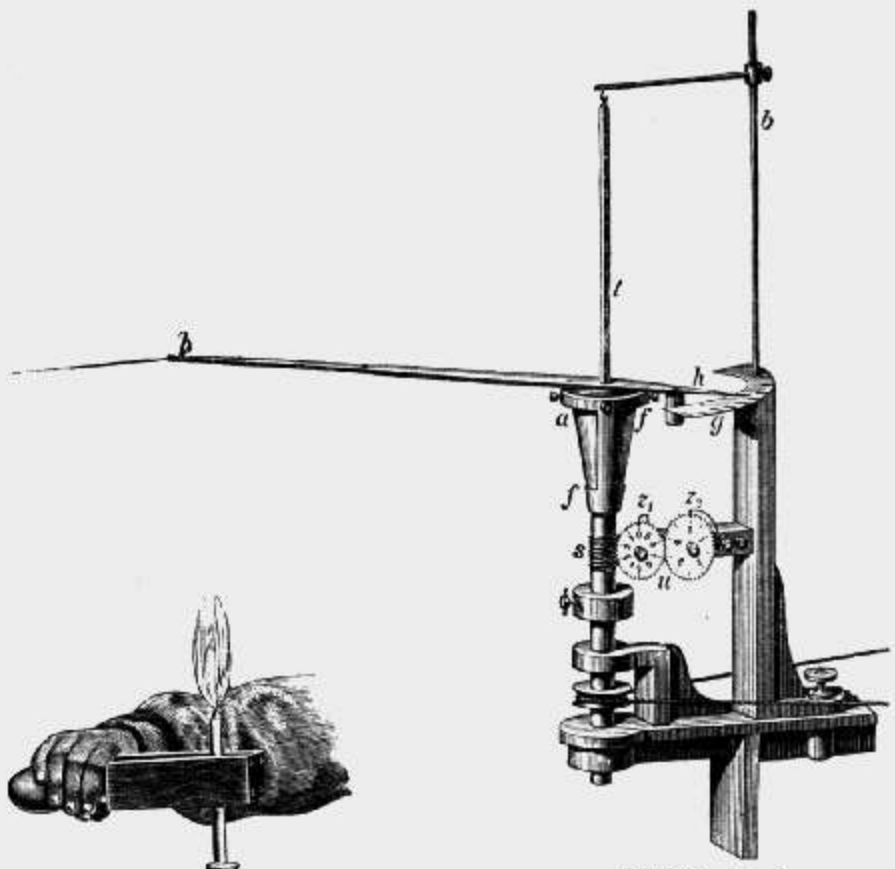
	£ s. d.
52,031. **Rotating Mirror Box,** 120 mm side of cube, for analysing acoustic flame images, see Figure, without gas-flame manometer	0.13.0
52,032. **Rotating Mirror** (Reichert's), with only one obliquely placed mirror (M. P. **I**, Fig. 648[675])	0.16.0
52,033. **Gas Flame Manometer** with rotating Burner, with rubber hose and sound glass, can be used for flame images without mirror (cf. W. D., Fig. 243 [229]), for the whirling table	1. 4.0
52,034. **1 Set Colour Discs,** 7 different single-colour discs and 1 with the 7 spectrum tints The single-colour discs are cut out radially as suggested by Maxwell, so as to mix the coloured lights.	0. 5.0
52,035. **Colour Disc** with the 7 spectrum colours, painted as clearly as possible on a metal disc, giving white when rotated, size 120 mm, see Fig. 51,969	0. 4.0
52,036. — idem, size 250 mm	0. 6.0
52,037. **Disc Apparatus** for alternating mixed colours, for the whirling table . . . . . The colours of a sector disc can be exposed to any proportion by circular sections cut out of a pasteboard disc, and be mixed by rotating.	0. 8.0
52,038. **Coloured Convex Surface** (or Cylinder) (Kolbe's), Figure, serving as complement to the colour discs (Ztschr. f. d. phys. u. chem. U., **8,** 1894/95, p. 243), without wood cone (see No. 52,040) . . . . . **Each**	0. 0.8
52,039. **14 Colour Cylinders** (Kolbe's), all different, without wood cone (see No. 52,040). .	0. 8.0
52,040. **Wood Cone with pins,** Figure, fitting the whirling table	0. 4.0

Cl. 5687, 661, 662, 663, 664, 5723, 5395.

Max Kohl A. G. Chemnitz, Germany.



52 047. 1 : 6.

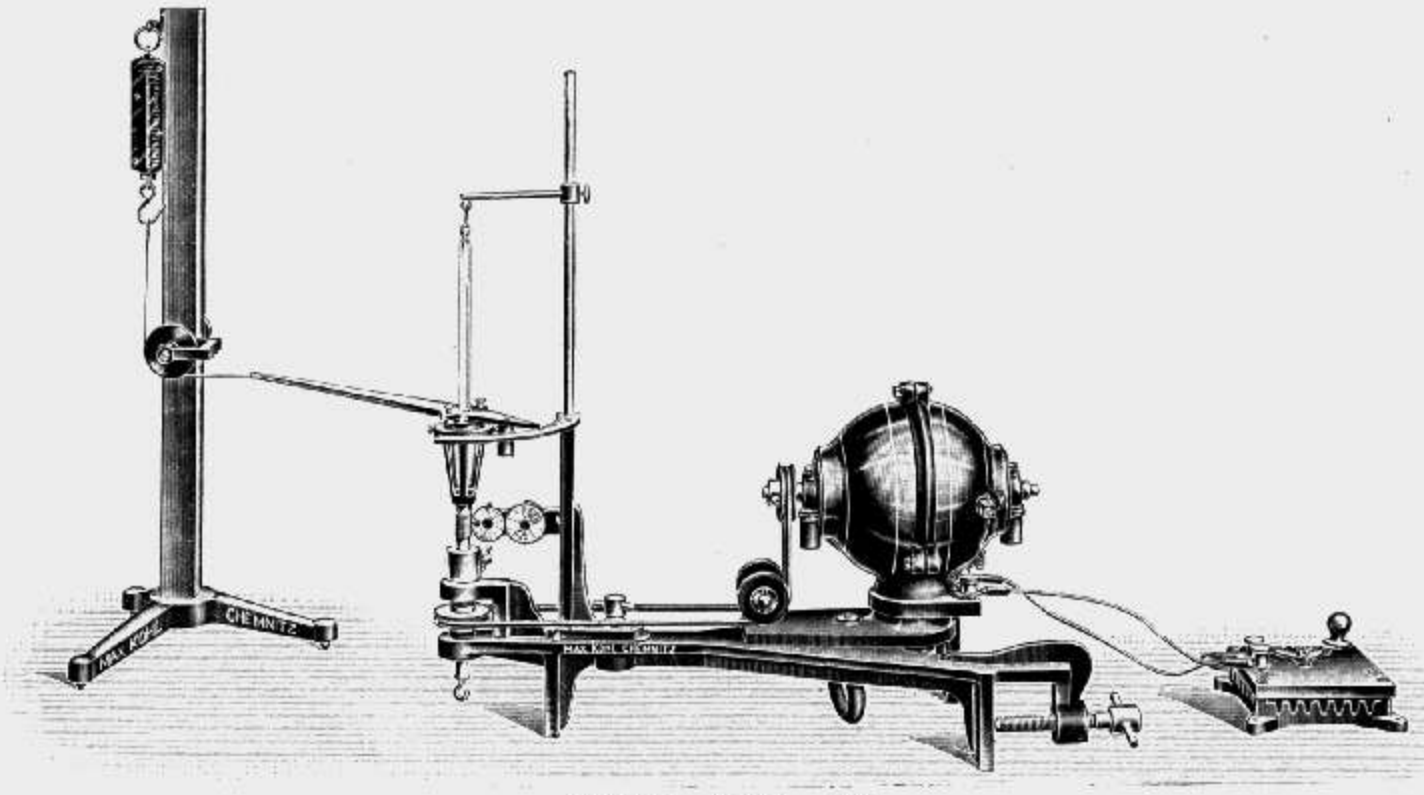


52 050. 1 : 5.

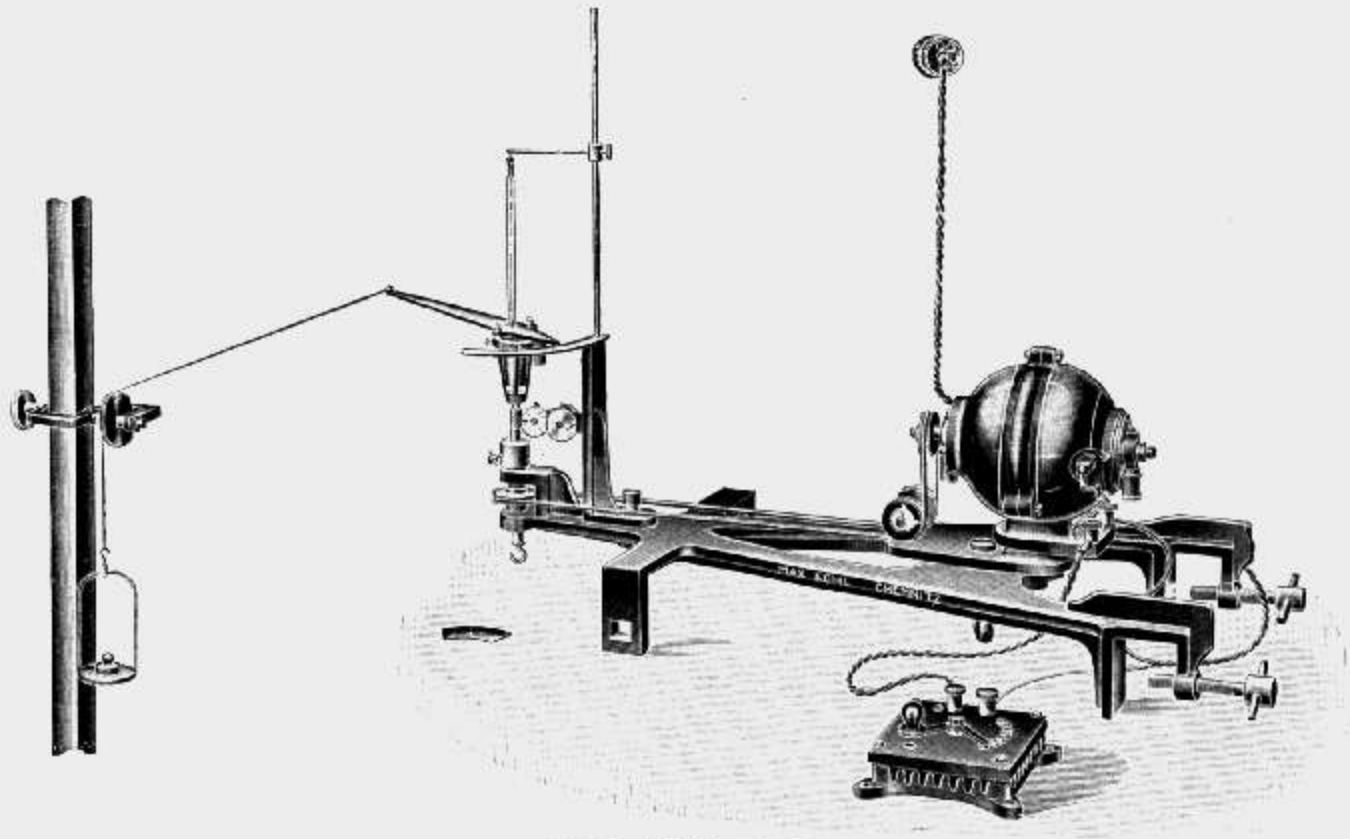
52 049. 1 : 8.

Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
52,041. **Screen of Bristol Board,** graduated, Fig. A, and with 2 sliders, Fig. B, on adjustable stand	0. 9.6
52,042. — idem, without stand	0. 4.6
52,043. **Oscillating Prism,** Fig. 51,949 B, p. 278, for mixing the spectrum tints (M. P., 8th Edn., **II, 1,** Fig. 137), the prism being 60×30 mm. Price, without whirling table	1. 5.0
52,044. — idem, 70×35 mm	1.10.0
52,045. **Glass Globe** with a solution of Glycerine and Soap (as suggested by Eisenlohr), Figure (Fr. phys. Techn., 6th Edn., **II,** p. 788), for demonstrating Newton's rings of thin liquid films The glass globe should be slightly warmed before the experiment is made until large soap films form when it is shaken. One of these films is introduced into the upper half of the glass vessel so that it is vertical to the axis; if now the globe is carefully rotated by means of the whirling table the film referred to shows the colour rings in a very beautiful manner.	0. 7.0
52,046. **Phosphoroscope** (Becquerel's), Figure (M. P., 9th Edn., **II, 1,** Fig. 257), with stand and universal clamp for firmly fixing the various bodies	2. 0.0
52,047. **Polarisation Apparatus,** Figure, for demonstrating the properties of polarised light, for the whirling table (M. P., **II, 1,** Fig. 671 [634])	1.10.0
52,048. **Apparatus for boiling by friction water, alcohol** or ether (W. D., Fig. 417 [393])	0. 5.0
52,049. — idem, with arrangement for igniting the vapour of the alcohol, Figure	0. 6.0
52,050. **Apparatus** (Puluj's) for determining the mechanical equivalent of heat, Figure, with a thermometer divided in $^1/_{10}{}^0$ and a screw clamp with pulley, for setting on the whirling table (W. D., Figs. 418—421 [394—397]) The inner cone is completely insulated by ivory rings. The apparatus is constructed in a thorough manner, and the experiment can be made with great accuracy.	5. 5.0
52,051. — idem, **with Whirling Table**	7. 0.0



52 052 A — 52 054. 1 : 8.

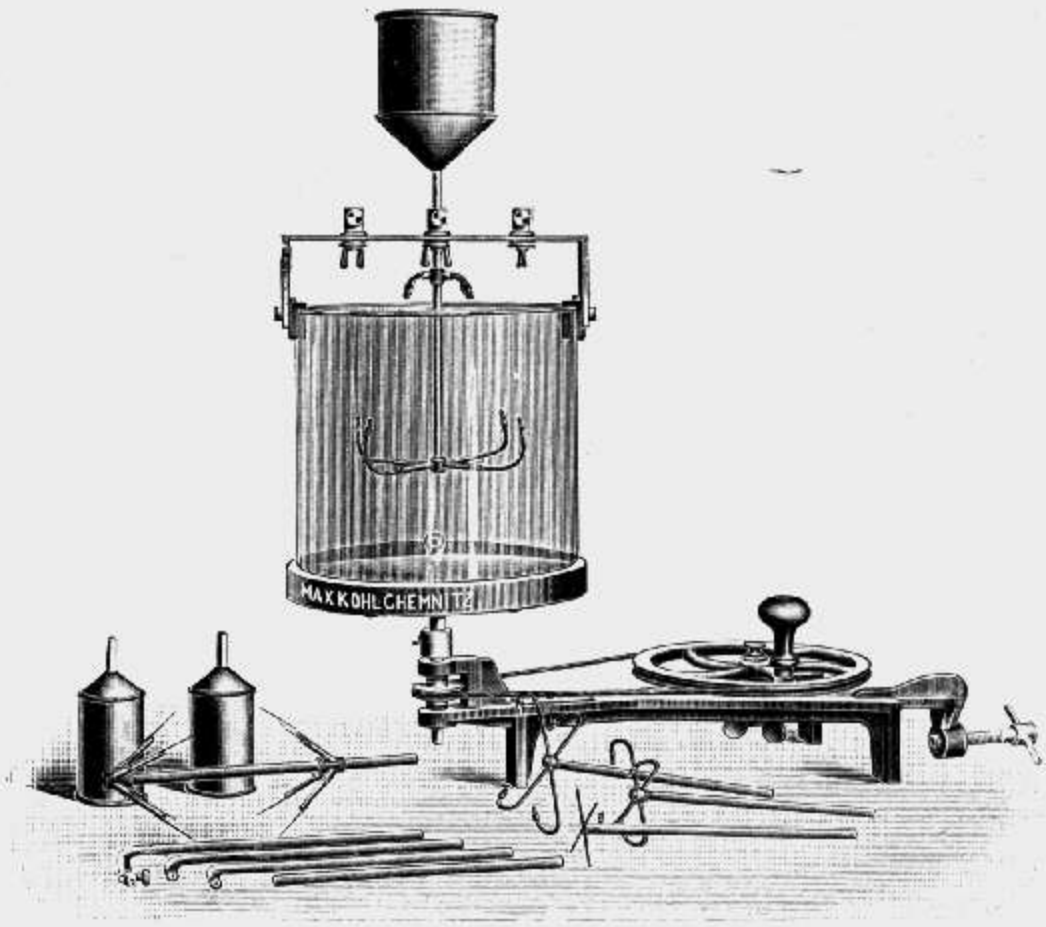


52 052 B, 52 055. 1 : 10.

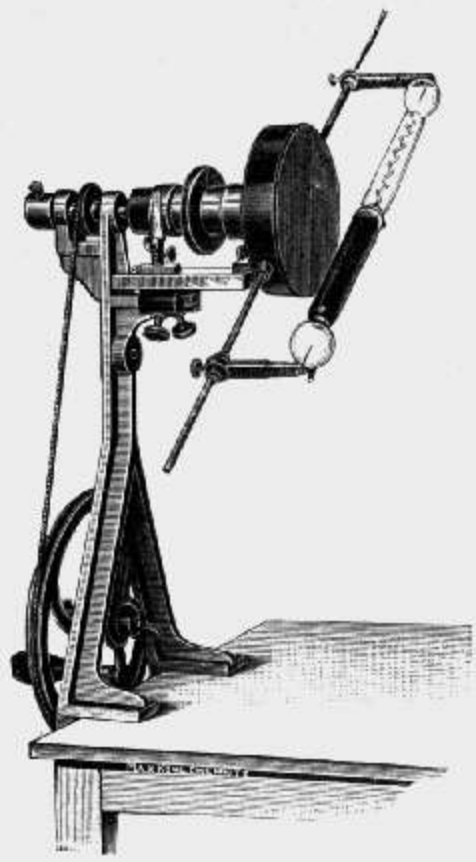
	£ s. d.
52,052. **Apparatus** (Puluj's), exactly as No. 52,050, **with Whirling Table** No. 51,959, **driven by electric motor,** Figs. A and B, with **110 volt D. C. Motor** and starter for regulating the speed, without wood stand, balance pan, spring balance or screw clamp . . . . Prices quoted on application for different voltages and types of current.	13. 0.0
52,053. **Wood Stand** with iron tripod, see Fig. 52,052 A	0. 6.0
52,054. **Spring Balance** for 0—250 grams, see Fig. 52,052 A	0. 4.0
52,055. **Balance Pan,** 50-g weight, see Fig. 52,052 B. For frame, see No. 51,851 a, and pulley with screw clamp, see No. 51,851 h	0. 2.6
52,056. **Apparatus** (Rosenberg's), Figure, for explaining the theory of cyclones, anti-cyclones, monsoons and anti-monsoons (Ztschr. f. d. phys. u. chem. U., **12**, 1899, pp. 335 to 338), without whirling table . . . . . Complete description and directions for use on application.	4.10.0

Cl. 3687, 3688.

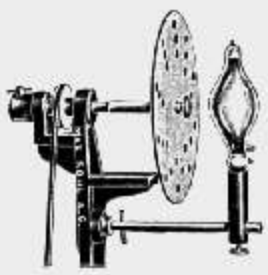
Max Kohl A. G. Chemnitz, Germany.



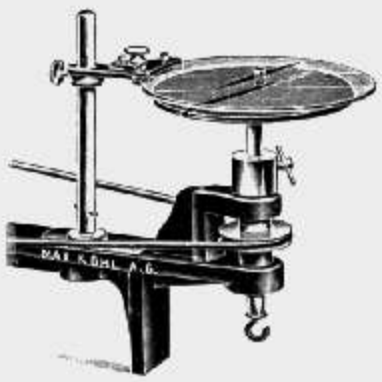
52 056, 51 949. 1 : 9.



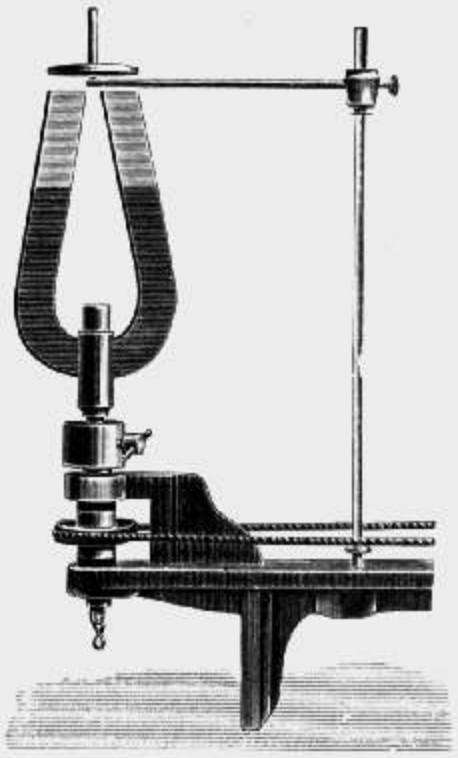
52 057, 51 949. 1 : 10.



52 058. 1 : 10.



52 059. 1 : 9.



52 060. 1 : 5.

52,057. **Rotating Device for large Geissler Tubes** of 30—50 cm long, Figure, with well insulated lead, for induction coils giving a spark of 40—100 mm . . . . . £ 1.18.0

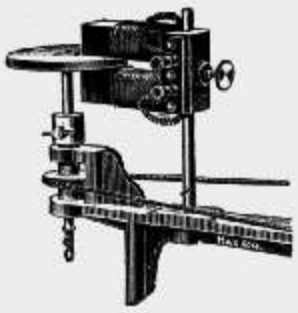
52,058. **Disc** (Poggendorff's), illuminated by Geissler tube, Figure, for proving that the light emitted by Geissler tubes is only apparently continuous (M. P., 9th Edn., **III**, Fig. 763), with one Geissler tube 0.15.0

52,059. **Apparatus for Arago's Magnetism of rotation,** Figure (W. D., Fig. 560 [533]) . 1. 4.0

An adjustable glass slab with magnetic needle is arranged over a large rotating copper disc. On rotating the disc the needle is deflected in the direction of rotation, being itself finally set in rotation.

52,060. **Rotating Magnet,** with rotary copper disc above it, Figure (Fr. phys. Techn. **II, 1**, Fig. 1086) 1. 0.0

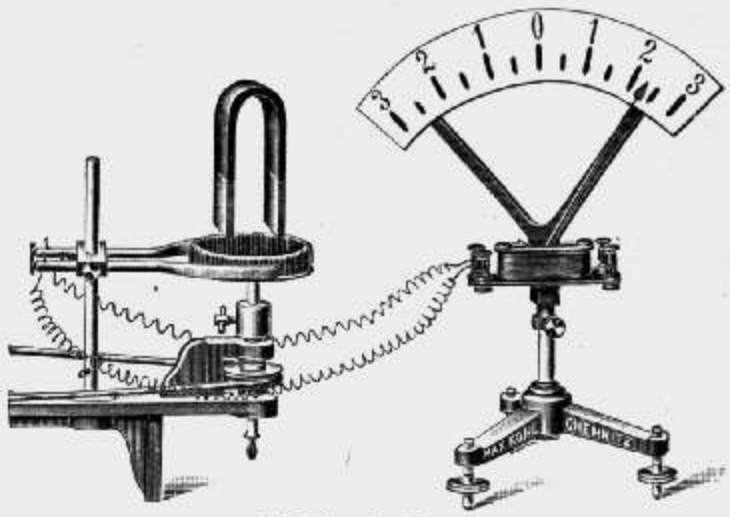
Cl. 669, 670, 5721, 5719, 674.



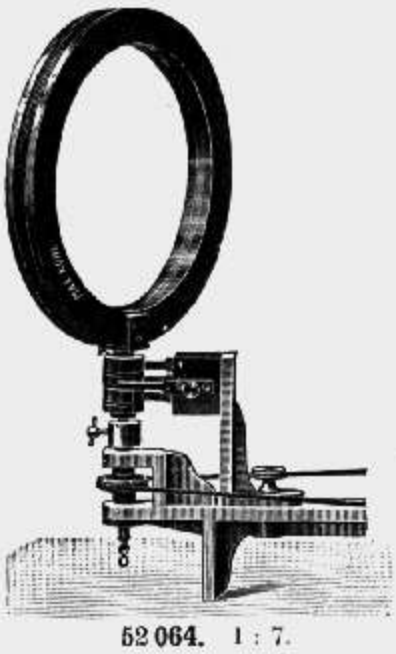
52 061. 1 : 7.



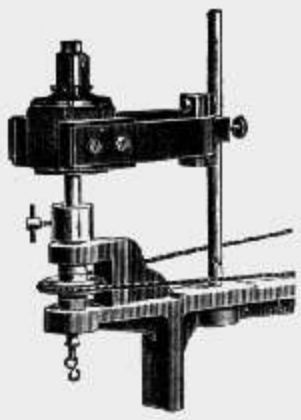
52 062. 1 : 8.



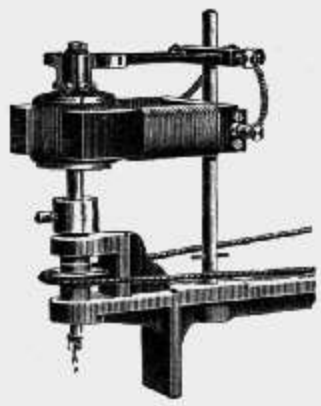
52 065. 1 : 7.



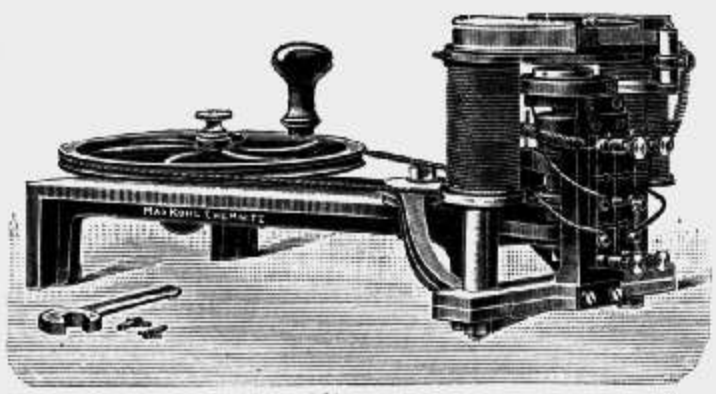
52 064. 1 : 7.



52 066 A. 1 : 8.



52 066 B. 1 : 8.



52 067. 1 : 7.

52,061. **Apparatus for generating Focault Currents in a copper disc rotating between the poles of an electromagnet,** Figure . . . . . £ 1. 8.0

When the circuit of an electro-magnet is closed, a large amount of power is necessary to rotate the disc very rapidly.

52,062. **Apparatus for Unipolar Induction,** Fessel and Plücker's, Figure, with 2 rotating bar magnets (M. P., 9th Edn., **III,** Fig. 584) 1. 8.0

52,063. **Apparatus for Earth Induction,** with rotary wire spiral and commutator, for taking off direct current (Fr. phys. Techn. **II, 1,** Fig. 1118) 1.13.0

52,064. — idem, with commutator and slip rings, Figure, for taking off direct and alternating current 1.16.0

52,065. **Pacinotti's Ring,** as suggested by Rühlmann, Figure, with conductor springs (Fr. phys. Techn. **II, 1,** Fig. 1138), without horse-shoe magnet and vertical galvanometer 1.15.0

When the ring is rotated and a magnet held above, a galvanometer joined up with the conductor springs gives a considerable deflection.

52,066. **Apparatus for explaining the Magneto-electric and Dynamo-electric Principle,** Figs. A and B 3. 0.0

The apparatus consists of: (a) 1 Pacinotti ring 0. 15. 0
(b) 1 Magnet 0. 15. 0
(c) 1 Electro-magnet 0. 15. 0
(d) 1 Brush Conductor 0. 15. 0

Cl. 673, 5322, 676, 675, 677, 678, 679.

Max Kohl A. G. Chemnitz, Germany.

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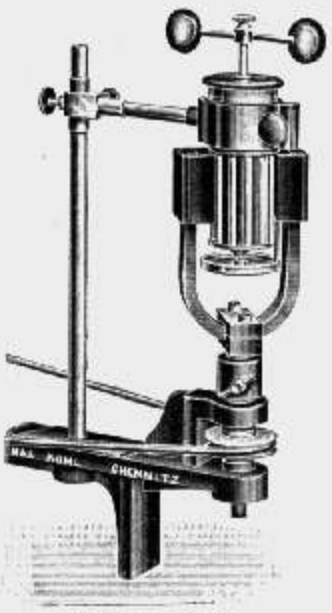
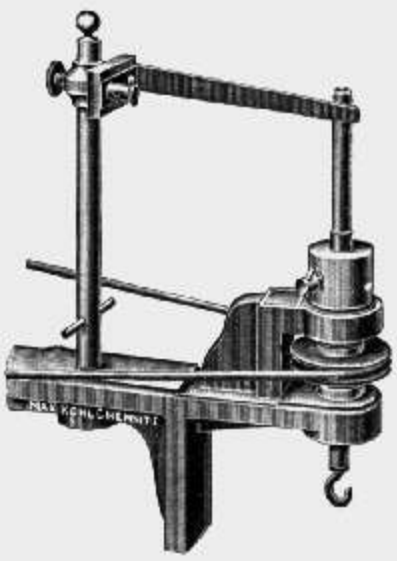
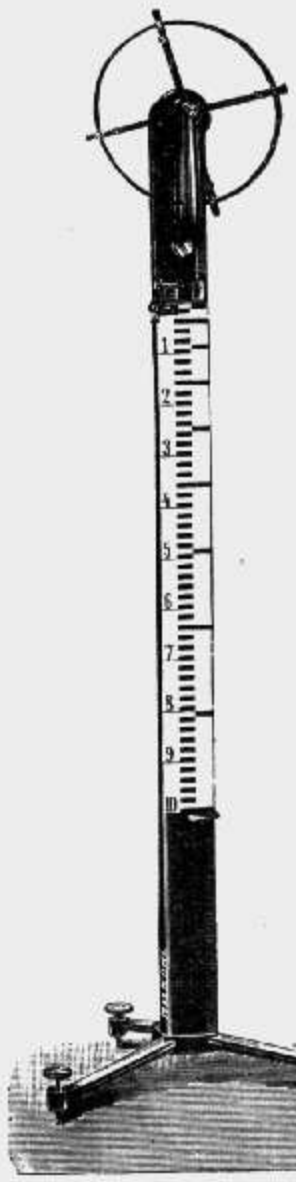


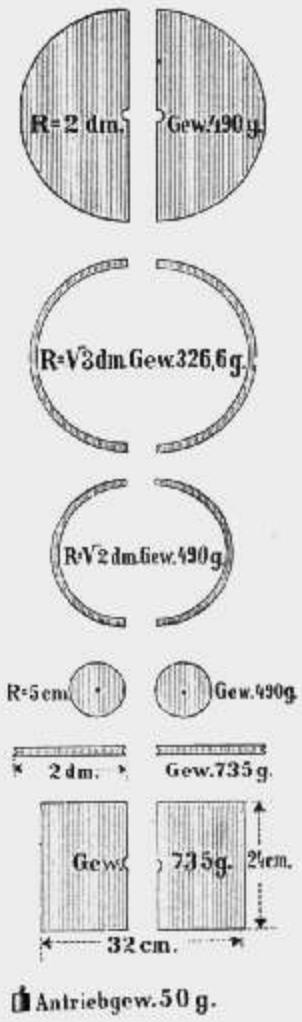
52 068. 1 : 6.



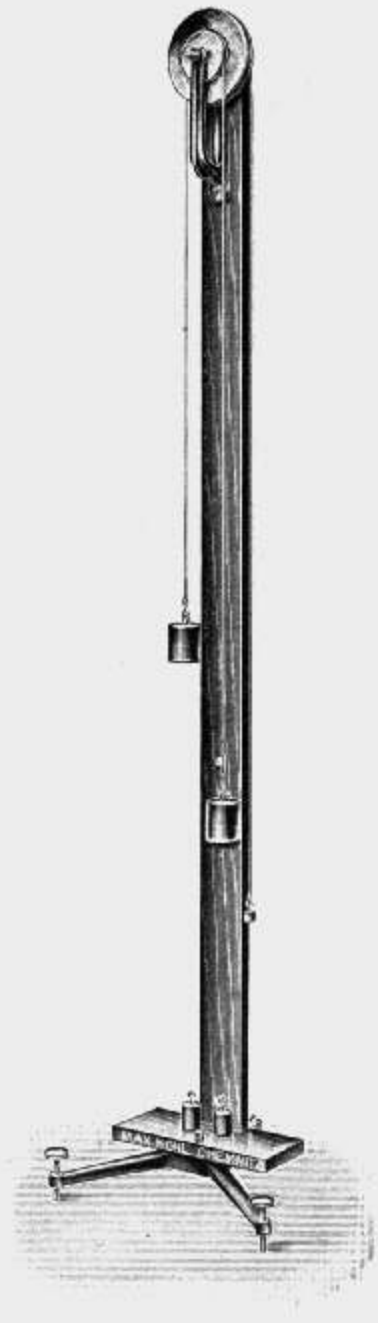
52 069. 1 : 5.



52 070 A. 1 : 17.



52 070 B. 1 : 12.



52 071. 1 : 15.

52,067. **Model of Pacinotti-Gramme Machine,** Figure, as suggested by Pfaundler (M. P., 9th Edn., **III**, Fig. 659 and 660), for the whirling table, with device for rendering visible the lines of force; this apparatus can be recommended for explaining the dynamo. Price, without whirling table . . . . . £ 6.10.0

The following pertain to the apparatus: an iron armature with winding, an iron armature, unwound, a wood armature with winding, and a frame with paper stretched across for demonstrating the lines of force.

52,068. **Model of a Short-circuited Armature in the Magnetic Field,** Figure, Friedr. C. G. Müller's (M. T., Fig. 222), for setting on the whirling table, with a squirrel-cage rotor which can be used either with or without an iron core . . . . . £ 2.10.0

52,069. **Rotating Thermocouple,** Figure, cylindrical form, of iron and German silver, with contact spring sliding along the cylinder . . . . . £ 0.15.0

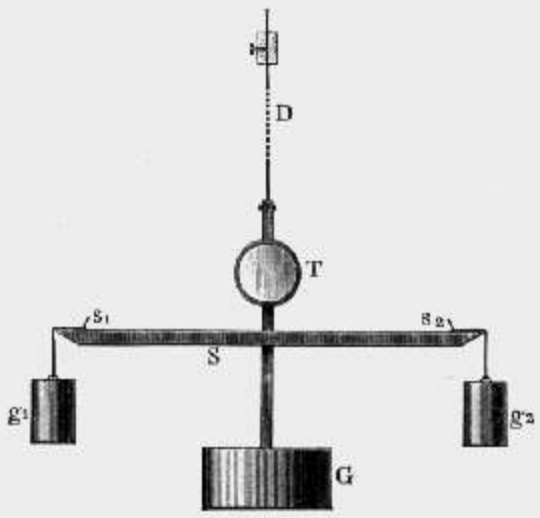
When the apparatus is rotated the cylinder becomes heated by the friction of the spring, thus producing a current which flows from the iron to the German silver according to the position of the spring.

52,070. **Apparatus for determining the Moment of Inertia,** Hartl's, Figs. A and B (Ztschr. f. d. phys. u. chem. U., **6**, 1892, p. 74, and **5**, 1891, p. 76) . . . . . £ 9. 0.0

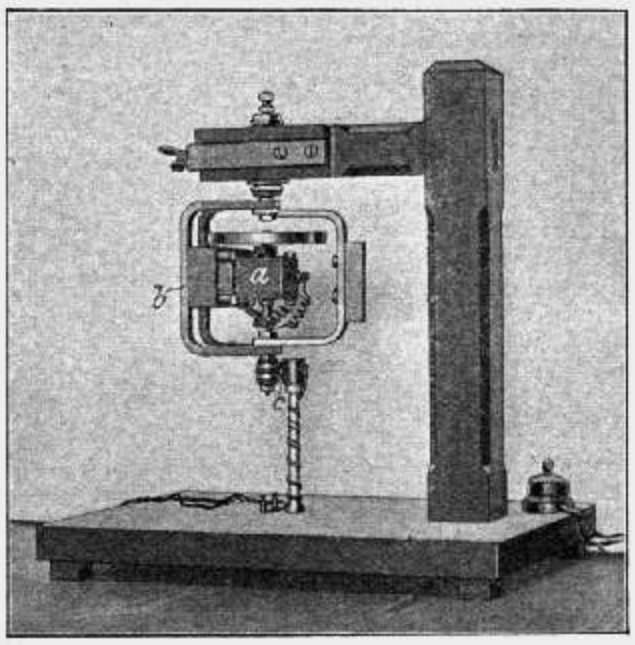
The test pieces (rings, discs, bars, rectangular plate) the moment of inertia of which it is desired to determine can be fixed to a spoke-cross. The release is electro-magnetic. Given in with the apparatus are 6 test pieces, 2 falling weights, 1 Morse key and leads.

52,071. **Moment of Inertia Apparatus** (Kurz'), Figure (M. P. **I,** Figs. 291, 292 [280, 281]), with cords, 2 loading weights each of $^1/_2$ kg and 2 kg, and an excess weight of 50 g; apparatus 2 m high . . . . . £ 3.10.0

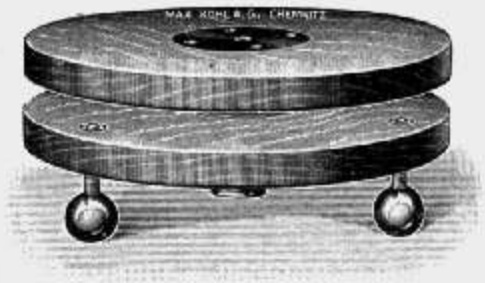
For Apparatus for demonstrating the laws of continuity and of inertia, see also p. 251.



52 073. 1 : 5.



52 076. 1 : 13.



52 075 A. 1 : 10.



52 075 B. 1 : 30.

52,072. **Pendulum for Moment of Inertia** (Weinhold's) (W. D., p. 112 [104]), iron rod with axis in the centre, with 2 bobs each 0.981 kg and 3 bobs each 0.245 kg in weight, with iron stand and Cardan suspension . . . . . £ 2.14.0

52,073. **Apparatus for determining the Moment of Inertia by means of torsional oscillations,** Figure (W. u. E. phys. Prakt., Fig. 66), for mirror-reading 2. 0.0

The duration of oscillation of the system is observed by means of a telescope with cross wires, first with these bodies, and then without them.

This apparatus is employed in conjunction with a massive frame, e. g., No. 52,195.

52,074. **Moment of Inertia Apparatus** (Grimsehl's) (Verh. d. Physikal. Gesellsch. VI, Nos. 15—19; Ztschr. f. d. phys. u. chem. U., **18**, 1905, p. 35) 4. 0.0

The discs, arranged so as to rotate, only execute translatory motions when the system is in oscillation; if the discs are firmly fixed, the total mass only of the system is taken into consideration in determining the moment of inertia.

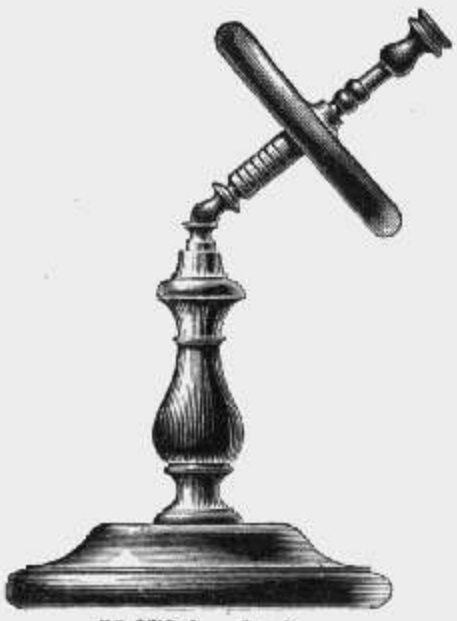
52,075. **Rotating Disc and Weighted Bar,** as suggested by Prof. L. Prandtl, Figs. A and B, for showing the relations between Angular Velocity and Moment of Inertia (Ztschr. d. Vereins deutscher Ingenieure, 1909, pp. 1301 et seq., No. 16, and Figs. 46 and 47 on text-page 16) 5.10.0

52,076. **Apparatus for the Surface Principle,** as suggested by Prof. Eug. Meyer, Figure, for proving that a rotating mass imparts in an opposite direction an angular velocity in a co-axially rotary mass, this angular velocity corresponding to the ratio of the moment of inertia. With 110 volt D. C. motor (Ztschr. d. V. d. I., **53**, 1909, pp. 1303 et seq., No. 17, and text-sheet 16, Fig. 48) 8. 0.0

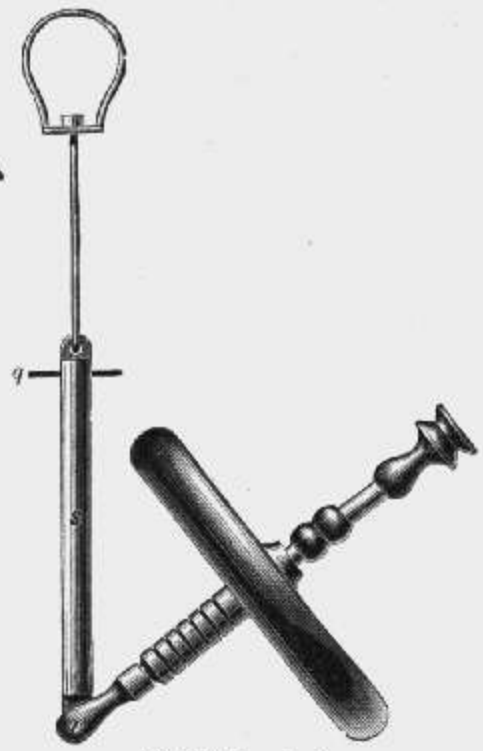
Cl. 518, 5551, 5669, 5559.

Max Kohl A. G. Chemnitz, Germany.

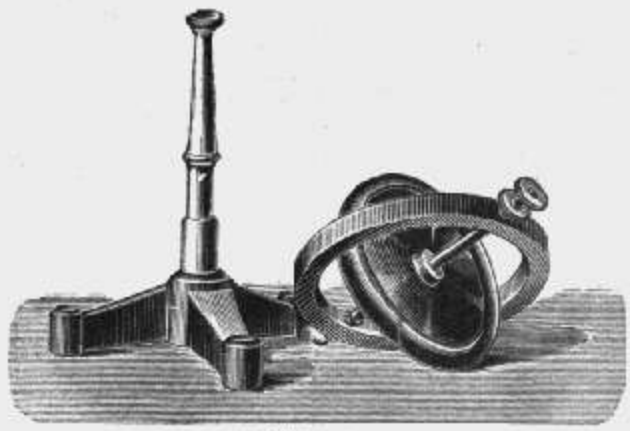
Max Kohl A. G. Chemnitz, Germany.



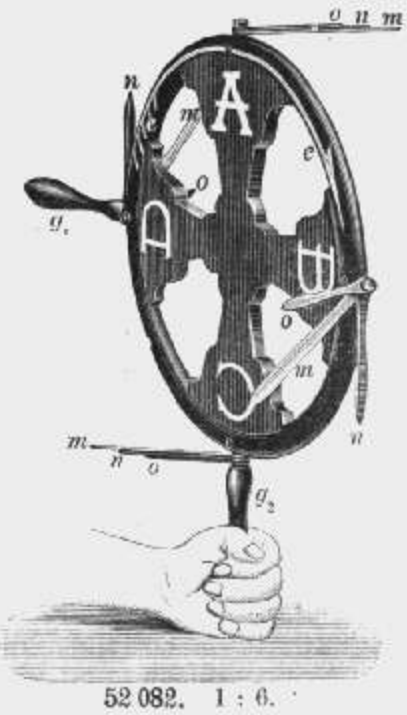
52 078 A. 1 : 3.



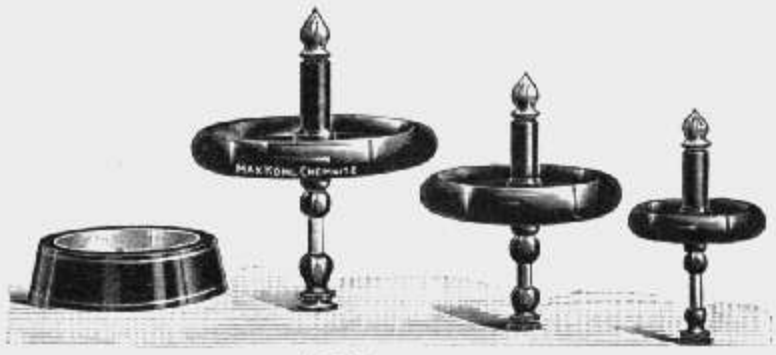
52 078 B. 1 : 2.



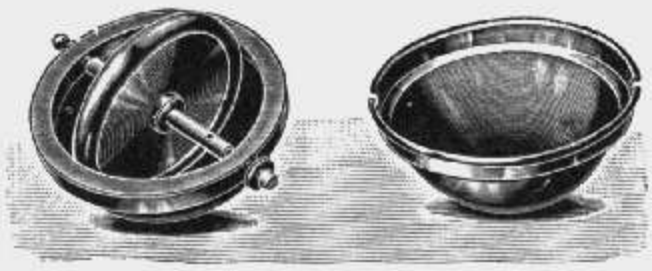
52 079. 1 : 3.



52 082. 1 : 6.



52 080. 1 : 3.



52 083. 1 : 3.



52 084. 1 : 8.

52,077. **Counteraction Apparatus** (Fuchs'), for demonstrating the Surface Principle (Ztschr. f. d. phys. u. chem. U., **15**, 1902, p. 218; Fr. phys. Techn. **I, 2**, Fig. 3277) . . . . £ 1. 5.0

52,078. **Schmidt's Top,** Figs. A and B (W. D., Figs. 89—92 [82—85]), with stand and suspension 1. 2.0

52,079. — idem, Figure, **in ring,** with stand, can also be used suspended from a cord 1. 0.0

52,080. **3 Tops of different sizes,** for placing over each other, Figure (Fr. phys. Techn. **I, 2**, Fig. 3248 [I, Fig. 438]) 2. 0.0

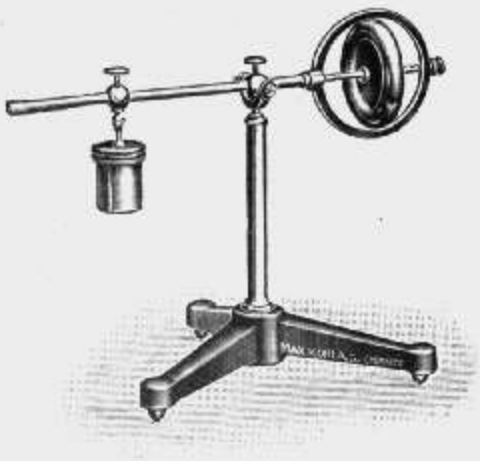
52,081. — idem, with stand and suspension for 1 top, as No. 52,078, and with pointed attachment and brass rod (Fr. phys. Techn. **I, 2**, Fig. 3249) 2. 8.0

52,082. **Model for explaining the main phenomenon in the Gyroscope,** Figure, as suggested by Hammerl (Ztschr. f. d. phys. u. chem. U., 1892, p. 68) 1.10.0

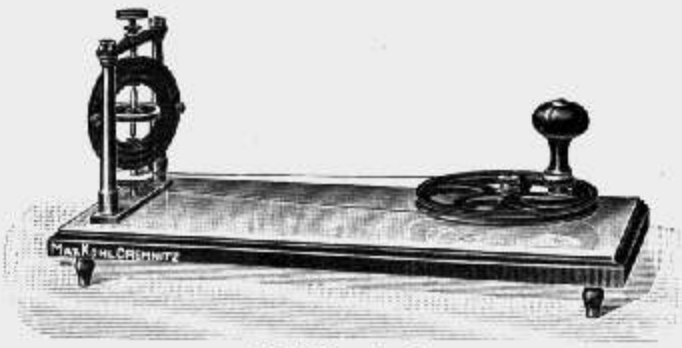
52,083. **Schmidt's Top with Hollow Sphere** of sheet iron and with stand, Figure (Fr. phys. Techn. **I, 2**, Fig. 3234 [I, p. 513]) 1. 4.0

If it is attempted to place the sphere in another plane, with the moving top, by turning the hand, a resistance is felt as if the axis of the top were held firmly in its position by unseen forces.

52,084. **Gyrostat** (Gray's) Figure (Fr. phys. Techn. **I, 2**, Figs. 3235, 3236) 6. 0.0



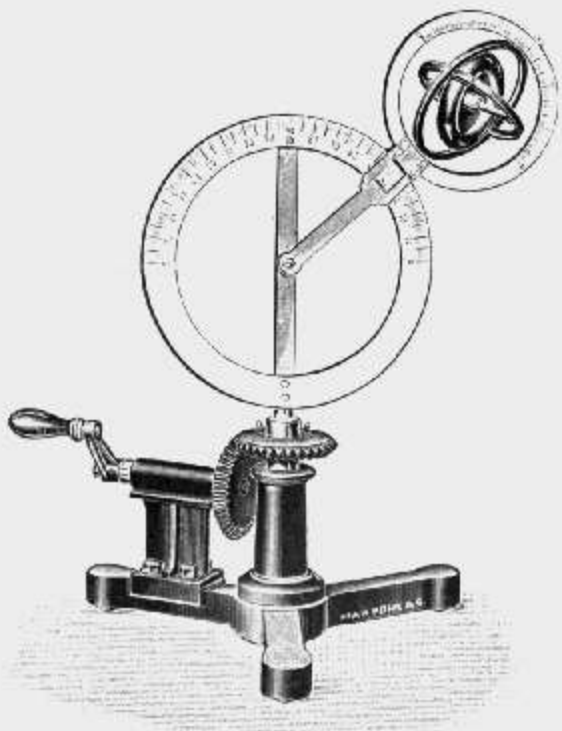
52 086. 1 : 7.



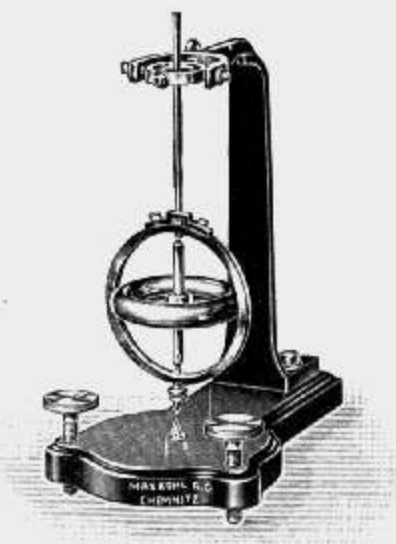
52 089. 1 : 6.



52 088. 1 : 3.



52 092. 1 : 8.



52 093. 1 : 5.

52,085. **Curve Top** (Koppe's) (Ztschr. f. d. phys. u. chem. U., **4**, 1890, p. 80; Fr. phys. Techn. **I, 2**, Fig. 3244) . . . . . £ 2.10.0

52,086. **Fessel's Top,** Figure, with 1 ring (Fr. phys. Techn. **I. 2**, Fig. 3239) . . . . . £ 2. 0.0

52,087. — idem, with 2 rings . . . . . £ 2.10.0

52,088. **Bohnenberger's Apparatus,** with excess weight, for explaining the conservation of the plane of rotation, with stand, Figure (Fr. phys. Techn. **I, 2**, Fig. 3243; M. P. **I**, Fig. 319) . . . . . £ 1. 8.0

If the disc is set into rapid rotation, the axis of rotation preserves its position in space, even if the apparatus is moved in any manner by raising and turning the base.

If required to act as a Fessel top, the ring must be firmly fixed.

52,089. — idem, improved by Poggendorff (Eisenlohr, Fig. 78), Figure, with device for driving . . . . . £ 3. 0.0

52,090. — idem, **for the whirling table,** see No. 52,009, p. 282 . . . . . £ 1. 7.0

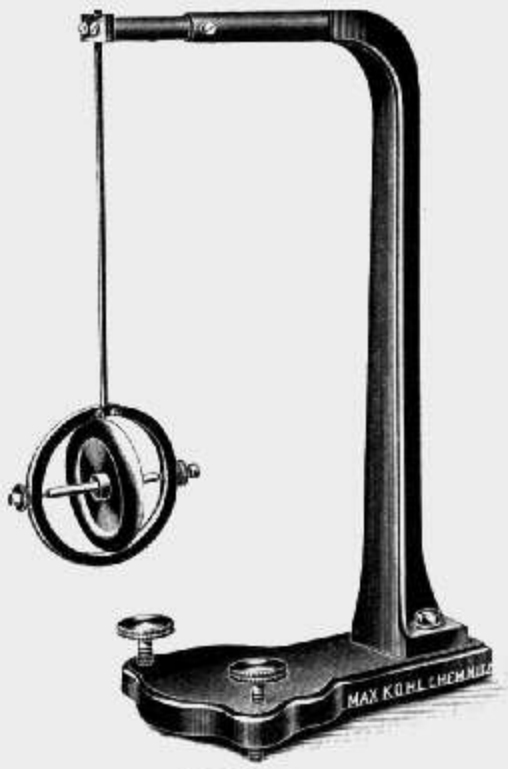
52,091. **Top,** as suggested by Schlick (Skutsch's model) (Ztschr. d. V. d. I., **52**, 1908, p. 464) Price on application.

52,092. **Polytrope** (Sire's), Figure, for combining a number of rotations (Fr. phys. Techn. **I, 2**, Fig. 3254) . . . . . £ 12. 0.0

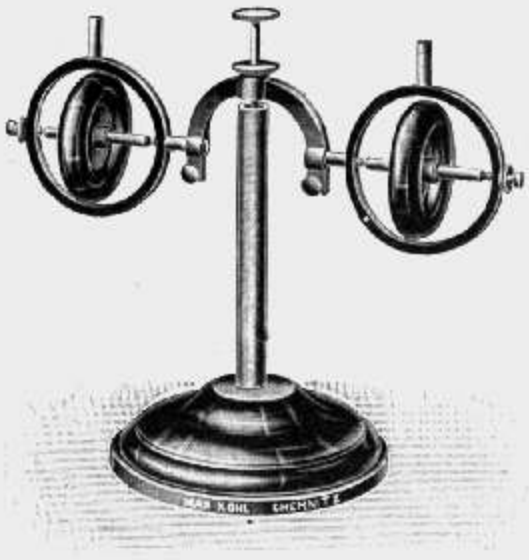
The apparatus has a spur drive and allows of demonstrating the following: 1) That the axes of rotation endeavour to take a parallel position. 2) That the rotations always take place in the same direction, thus showing: (a) the determination of meridian, (b) the determination of the geographical latitude of any place, (c) the invariability of the plane of rotation, (d) the earth's own rotation, (e) the conical motion of the earth: the nocturnal equation, nutation, (f) parallel progressive motion of the earth's axis in space.

Cl. 5786, 612, 611, 5784, 5801.

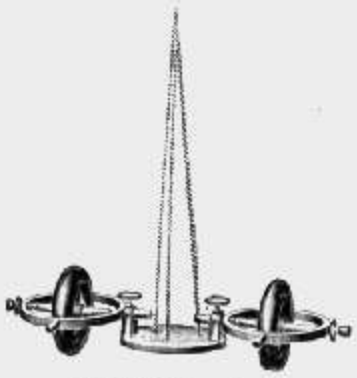
Max Kohl A. G. Chemnitz, Germany.



52 094. 1 : 5.



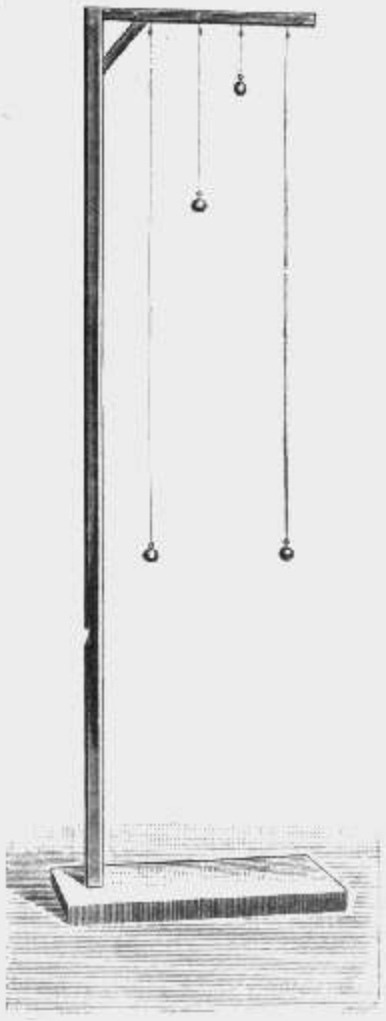
52 095 A. 1 : 4.



52 095 B. 1 : 4.



52 099. 1 : 16.



52 098. 1 : 10.

52,093. **Polygonal Pendulum** (Gruey's), Figure, in cardanic suspension, with frame (Fr. phys. Techn. **I, 2**, Fig. 3384) . . . . . £ 3.10.0

If the top is wound up and the pendulum rotated out of the vertical, the point of the pendulum describes a stellate, spherical polygon; if the top is not rotating, the pendulum swings as an ordinary pendulum.

52,094. **Conical Pendulum** (Gruey's), Figure, with frame 2.10.0

The suspension of the top, of rubber, is twisted a number of times and the top released in a vertical position without any jar. The pendulum then describes a gradually widening cone, which again becomes narrow until the suspension cord is twisted in a vertical position in the opposite direction and a reverse motion of the pendulum takes place, etc.

52,095. **Top Apparatus** (Wanka's), Figs. A and B, with stand, for setting up and with special clip device for suspending the top (Ztschr. f. d. phys. u. chem. U., **11**, 1898, p. 235) 2.14.0

Each top can be fixed in the three main positions perpendicular to each other.

52,096. **Alternating Gyroscopic Tree** (Gruey's) (Fr. phys. Techn. **I, 2**, Fig. 3250) 5. 0.0

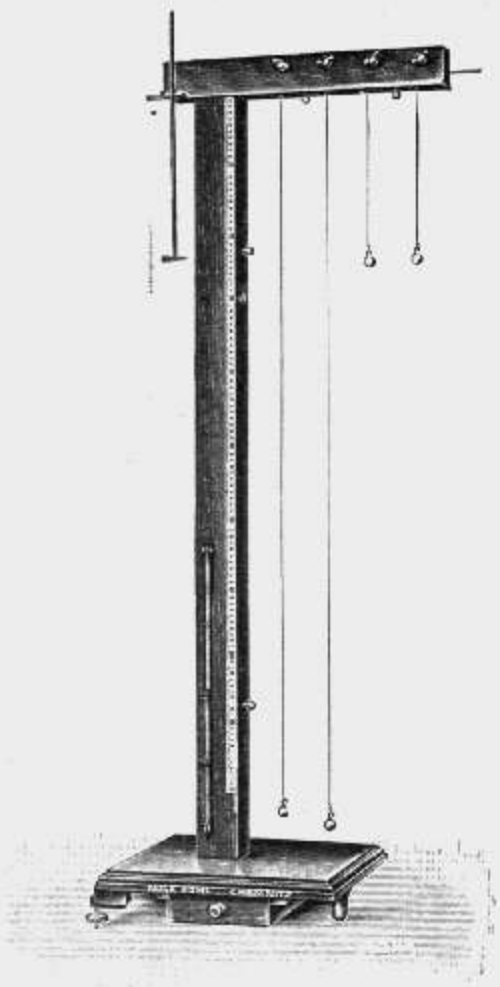
52,097. — idem, the top being rotated by its own weight instead of by rubber cords . 5. 0.0

52,098. **Pendulum Stand,** Figure, light wood frame, with 3 brass balls and 1 wood ball, on single cords 0.15.0

52,099. — idem, of iron, Figure, with 6 pendulums on double threads, on massive base, with adjustable swivels for the cords 0.18.0

Two pendulums with discs hanging in different planes, 2 with bobs, each 900 mm long, and 2 shorter, viz., 400 and 100 mm long respectively.

Cl. 3314, 3945, 4853, 617, 615.



52102. 1 : 12.



52105. 1 : 12.



52109. 1 : 14.

	£ s. d.
52,100. **Frame with Pendulums,** cf. Fig. 51,850, p. 265 (W. D., Fig. 93 [86]), with 3 brass balls and 1 wood ball on double threads	0.15.0
52,101. **4 Pendulums,** as No. 52,100, separately, for use with frame No. 51,151	0. 3.0
52,102. **Pendulum Frame** (Friedr. C. G. Müller's), Figure, with 4 brass balls, 2 of these with 2 hooks and 2 with 1; 1 wood ball with hook; 1 lead ball with hook; 1 bearing for reversing pendulums; 1 knife-edge for disc pendulums, wire figures, etc.; 1 angle piece; 4 spiral springs for demonstrating the spring pendulum; 1 physical and 1 reversing pendulum; 1 disc pendulum (M. T., Figs. 46 and 51)	3. 4.0
52,103. **Pendulum for explaining the Laws of the Pendulum,** simple type, iron rod, graduated, with adjustable bob and wall arm	0.18.0
52,104. **Maxwell's Pendulum**	0.12.0
The pendulum consists of a rod 80 cm in length, the upper end of which can turn about an axis. A cord can be wound round this axis and a metal ball suspended from the cord, so that the periodicity of both pendulums can be made to coincide.	
52,105. **Pendulum with directly measurable length,** Figure, Grimsehl's (Ztschr. f. d. phys. u. chem. U., **18**, 1905, p. 36)	5.10.0
The pendulum has two knife-edges, 1 m apart; the pendulum is hung upon the upper knife-edge, the bob resting at its centre of gravity on the lower one, thus the pendulum only undergoes a translatory, small circular motion when swung. The moment of insertia of the disc is negligible when the pendulum is swinging. The pendulum accordingly swings like a mathematical pendulum the length of which is equal to the distance between the two knife-edges.	
52,106. **Compensating Pendulum,** on stand, pendulum 0.5 m long: see No. 51,695 a . . .	1. 4.0
52,107. — idem, with 9 brass and steel rods, beating $^1/_2$ seconds: see Fig. 51,695, p. 245	2.10.0

Kindly compare the Pendulum Stands for fitting to the Lecture Tables Nos. 50,097 and 50,098, pp. 18 and 19, and the Frame No. 51,151, p. 206, and 51,851, p. 265.

For **Seconds Pendulums,** see Section "Measurement of Time", pp. 245 and 246.

Cl. 4543, 5406, 619

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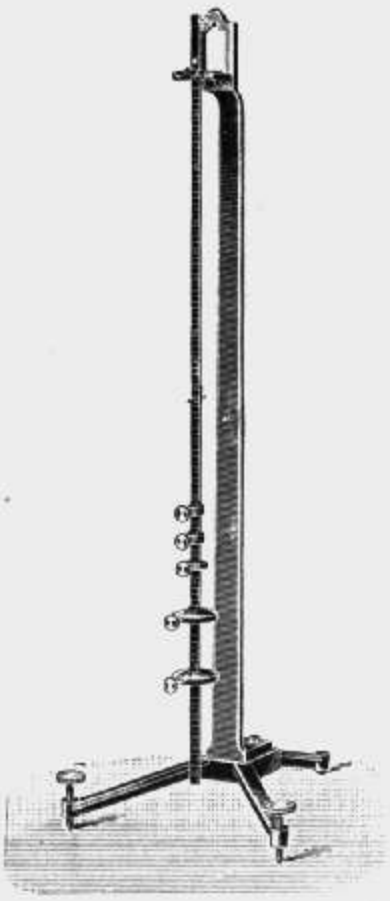
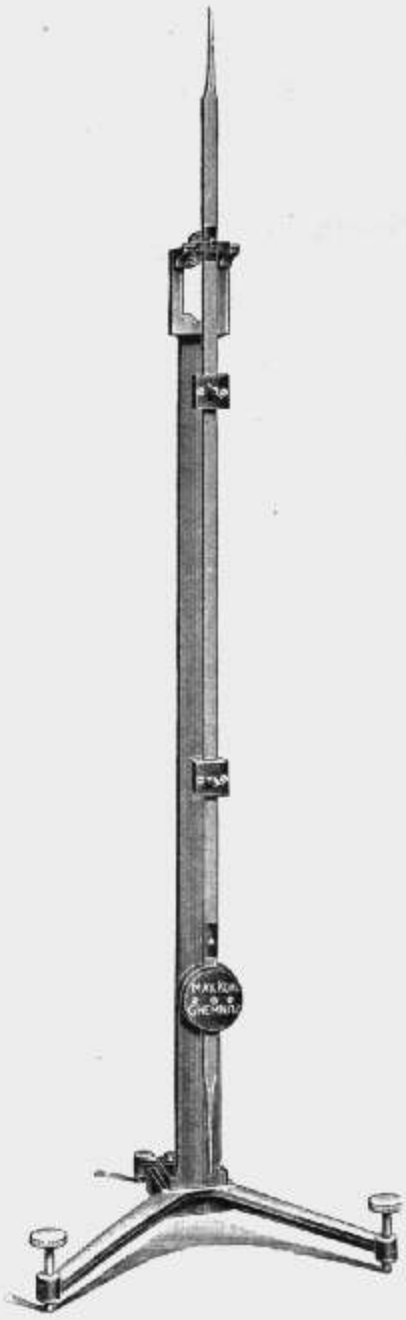
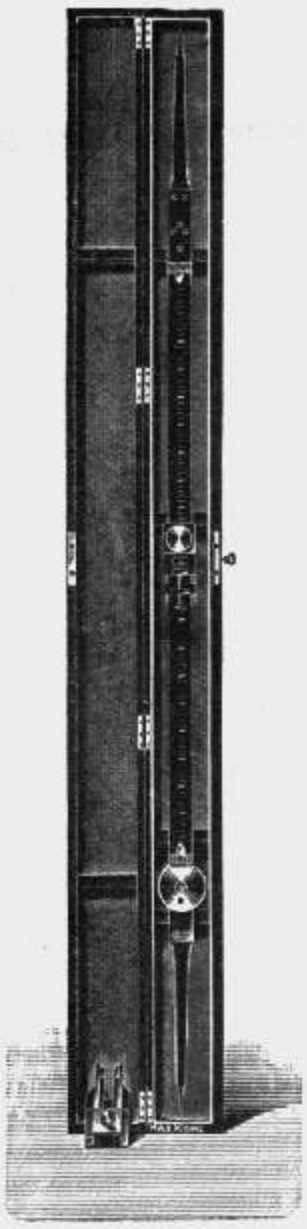


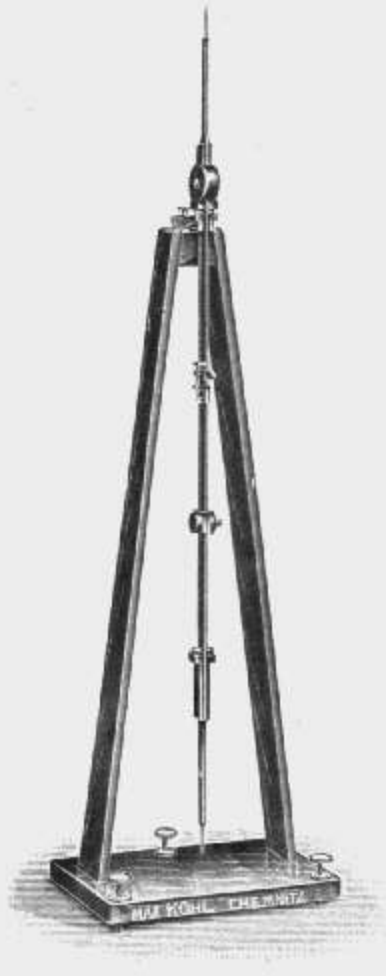
52 110. 1 : 15.



52 112. 1 : 13.

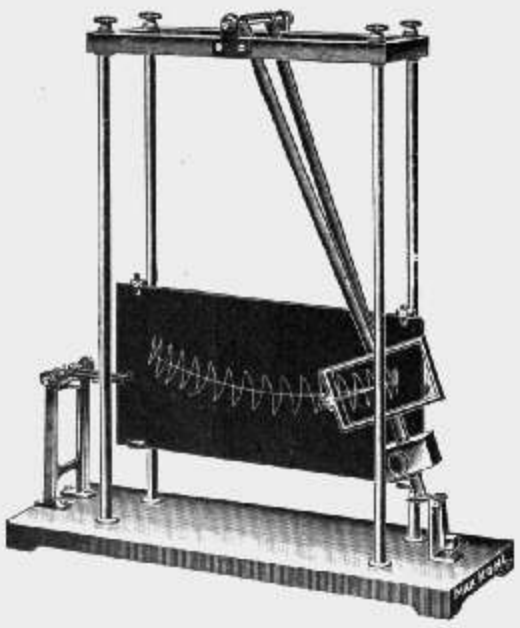


52 113. 1 : 16.

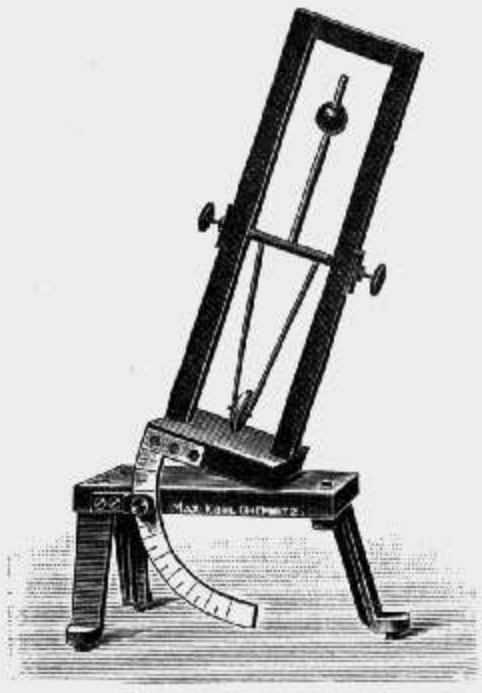


52 113a. 1 : 18.

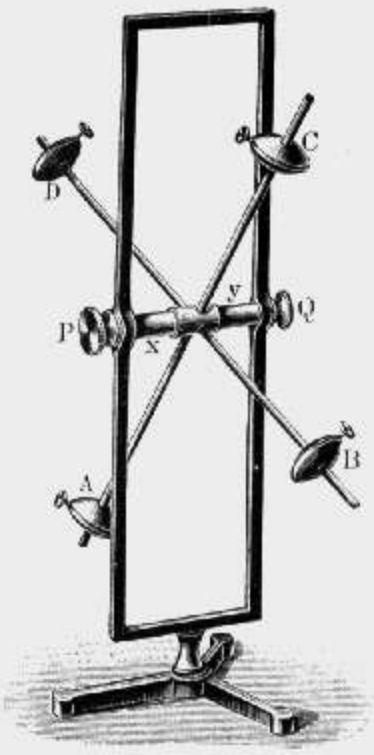
	£ s. d.
52,108. **Reversing Pendulum** (Weinhold's) (W. D., p. 115 [106]), of wood, with wall bracket	0. 9.0
52,109. — i d e m, Frick's (Fr. phys. Techn. **I, 2,** Fig. 3356 [Fig. 476]), F i g u r e, iron rod with 2 knife-edges and graduation, with 2 bobs (lead) and wall arm suspension . .	1. 0.0
52,110. — i d e m, can also be used for experiments on the moment of inertia, F i g u r e, with 2 bobs each of 1 kg weight, 2 bobs each of 0.25 kg, and a small bob, with stand and Cardan suspension (Fr. phys. Techn. **I, 2,** Fig. 3354 [I, Fig. 477])	2. 8.0
52,111. **Demonstration Pendulum (reversible)**, of brass and iron, for showing the laws of motion of the compound pendulum, swing $1^1/_2$ seconds, with stand	6. 5.0
52,112. **Reversing Pendulum** (Kater's), simple pattern, F i g u r e, with 1 bob and two adjusting weights, in Cardan suspension, on stand with levelling screws	2.15.0
52,113. **Reversing Pendulum** (Kater's), F i g u r e, well and substantially constructed: length between knife-edges, exactly 1 m; the weight adjusted by micrometer screw; graduation with vernier, with wall bearing and arresting device. The total length of the pendulum is 1.7 m (Gan.-Man., Fig. 58). In box, without stand	12. 0.0
52,113 a. — i d e m, **with stand and box,** F i g u r e	14. 0.0



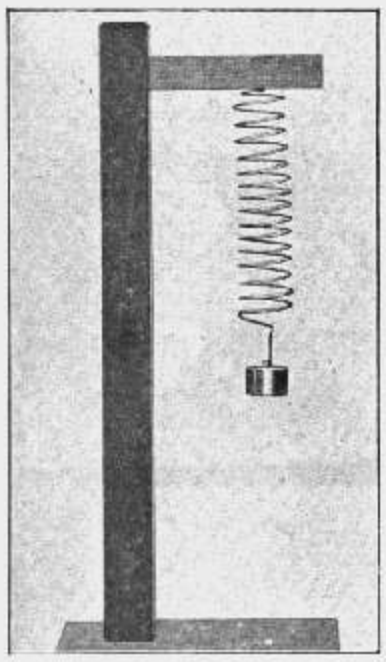
52 116. 1 : 8.



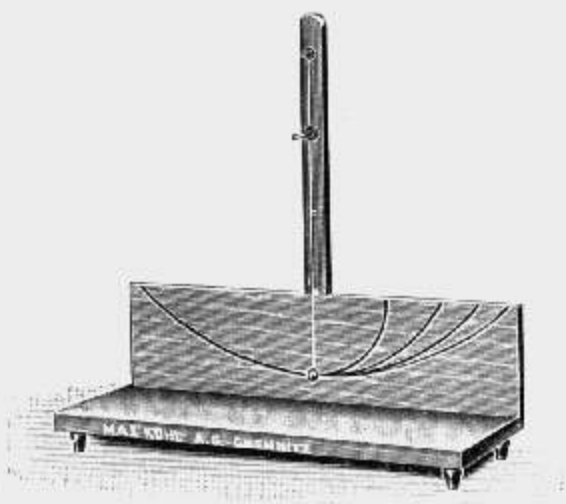
52 117. 1 : 8.



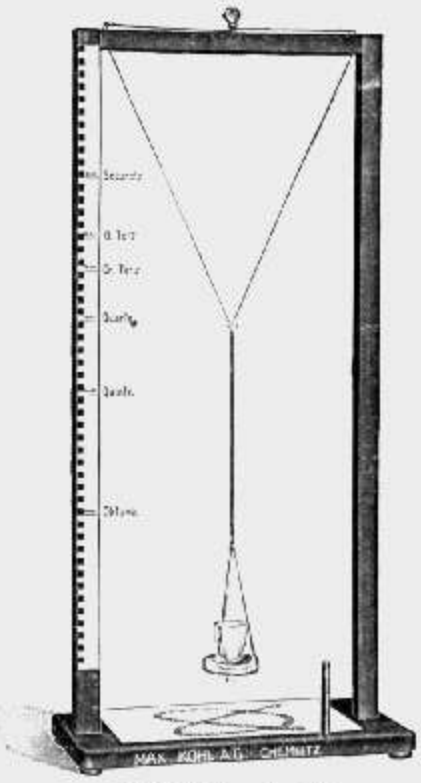
52 118. 1 : 6.



52 120. 1 : 14.



52 123. 1 : 10.



52 124 A. 1 : 15.

52,114. **Sheet Iron Pendulum** (W. D., Figs. 94, 73 B and C [Figs. 87, 66 B and C]), for proving, that the periods of swing are equal for axes parallel to each other at the same distance apart from the centre of gravity; the pendulum suspended as in Fig. 51,877, p. 269 £ 0.15.0

52,115. — i d e m, without suspension, assuming that Apparatus No. 51,877 is available . 0. 8.0

52,116. **Pendulum Apparatus** (Hillig's), F i g u r e, for demonstrating the change of velocity of a swinging motion, with stand and adjustable glass plate (Fr. phys. Techn. **I, 2,** Fig. 3460) 4. 0.0

A lead pendulum is suspended on a frame in such manner that it swings accurately in a plane. The pendulum weight has a spring which can swing easily and write on a blackened glass plate. On one side of the frame is an arresting device for releasing the pendulum weight, this device being arranged so that the pen is released simultaneously by the lock action. An arresting device is fitted at the other side of the frame for catching the pendulum. The tracing style leaves a wavy line behind it on the glass slab; on the return journey, during which it does not exert a swinging motion of itself, it traces an arc, which cuts the sine line. The individual sections on this arc (pendulum line) are the tracks traversed by the pendulum during equal periods and they therefore demonstrate the various pendulum velocities.

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5670, 5574, 5799.

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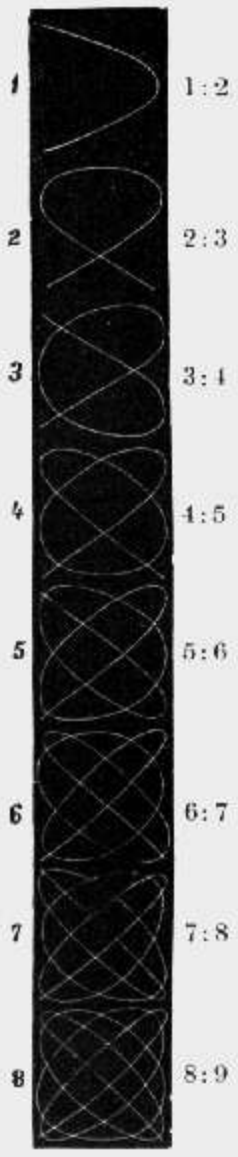
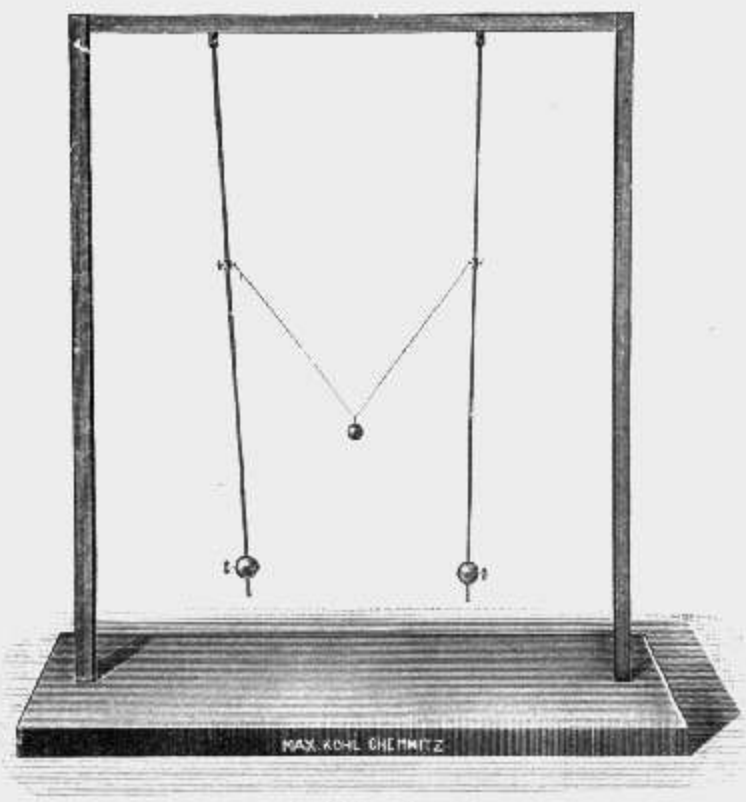
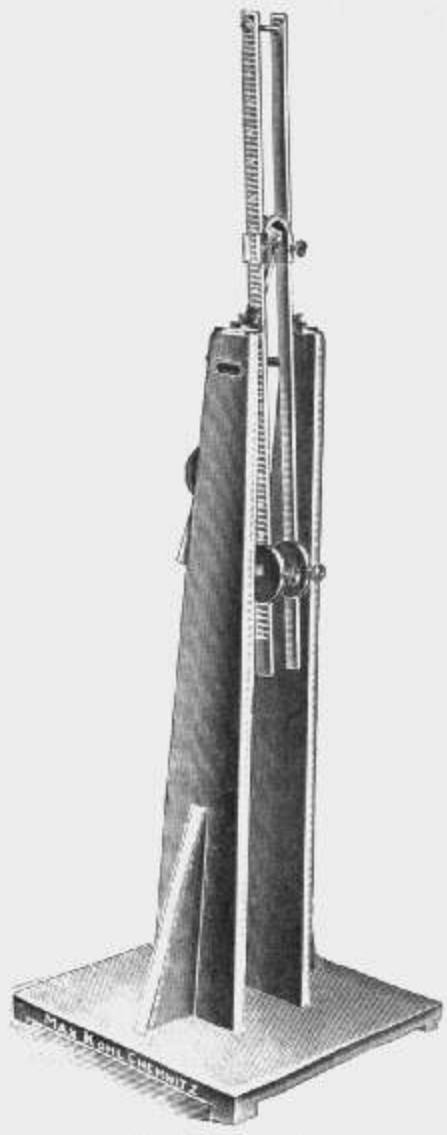


52 124 B.

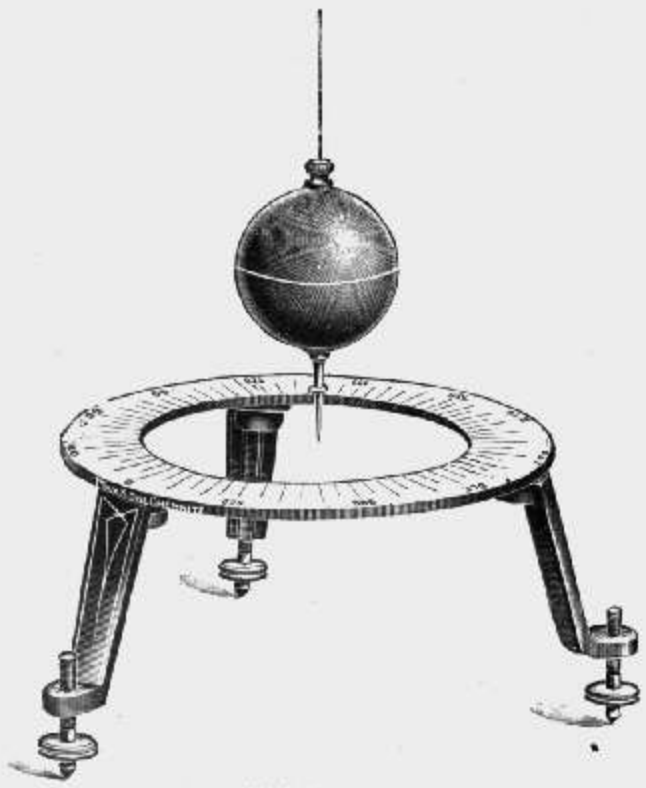


52 126. 1 : 12.

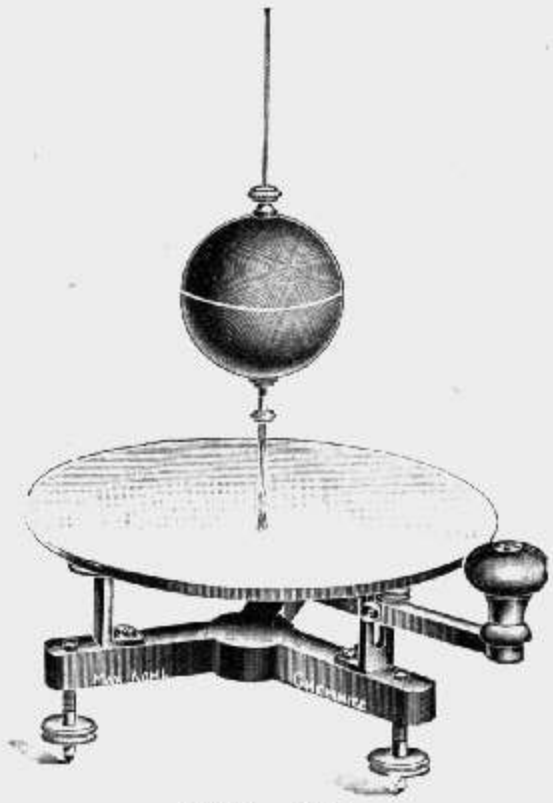


52 127. 1 : 13.

	£ s. d.
52,117. **Pendulum Apparatus** (Mach's), Figure, with adjustable pendulum plane and graduated arc (M. P. **I**, Fig. 150 [157]; Fr. phys. Techn. **I, 2**, Fig. 3343 [I, Fig. 479])	1. 10. 0
52,118. **Cross Pendulum** (Oberbeck's), Figure, for demonstrating the laws of the physical pendulum (Ztschr. f. d. phys. u. chem. U., **I**, 1887/88, p. 253; Fr. phys. Techn. **I, 2**, Fig. 3355 [I, Fig. 480])	1. 4. 0
52,119. — idem, without stand, for use with the Mach pendulum apparatus stand No. 52,117	0. 16. 0
52,120. **Spring Pendulum** (Prof. Eug. Meyer's), Figure, for demonstrating the individual periodicity of a system, the periodicity of a periodic force, the forced oscillations, the static deflection, resonance and the critical periodicity of a force (Z. d. V. d. I, **53**, 1909, pp. 1301 et seq., No. 18, and text-sheet 16, Fig. 49)	2. 5. 0
52,121. **Model for Ship Oscillations,** as suggested by Schlick (Z. d. V. d. I., **53**, 1909, p. 1301 et seq., No. 20, and text-sheet 16, Fig. 51)	Price on application
52,123. **Galilean Escapement Pendulum,** Figure: see also No. 51,811, p. 258	0. 14. 0
52,124. **Double Pendulum** (Airy's), Figs. A and B (Fr. phys. Techn. **I, 2**, Fig. 3389 [I, Fig. 493]), for demonstrating Lissajous' curves by means of blue sand	1. 0. 0
52,125. — idem, without stand, for drawing the curve by ink (M. T., Fig. 50)	0. 12. 0
52,126. **Double Pendulum** (Oberbeck's), Figure, for demonstrating co-oscillation (Fr. phys. Techn. **I, 2**, Fig. 3398 [I, Fig. 496]; Ztschr. f. d. phys. u. chem. U., **I**, 1887/88, p. 254)	1. 0. 0
52,127. **Double Pendulum** (Lorenz'), Figure, for studying combined oscillations on the flat, specially suitable for the oscillations of bells and clappers	6. 0. 0



52 128. 1 : 5.



52 129. 1 : 4.

	£ s. d.
52,128. **Apparatus for Foucault's Pendulum Experiment,** Figure	2.10.0
The 10 cm diameter iron ball, weighing about 4 kg, is suspended from an iron plate by means of a fine steel wire. By unscrewing a milled screw this ball can be removed from the wire. The centre of gravity of the ball is determined in mercury. The sheet metal disc is covered with sand during the experiment. In ordering, please state length of suspension wire desired.	
52,129. — idem (Weinhold's), Figure (W. D., Figs. 96—98 [89—91])	4. 5.0
The accurately turned cast iron ball, 10 cm in diameter and weighing 4 kg, is fastened to a steel Cardanic suspension by means of a fine steel wire. This ball swings over a paper-covered metal disc which can be raised by a lever. A brush, filled with coloured glycerine, and inserted in the ball, leaves a coloured line behind only when the plate is raised.	
52,130. — idem, with 20 cm diameter ball, weighing 30 kg, suitable for lofty rooms .	5.10.0
* 52,131. **Apparatus** (Edelmann's) for **Foucault's Pendulum Experiment,** for objective projection, Figure (Wied. Ann., 45, 1892, p. 187), with device for projecting . . .	9.10.0
A magnet is inserted in the pendulum underneath. When the pendulum is swinging the magnet swings over a soft-iron knife-edge fitted on the rotary vertical axis. By magnetic attraction this knife-edge is always brought into the predominating plane of the pendulum.	
52,132. **Projection Device, separately**	5.10.0
52,133. **Contact Device,** Figure, for the balls used in the Foucault pendulum experiment, as suggested by Weinhold (W. D., 4th Edn., Fig. 99; Ztschr. f. d. phys. u. chem. U., **17,** 1904, p. 198), with stand	1. 0.0
Contact is effected by the internal friction of a liquid (coloured water).	
52,134. **Hartl's Model for explaining Foucault's Gyroscope (Pendulum) Experiment** (Fr. phys. Techn. **I, 2,** Fig. 3259)	2. 0.0
52,135. **Torsion Pendulum** with Accessories, as suggested by Friedr. C. G. Müller, comprising an iron rod and a circular disc with clamp (M. T., Fig. 52), with lead weights inserted, with 4 suspension wires of 3 different materials	2. 0.0
52,136. **U-Tube** for oscillations of liquids (M. T., Fig. 49)	0. 8.0
52,137. **Apparatus for demonstrating and explaining the harmonically Oscillating Motion** of the projection of a point moved in the circle on a straight line, as suggested by Weiler, Figure (Ztschr. f. d. phys. u. chem. U., **20,** 1907, p. 105)	1.16.0
If the handle on the back of the disc is turned the harmonic motion can be followed.	

* Can be used with the Projector.

For Apparatus for Foucault's Pendulum Experiment, suitable for the Whirling Table, see Nos. 52,015—52,017, p. 283. Cl. 631, 632.

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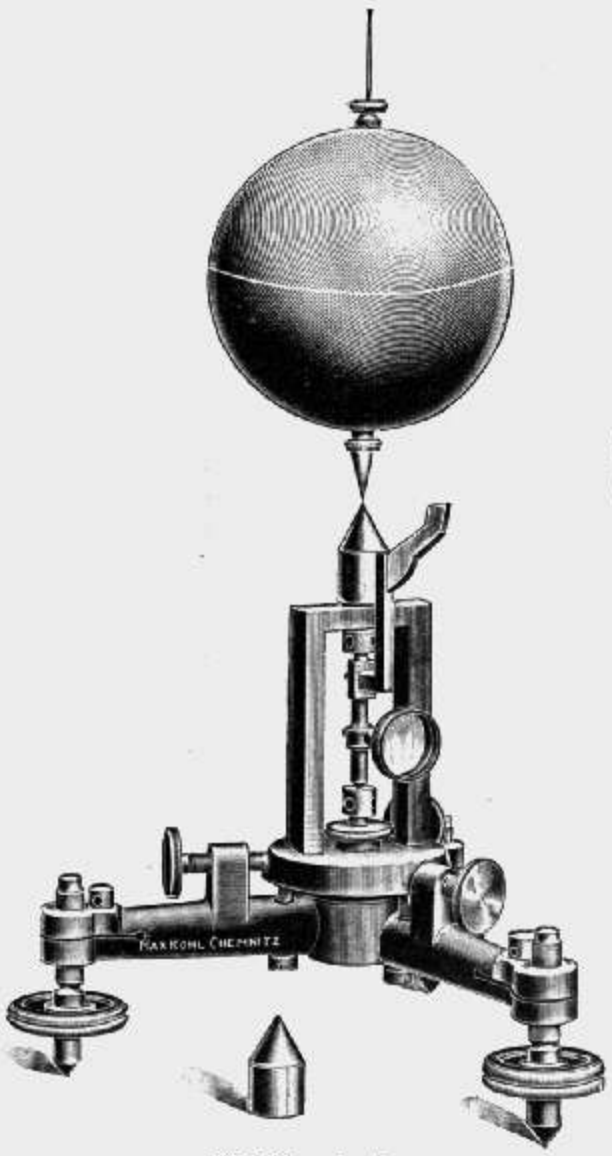
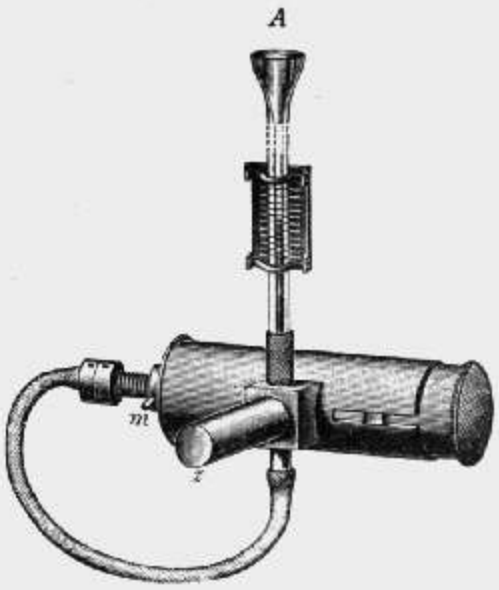
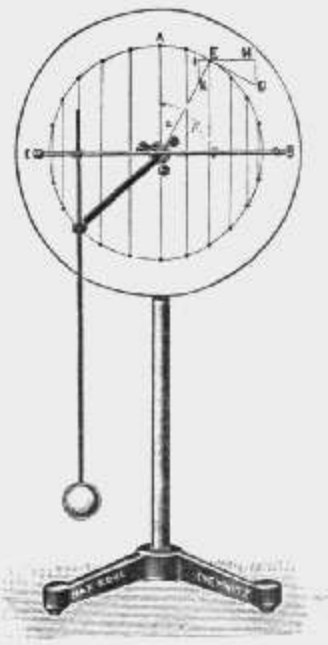


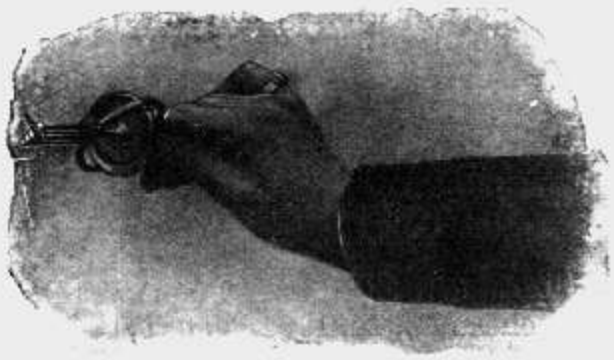
52 131. 1 : 3.



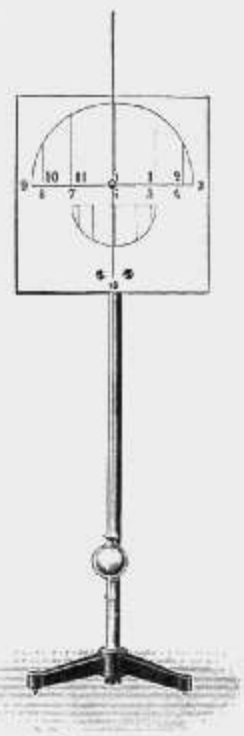
52 133. 1 : 3



52 137. 1 : 6.



52 140. 1 : 10.



52 138. 1 : 14.



52 139. 1 : 6.

* 52,138. **Apparatus for projecting harmonic vibration (sine vibration)**, as suggested by Höfler, Figure (Höfler, Physik, Figs. 30 and 243; Höfler-Poske, Figs. 12 and 144) . . . £ 2. 0.0

For demonstrating the composition of two sine vibrations, two of the above apparatus and two projectors are necessary.

52,139. **Resonance Top** (van Schaïk's), Figure (Ztschr. f. d. phys. u. chem. U., **7**, 1893/94, p. 181). Price, exclusive of vice 1. 2.0

The top is loaded on one side and produces considerable vibration, according to the free length of the spring, and at high or low speed.

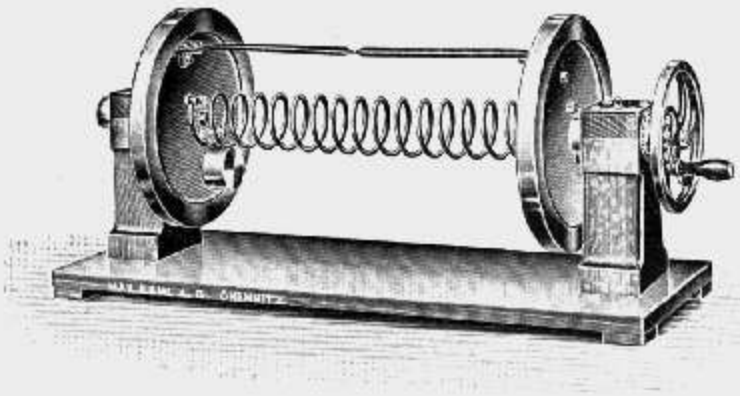
52,140. **Resonance Top** (Frahm's), Figure (Glaser's Ann., Vol. 59, 1906, pp. 697 et seq.) 2. 5.0

The rotating disc of the top is loaded on one side, so that the top when held in the hand makes a considerable amount of vibration. A so-called Frahm comb with six spring tongues is fixed to the top, these tongues having different numbers of vibrations. With decrease in the number of vibrations one spring after another vibrates.

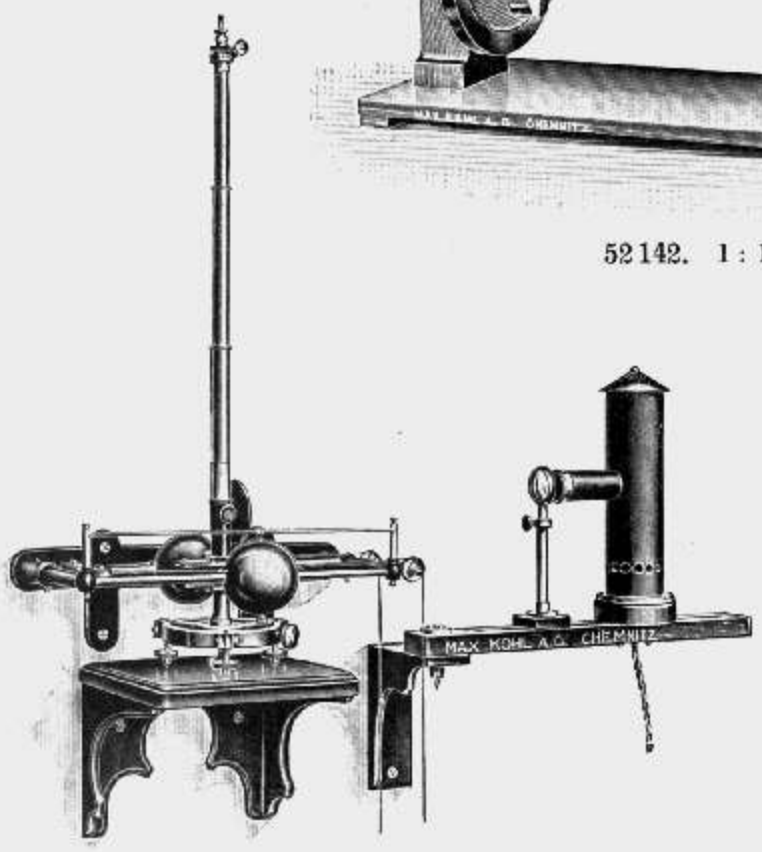
The principle is used in speed measurements on prime movers, and when the tongues are electrically excited by means of an A. C. magnet, it can also be applied to frequency measurements.

52,141. — idem, in velvet case 2.10.0

* For use with the projection apparatus.



52142. 1 : 14.



52144 A. 1 : 9.



52144 B. 1 : 5.

	£ s. d.
52,142. **Resonance Apparatus,** as suggested by Prof. Eug. Meyer, for demonstrating torsional vibrations of elastic waves by resonance (Z. d. V. d. I., **53**, 1909, p. 1301 et seq., No. 19, and text-sheet 16, Fig. 50)	6.15.0
52,143. **Analysing Apparatus** for vibrations, as suggested by Grimsehl, for analysing the vibrations of tuning forks, strings, etc., and for determining the frequency of sirens, etc. by a photographic method (Ztschr. f. d. phys. u. chem. U., **17**, 1904, p. 33)	4. 8.0
52,144. **Apparatus for Cavendish's Experiment on the Attraction of Mass** (Gravitation Balance), as suggested by Boys, Figs. A and B (Ztschr. f. d. phys. u. chem. U., **14**, 1901, p. 381; M. T., p. 86)	15. 0.0

Two small silver balls, each 0.75 g in weight, are suspended by means of a very fine quartz fibre from a fine balance beam (torsion balance). The whole is enclosed in a glass case and has a first rate arrestment device so that the instrument can be carried about from one place to another without fear of damage. The small balls are influenced by large lead balls each 2800 grams in weight which can be moved along a frame to the two end positions by cords. In order to make the deflections visible to a large audience, an image of the filament of a glow lamp is produced on a scale fixed to the wall by the aid of a bi-convex lens and a light mirror fixed on the apparatus.

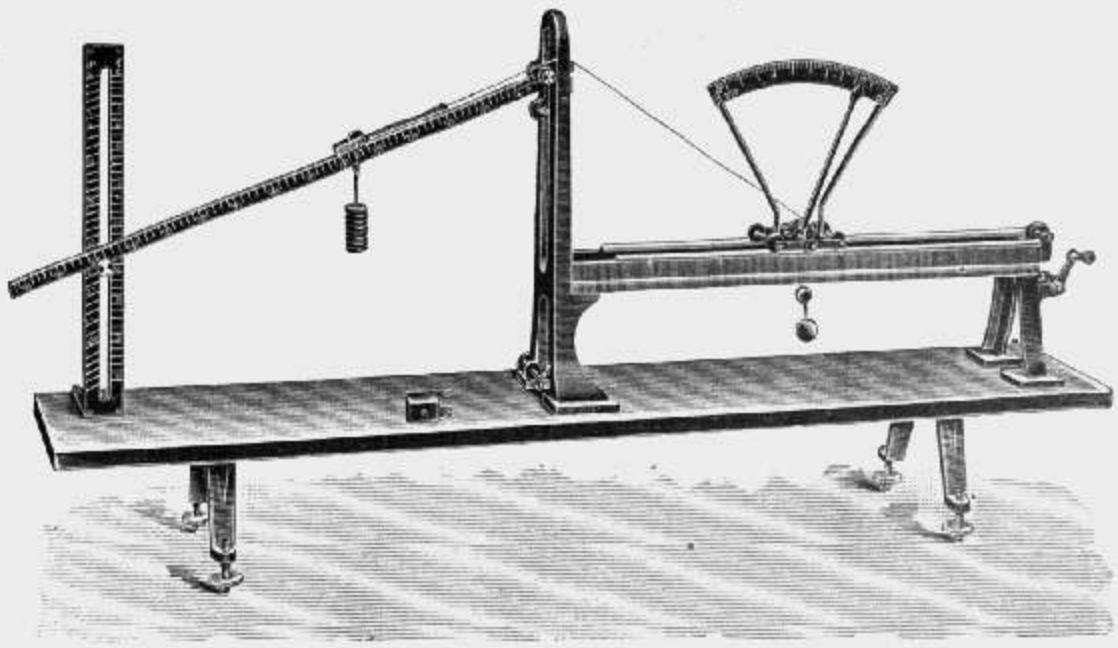
To give an idea of the sensitiveness of the apparatus, we might mention that an apparatus installed in our test room gave a preliminary deflection of $^1/_5$ of the scale distance in one direction when the lead balls were moved from the centre to one of the end positions; after some movement to and fro of the balls the luminous pointer stopped at about 21 cm to the left or right according to the direction of movement of the balls. The scale distance in this case was only 2.25 m. — Complete directions for use are given with each apparatus.

52,145. **Attraction of Mass Apparatus,** Weinhold's (W. D., 4th Edn., Fig. 100)	17.10.0

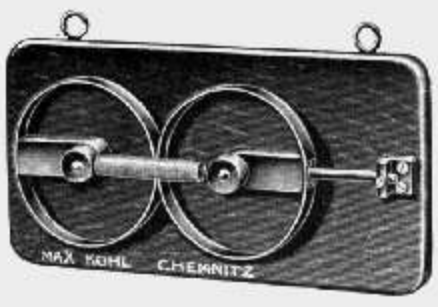
Max Kohl A. G. Chemnitz, Germany.



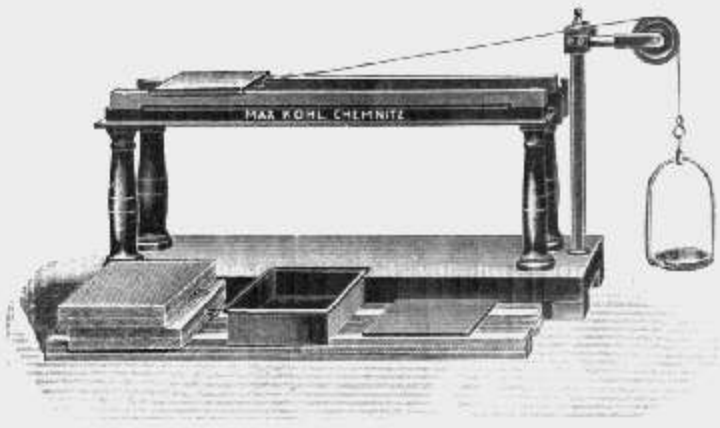
52 146. 1 : 8.



52 148. 1 : 11.



52 147. 1 : 6.



52 149. 1 : 10.

Molecular Effects of Solids.

52,146. **Molecule Model,** as suggested by Körner, Figure, on stand (Fr. phys. Techn. I, 2, Fig. 3899) . . . . . £ 1.10.0

The balls are capable of easy motion round their position of equilibrium. A blow increases the movement which is generally existent, and the development of heat by impact or friction can be shown. A plate is placed on four of the uppermost layer of balls. This is loaded (in a positive or negative sense) with weights. The molecules are compressed or expanded until the action of tensile or compressive strength proceeding from them attains equilibrium.

52,147. **Molecule Model,** as suggested by Hartl, Figure 0.15.0

This model has two spheres joined by a spiral spring, each ball representing a molecule. The spring endeavours to bring these together. Two flat springs placed round the molecules represent the surrounding ether envelopes, the molecules being held apart by these flat springs. The simultaneous attraction and repulsion is plainly observable in this model.

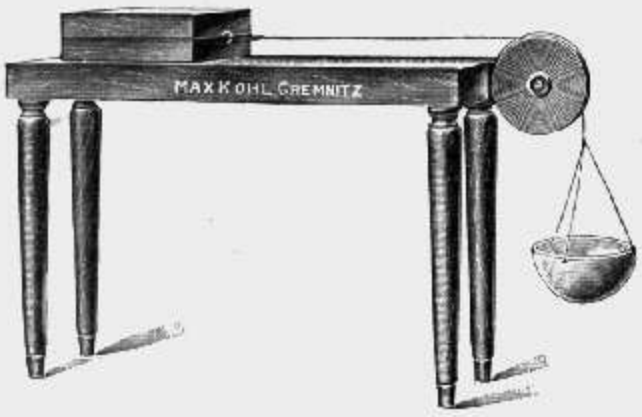
52,148. **Tribometer** (Hartl's) (Ztschr. f. d. phys. u. chem. U., 7, 1893/94, p. 231), Figure, for experiments on sliding friction, the inclined plane, etc. 15. 0.0

The tribometer is a demonstration dynamometer, and permits of reading on a scale, even at some distance away, the force used. A sliding track forms the lower surface, and this track can be laid with slabs of different materials. The sliding bodies are wood blocks covered with different materials. Given in with the apparatus are 3 slabs, one of glass ground on one side and polished on the other; one slab of cast iron, planed, and one of brass. An oak block is given in as a sliding body, as are also a block covered with drawing paper and one covered with brass.

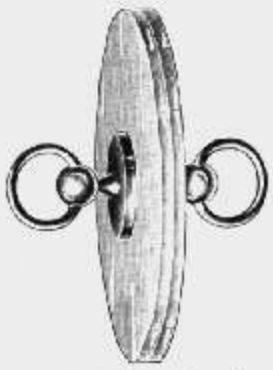
52,149. **Tribometer for Sliding Friction,** as suggested by Coulomb, Figure (M. P. I, Fig. 341 [330]), with one pair horizontal bearing rails of wood and of iron, with roller and balance pan, also a large selection of test materials 2.10.0

For Brake Dynamometers (Prony Brakes), see Nos. 52,424—52,426, p. 332.

Cl. 3291, 681, 5279, 682.



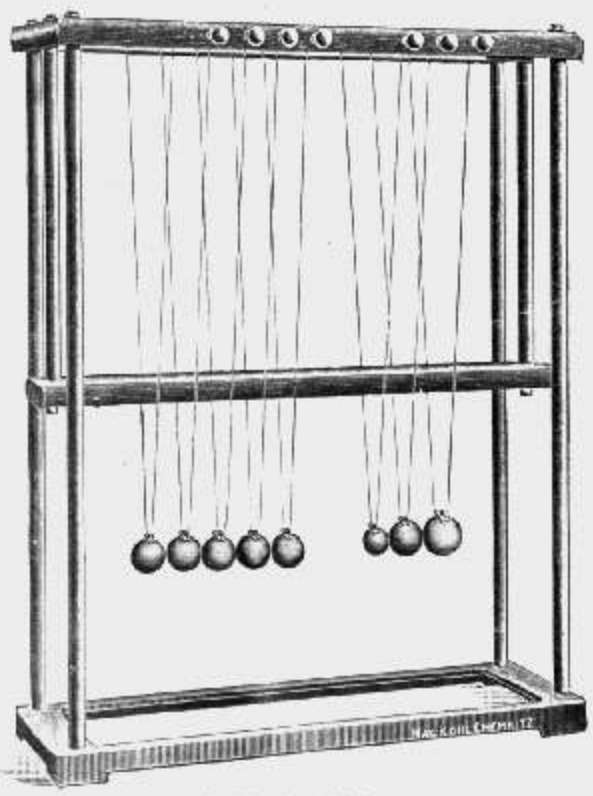
52150. 1 : 8.



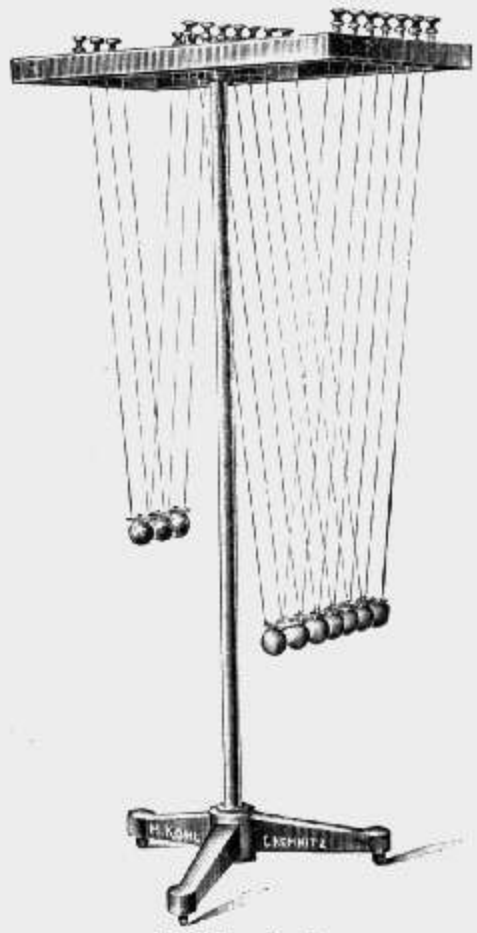
52156. 1 : 5.



52157. 1 : 6.



52163 (52164). 1 : 8.



52165. 1 : 8.

	£	s.	d.
52,150. **Tribometer for Sliding Friction,** Coulomb's, simpler than No. 52,149, Figure . .	1.	4.	0
52,151. **Apparatus for testing the Friction of Journals** (Müller's) (M. T., Fig. 54), with bearings of brass, iron and wood, each with a polished and an unpolished cylinder of iron and wood with sheaves for inserting	1.	10.	0
52,152. **Bicycle Ball Bearing** (M. T., p. 94)	0.	10.	0

Adhesion Plates, of glass, Figure 52,156.

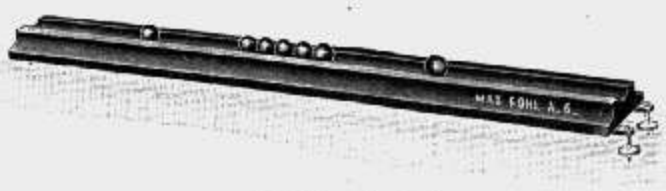
List No.	52,153	52,154	52,155	52,156
Diameter of plates mm	80	120	150	200
£	**0. 12. 0**	**1. 2. 0**	**1. 5. 0**	**1. 13. 0**

52,157. **Rubber Discs** with handles, excellent in their action, Figure	1.	5.	0
52,158. **Cylinder of Lead and Wax,** for adhesion experiments (M. T., p. 51)	0.	2.	0
52,159. **Ivory Ball with Marble Slab,** for elastic impact (W. D., p. 136 [115]), ball 30 mm diameter	0.	10.	0
52,160. — idem, with nickelled Iron Slab	0.	10.	0

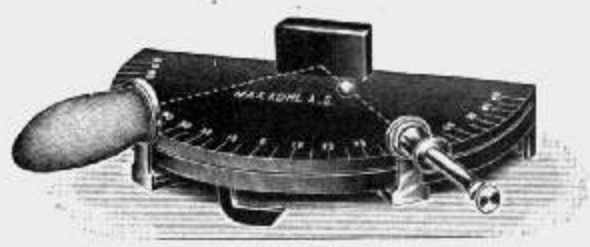
If the slab is breathed upon before the experiment, a plainly visible surface is produced by the falling ball caused by the elasticity of the ivory ball.

52,161. **Percussion Trough,** as suggested by Tyndall, of wood, 1 m long, with levelling screws and 7 lignum vitae balls, Figure	0.	16.	0
52,162. **3 Lead Balls and 3 Hardwood Balls** with hooks, for impact experiments (M. T., p. 90)	0.	7.	0

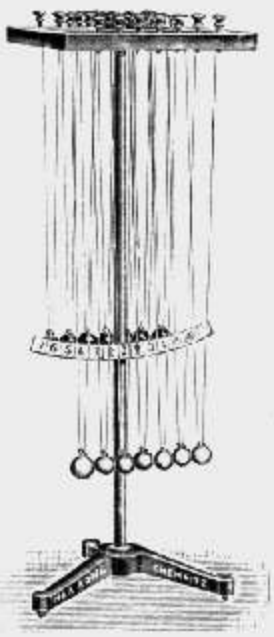
Cl. 3689, 5748, 5374, 3318, 3319.



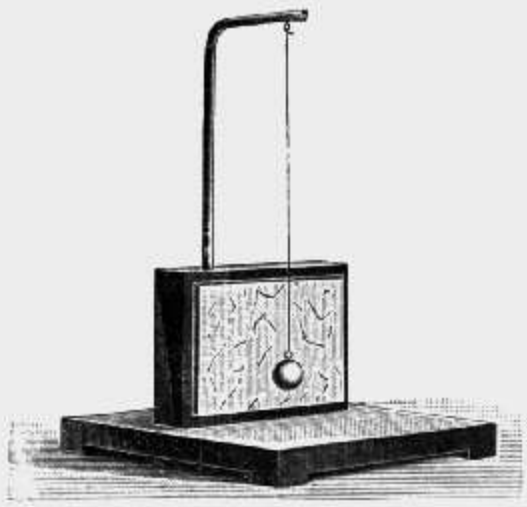
52161. 1 : 10.



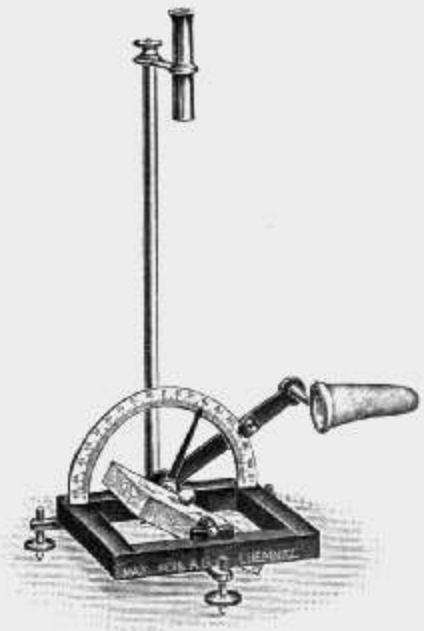
52167. 1 : 8.



52166. 1 : 12.



52168. 1 : 6.

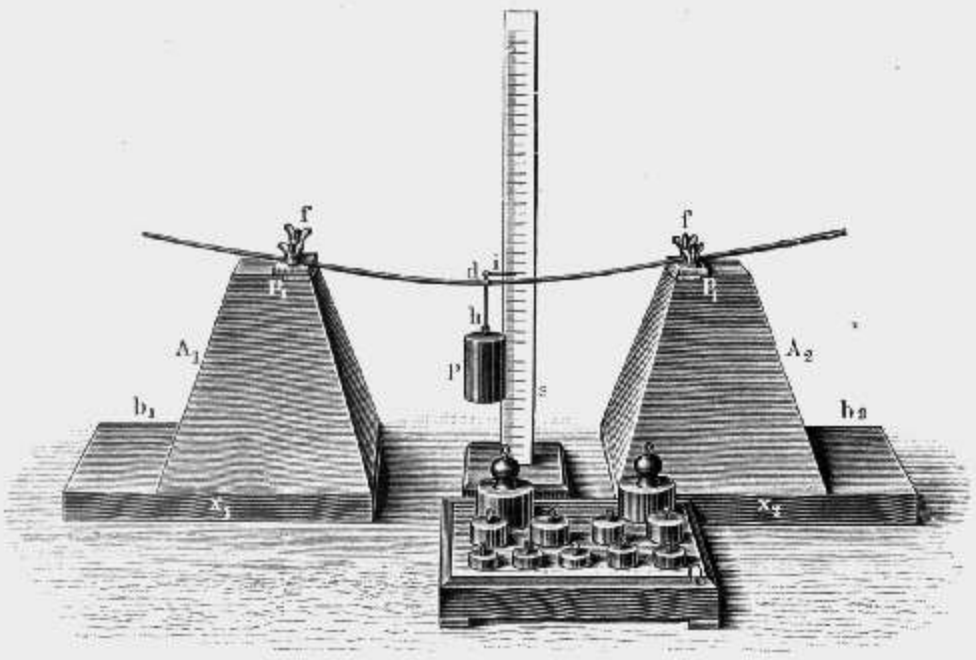


52169. 1 : 7.

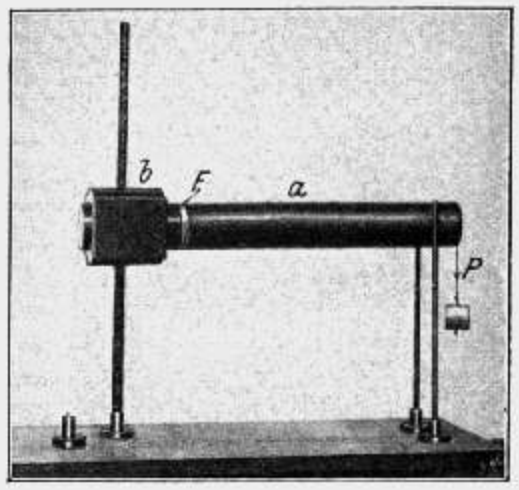


52171. 1 : 7.

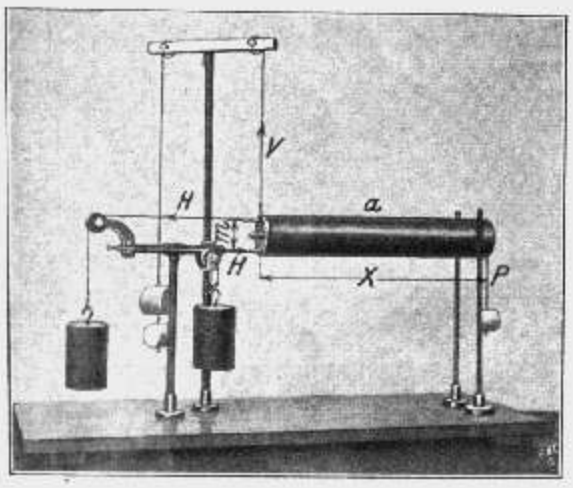
	£ s. d.
52,163. **Percussion Apparatus,** Figure, with 5 balls of the same size and 3 of different sizes, of lignum vitae, the ratio of weights of the latter balls being $^1/_2 : 1 : 2$ . . .	1.16.0
52,164. — idem, **with ivory balls,** Figure (the balls of equal size being 35 mm diameter)	4.16.0
52,165. **Percussion Apparatus,** Figure, with 7 ivory and 3 lead balls 25 mm in diameter	2.14.0
52,166. — idem, Figure, with 6 ivory and 6 lead balls 25 mm, and 1 ivory and 1 lead ball 30 mm in diameter, and comparison scale	3. 0.0
52,167. **Apparatus,** Figure, for showing that the angle of reflection is equal to the angle of incidence, with ivory ball (Fr. phys. Techn. **I, 2,** Fig. 3303)	2.10.0
52,168. — idem (Frick's) (Fr. phys. Techn. **I, 2,** Fig. 3302 [I, Fig. 442]), Figure . .	0.16.0
52,169. — idem (Nollet's), with ivory ball falling perpendicularly, Figure (Fr. phys. Techn. **I, 2,** Fig. 3304)	2.10.0
52,170. **Glass Spiral** of thin Glass Fibre, for proving elasticity, in preserving tube (W. D., p. 139)	0. 1.0
52,171. **Glass Vessel, cracked spiral shape,** Figure, for experiments in elasticity . . . The flask forms a large, closed, spring spiral, and can be taken apart.	0. 3.0
52,172. **Rubber Hose for Elasticity Experiments** (W. D., p. 139 [118]), 40 cm long, with strong hooks on the ends	0. 5.0
52,173. **Apparatus for demonstrating and measuring the expansion and elasticity of wires of different metals, by extension and heat** (Fr. phys. Techn. **I, 2,** Fig. 3244).	3.10.0
52,174. **Wood Rod** for experiments on elasticity in bending (Friedr. C. G. Müller's) (M. T., p. 50)	0. 2.0
52,175. **Apparatus (S'Gravesande's), for showing the elasticity of metal wires** (M. P. **I,** Fig. 328 [320])	1. 2.0



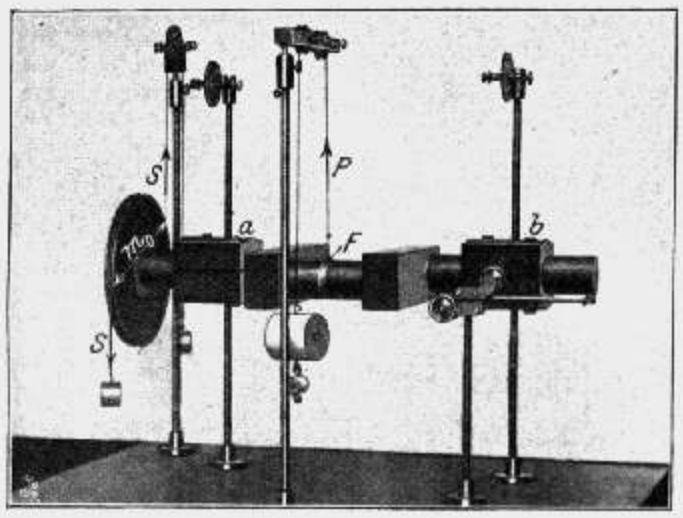
52 176. 1 : 8.



52 179 A. 1 : 20.



52 179 B. 1 : 20.



52 180. 1 : 13.

52,176. **Apparatus for determining elasticity in bending,** Figure (W. u. E. phys. Prakt., Fig. 63) . . . . . £ s. d. 1. 12. 0

The apparatus consists of two wood blocks fixed on boards, these blocks being fitted with clamps for screwing down the wires; the blocks can be weighted by means of weights. In addition the following pertain to the apparatus: 1 vertical scale on base, one pointer for sliding along the rod to be tested; 3 steel rods and 1 copper rod. Weights not included in above price.

52,177. — idem, with small glass scale, graduated in $^1/_2$ mm, for reading with Reading Microscope No. 51,474 . . . . . 2. 0. 0

The scale is fixed to the rod instead of the pointer.

52,178. **One Set Weights,** suitable for No. 52,176 and 52,177 . . . . . 1. 5. 0

52,179. **Transverse Strength Apparatus,** as suggested by Prof. Eug. Meyer, Figs. A and B, for explaining the calculation of the transverse strength of straight bars, also for explaining the conception of bending moment (Z. d. V. d. I., **53**, 1909, p. 1301 et seq., No. 3, and text-sheet 13, Figs. 7 and 8) 6. 15. 0

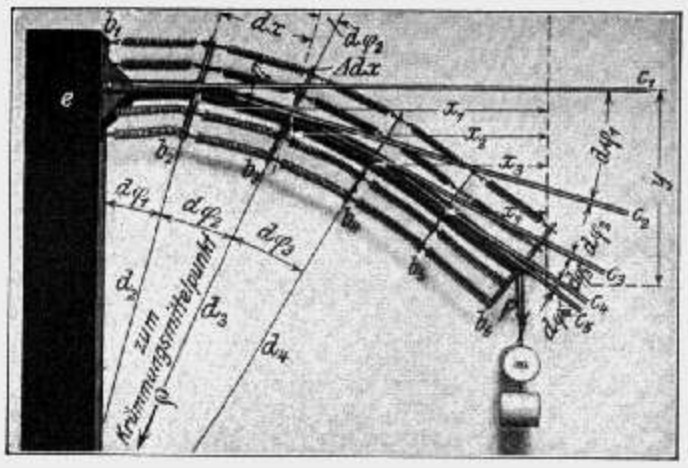
The wire maintained in tension at one end is loaded at the other end, Fig. A. The end of the bar in the clip is then moved up to a nick F, at which the bar can be dismounted; and forces of such direction and magnitude are applied to the loaded portion that the portion of the bar in the original position is again in a state of equilibrium, Fig. B.

52,180. **Bent Crankshaft,** as suggested by Prof. Eug. Meyer, Figure, a model for demonstrating the bending moment, the turning moment and the thrusts in a crankshaft (Z. d. V. d. I., **53**, 1909, pp. 1301 et seq., No. 4, and text-sheet 13, Figs. 10—12) . . 10. 15. 0

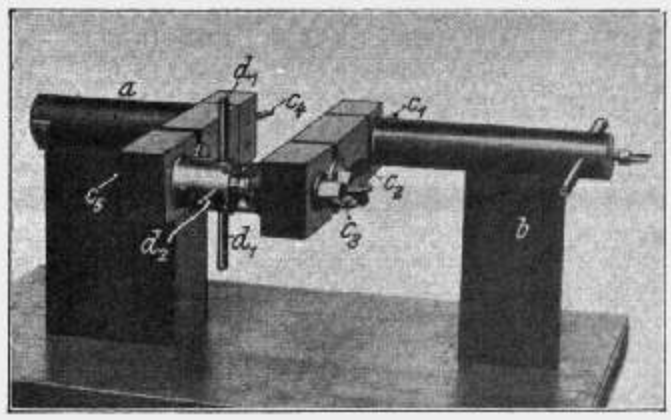
The crankshaft can be divided in the centre of the crank pin in order to explain the actions of the individual forces at this section.

Registering Apparatus for Sag in Bridge Constructions, etc. quoted for on application. Cl. 689, 5636, 5637, 5638.

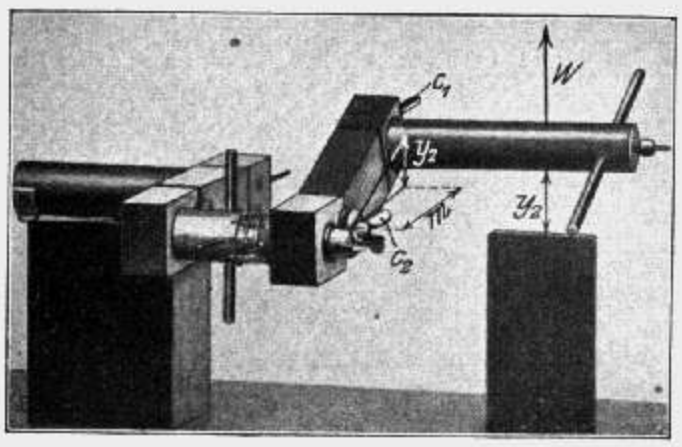
Max Kohl A. G. Chemnitz, Germany.



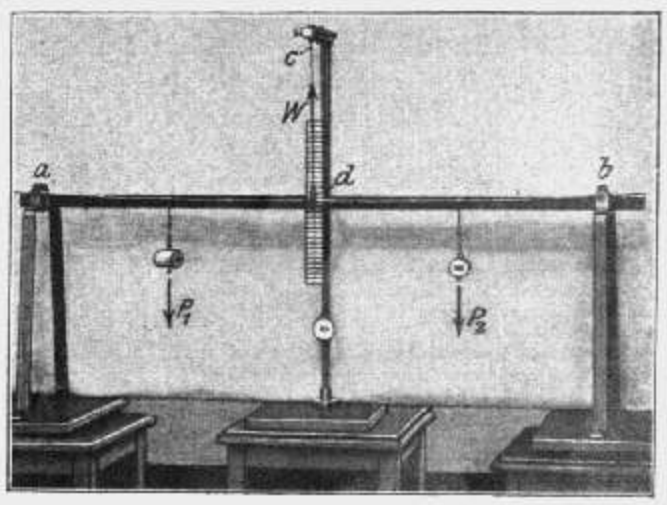
52 181. 1 : 14.



52 182 A. 1 : 10.



52 182 B. 1 : 10.



52 183. 1 : 18.

One half of the crank-shaft is taken forward, the other half being again brought to a state of equilibrium in the original position by the introduction of single forces and couples, after removing the bearing, so that all forces present and their action can be plainly demonstrated. £ s. d.

52,181. **Bending Model** (Prof. Eugen Meyer's), Figure, for demonstrating the deformation of a bar by submitting it to bending: consisting of a bar formed of a number of parts held together by springs which when loaded on one side form the elastic line as a polygonal line (Ztschr. d. V. d. I. **53**, 1909, pp. 1301 et seq., **No. 5**, and text-sheet 13, Figs. 13—15) 6.15.0

Instead of using the steel springs a brass spring can be used whose coefficient of expansion is greater than that of the steel springs, so as to be able to analyse the conditions in the bending of cast iron bars. Wood bars can be placed on the model which become as tangents on the elastic line or which give the direction of the radius of curvature of the elastic line.

52,182. **Crankshaft with moving parts,** as suggested by Prof. E. Meyer, Figs. A and B, for explaining the deformation of a crankshaft (Ztschr. d. V. d. I. **53**, 1909, pp. 1301 et seq., **No. 6**, and text-sheet 14, Figs. 16—22) 5. 5.0

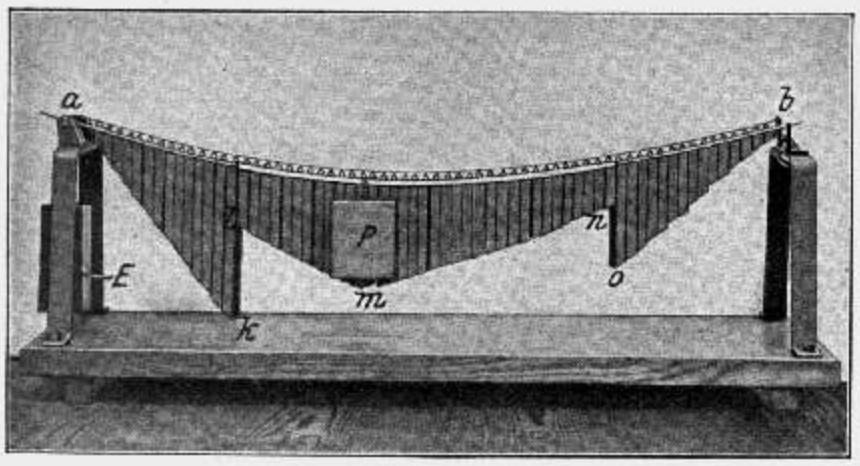
The model is provided with joints at the sections to be considered, so that the deformations caused by all the prevailing forces can be shown separately.

52,183. **Apparatus for Determining the Statically Indefinite Forces on a Bearing,** on a bar with three bearing surfaces, as suggested by Prof. E. Meyer, Figure (Ztschr. d. V. d. I. **53**, 1909, pp. 1301 et seq., **No. 7**, and text-sheet 14, Figs. 23—25) 4.10.0

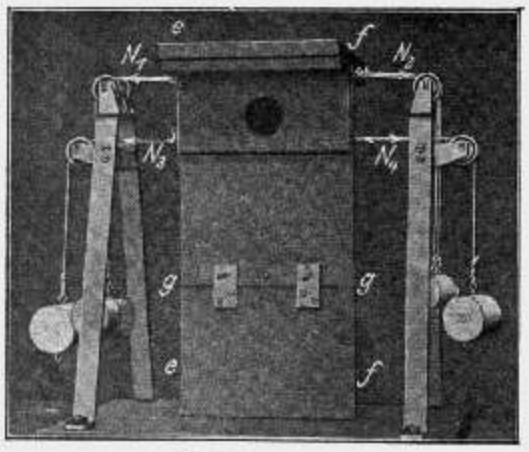
We will assume that the magnitude of the bearing force in the centre of the bar loaded as in the illustration with P_1 and P_2 is to be determined. The centre bearing is taken away and the sag caused in the middle is measured by P_1 and P_2; P_1 and P_2 are then shifted and a force W is applied to the centre which tends to bend the bar in an upward direction just as much as it was bent downwards by P_1 and P_2. If P_1, P_2 and P_3 are applied simultaneously the resultant deflection is obtained from the algebraic sum of both at zero.

Complete description of Prof. Eugen Meyer's models on application. Cl. 5643, 5644, 5646, 5651. 20

Max Kohl A. G. Chemnitz, Germany.



52184. 1 : 10.



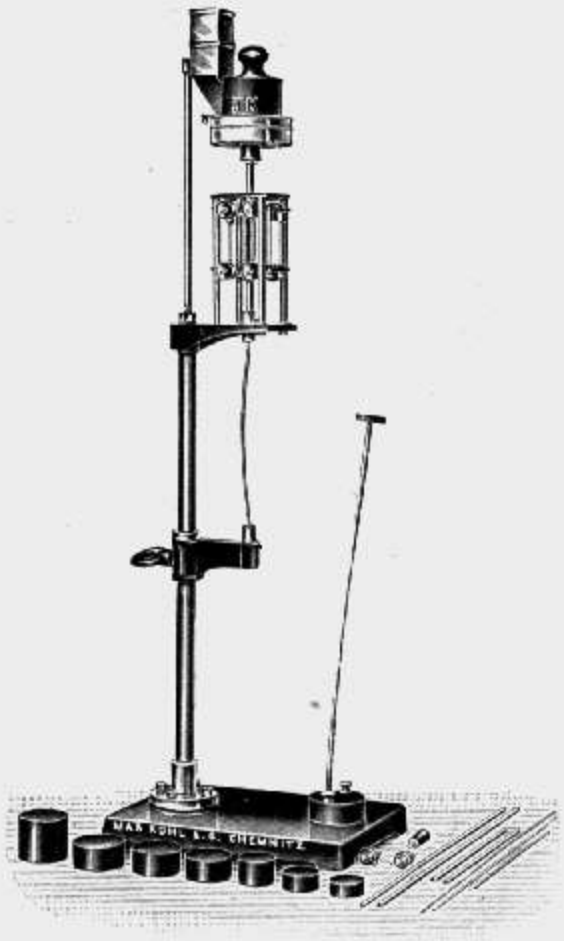
52185. 1 : 10.



52186 A. 1 : 12.



52186 B. 1 : 12.



52187. 1 : 13.

52,184. **Model** for Demonstrating **Mohr's Law** on the **Elastic Line**, as suggested by Prof. Eugen Meyer, Figure (Ztschr. d. V. d. I. **53**, 1909, pp. 1301 et seq., **No. 8**, Fig. 27, and text-sheet 14, Fig. 26) . . . . . £ s. d. 5.10.0

The bar resting freely on bearings at the points a and b, loaded with the weight P, assumes the same elastic line as the chain carried over the same bearing, since its horizontal tension is equal to the modulus of elasticity, and as the line of load of the chain is equal to the line of the $\frac{M_o}{J}$ determined for the bar.

52,185. **Rivetting Model**, Prof. Eugen Meyer's, Figure, for explaining the strain on the chord rivets and the shearing stress in compound girders which are submitted to a bending strain (Ztschr. d. V. d. I. **53**, 1909, pp. 1301 et seq., **No. 9**, Figs. 31 and 32, and text-sheet 14, Figs. 28—30) 5. 5.0

The rivet submitted to the different stresses can be taken out and it is possible that the shearing or compressive stress present in the cross sections ee, ff, and which the rivet must take up can be ascertained by a lateral movement of the angle iron with the chord piece opposite the web sheet. In like manner the shearing force present in the section gg can be shown by loosening the connection.

52,186. **Breaking Model** (Bach's), Figs. A and B (Ztschr. d. V. d. I. **53**, 1909, pp. 1301 et seq., **No. 10**, and text-sheet 14, Figs. 33 and 34), for showing that the resistance to breaking strain is inversely proportional to the square of the length of the bar . . . 1.15.0

On loading the bars, which are gripped vertically, stable equilibrium occurs between the bending moment of the load and the elastic forces, either when the bars are in an extended or a curved position; — or — when the load is considerable — a condition of equilibrium does not take place and the wood bars are fractured. Test bars are given in with the apparatus, these comprising bars of various material in lengths of 30 and 60 cm.

52,187. **Apparatus for Demonstrating Resistance to Breaking Strain** of Bars, as suggested by Prof. Michel, Figure 8. 0.0

With this apparatus the resistance to breaking strain of bars of different lengths, varying section, and of different materials can be determined and the bars can be gripped either on one side, or both ends can be left free and be guided in the original axis or both ends can be gripped and guided in the original axis.

52,187 a. — idem, with automatic supply of the load 10.10.0

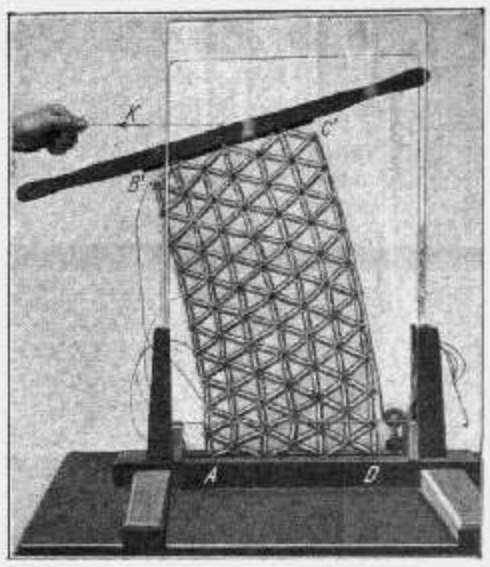
Complete description of Prof. Eugen Meyer's models on application. Cl. 5654, 5655, 5658, 5659, 5577.

Max Kohl A. G. Chemnitz, Germany.

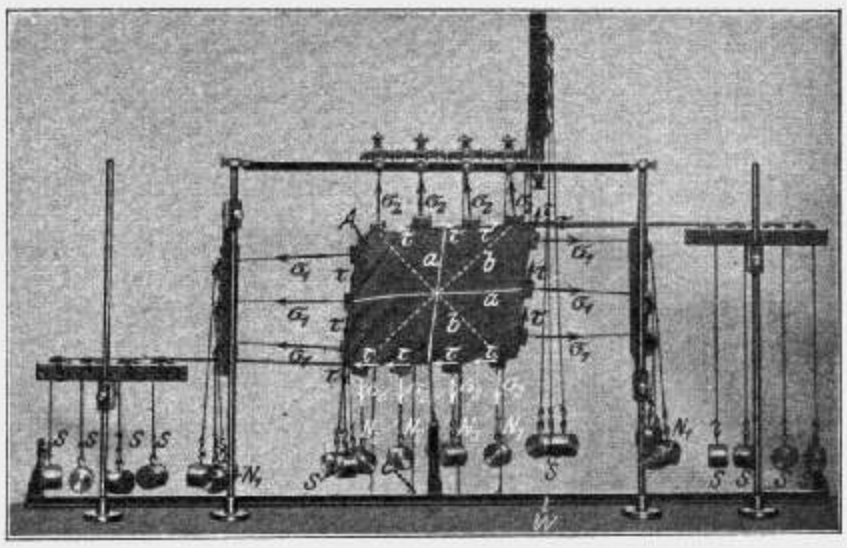
Max Kohl A. G. Chemnitz, Germany.



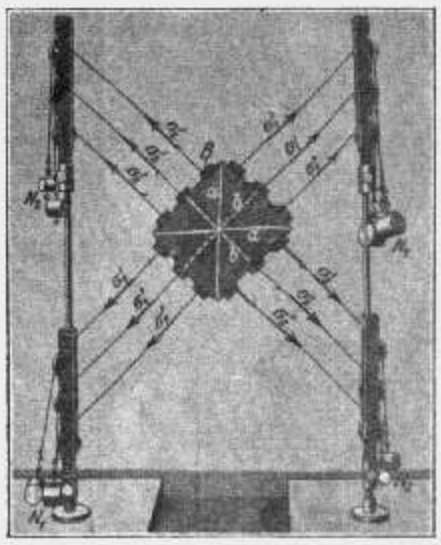
52 188. 1 : 10.



52 189. 1 : 12.



52 190. 1 : 13.



52 191. 1 : 12.

52,188. **Model for Explaining Tension,** as suggested by Prof. Eugen Meyer, Figure (Ztschr. d. V. d. I., **53,** 1909, pp. 1301 et seq., **No. 11,** Fig. 35, and text-sheet 14, Fig. 35) — £ 1. s. 15. d. 0

The rubber plate submitted to the forces P_1, P_2, P_3 and P_4 has a cut in the direction a—b and forms a gap. The division of the forces working on the cut into normal tension and shearing stress is explained.

52,189. **Apparatus** (Prandtl's), **for Demonstrating the Angular Changes at the edges of a body by shearing stresses** occurring in pairs (Ztschr. d. V. d. I. **53,** 1909, pp. 1301 et seq., **No. 12,** Figs. 36 and 37, and text-sheet 14, Figs. 38 and 39) . . . . . — Price on application

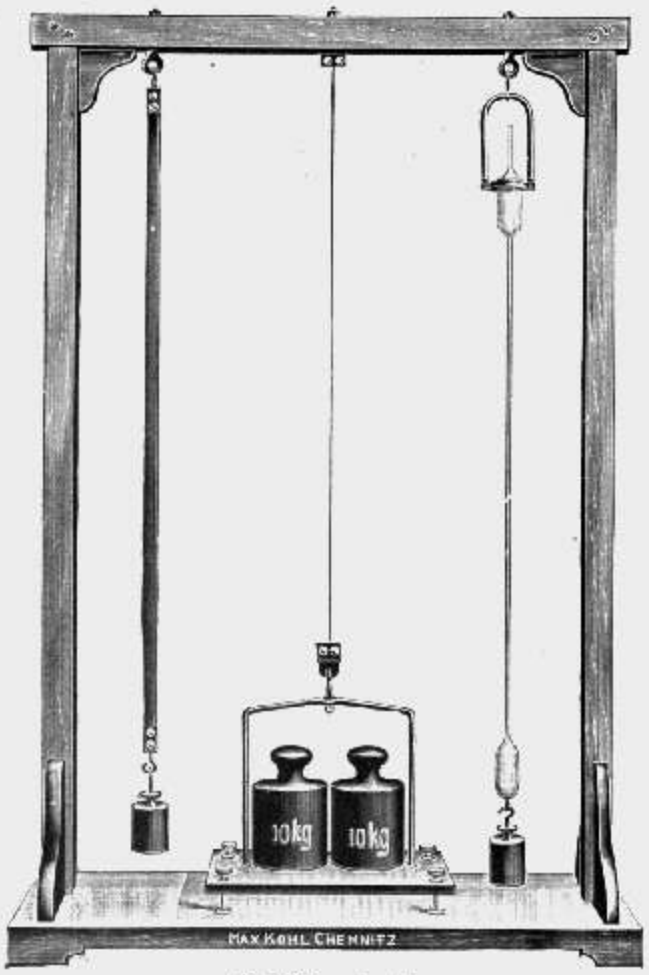
The apparatus consists of a system of spiral springs arranged between two glass discs as in the illustration. If these are pulled as shown in the illustration no angular changes result at the corners A, B', C' and D; this case corresponds to ordinary bending. Shearing forces can be applied at the same time; in this case angular changes also take place at the corners, i. e., the right angles are sometimes acute and sometimes obtuse.

52,190. **Apparatus for Demonstrating the Deformation of a Parallelepipedic Body on the end surfaces of which normal shearing stresses act simultaneously,** as suggested by Prof. Eugen Meyer, Figure (Ztschr. d. V. d. I. **53,** 1909, pp. 1301 et seq., **No. 13,** and text-sheet 13, Fig. 42) . . . . . — 10. 0. 0

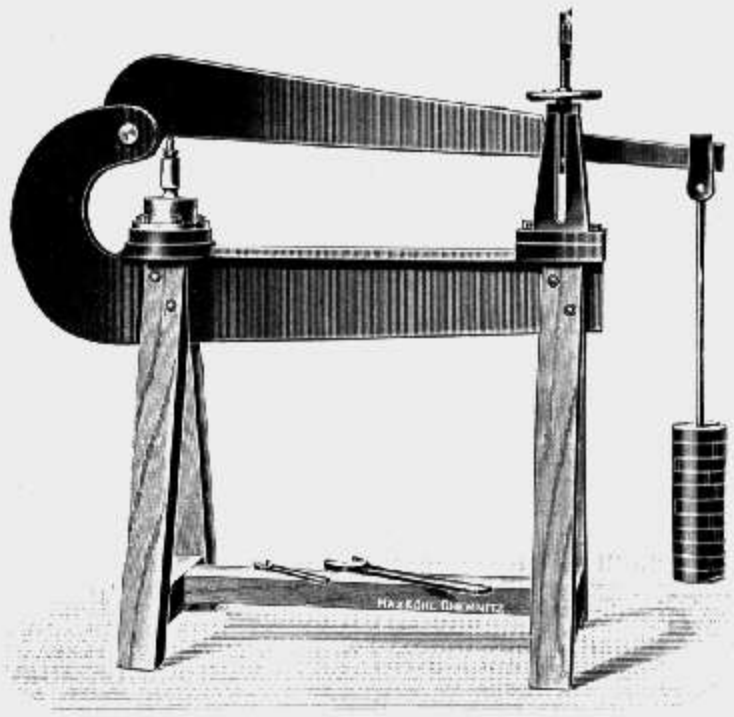
A base plate (angle iron W) can be raised and thus intercepts all the weights, and accordingly the elastic slab is unloaded and it assumes its original rectangular shape.

52,191. — idem, Figure, constructed as per **Fig. 43** in the publication mentioned . — 6. 5. 0

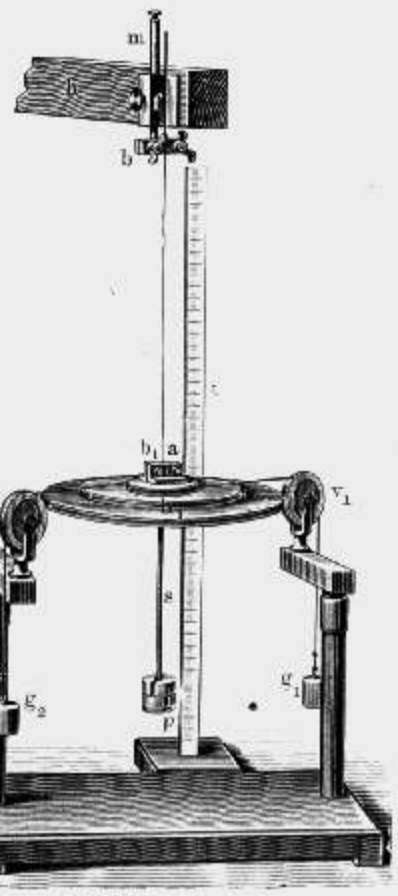
Complete description of Prof. Eugen Meyer's models on application.



52 192. 1 : 15.



52 193. 1 : 30.



52 195. 1 : 8.



52 201. 1 : 10.



52 200. 1 : 5.

52,192. **Apparatus for Determining Young's Modulus,** Figure, with the aid of the cathetometer (Chwolson-Pflaum, Lehrb. d. Phys., 1904, Vol. 1, p. 700) . . . . . £ 9. 0.0

Rubber, steel and glass are given in as test materials.

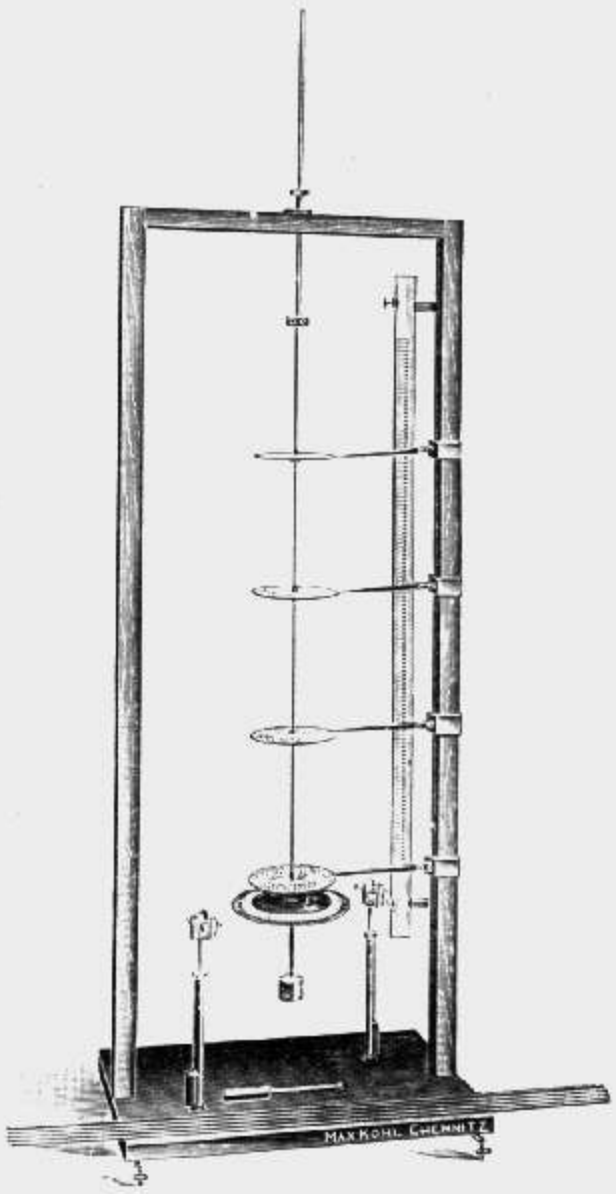
52,193. **Apparatus** (Spring's), for proving that a permanent **deformation** (plasticity) increasing with time takes place when the elastic limit is exceeded, Figure (Fr. phys. Techn. I. 2, Fig. 2254 [I, Fig. 137]) . . . . . £ 17.10.0

The apparatus consists of a massive oak frame, an iron T-shaped girder the thicker end of which is curved upwards, and a wrought iron downing-lever which serves as bearing. The latter is loaded at its free end with weights, as shown in the Figure, while the point of pressure is as close as possible to the fulcrum. The pressure exerted can be easily calculated from the dimension. The apparatus and a pressure mould, supplied by us, admit of a pressure of 10,000 atmospheres. The necessary weights are included in the price of the apparatus.

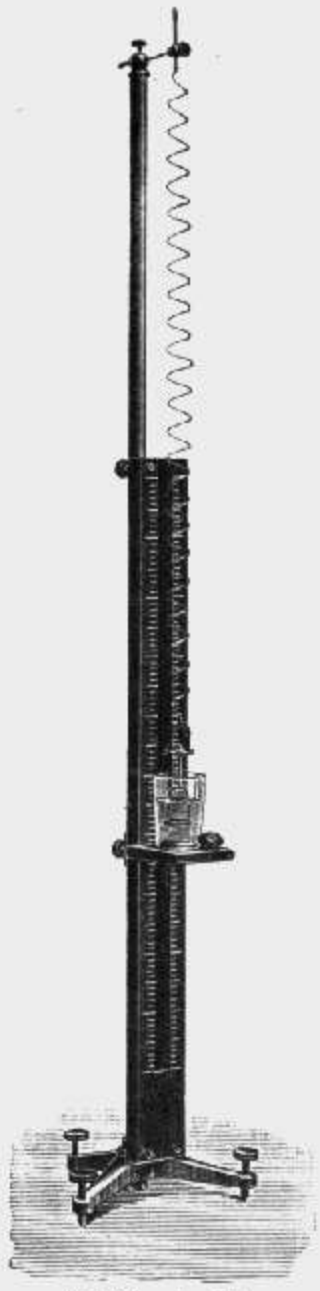
52,194. **2 Bars for Comparing Torsion of Elasticity,** as suggested by Friedr. C. G. Müller (M. T., p. 50), with clamping device . . . . . £ 0. 2.0

Cl. 3320, 699, 5080, 690, 692.

Max Kohl A. G. Chemnitz, Germany.



52 196. 1 : 16.

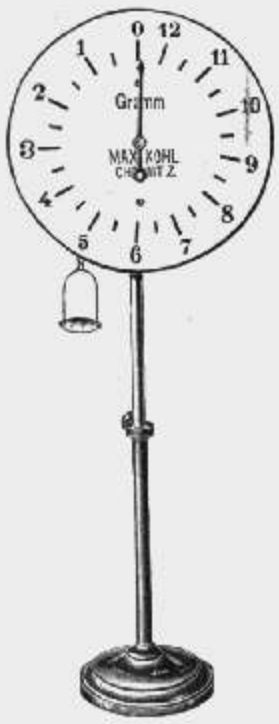


52 199. 1 : 10.

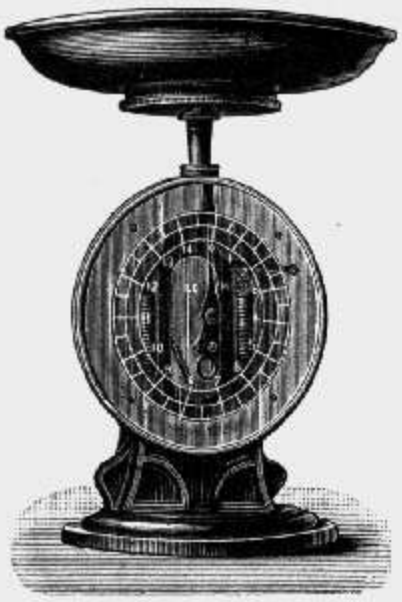


52 202. 1 : 5.

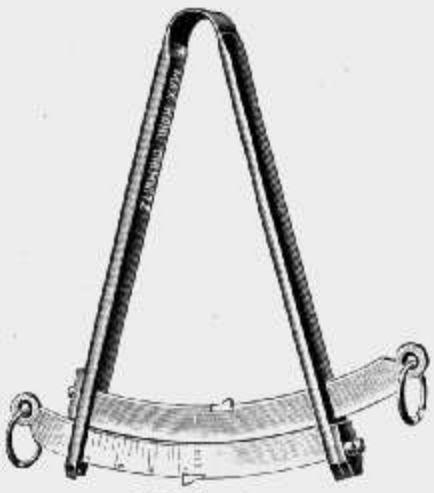
	£ s. d.
52,195. **Apparatus for Determining Torsional Elasticity,** Figure (W. and E. phys. Prakt., Fig. 65)	5.10.0
The apparatus is (not as shown in figure) built into a massive frame 1.4 m high and has an adjustable tension clip at the top for the wire to be tested, 3-stage aluminium disc, ribbed and graduated, 2 rollers turning about pillars and 1 vertical rule. Six different wires and 1 set of perforated lead weights pertain to the apparatus.	
52,196. **Apparatus for Determining Torsional Elasticity,** Figure	6.10.0
The apparatus is constructed in a similar manner to No. 52,195. Four scales can be fixed to the wires to be tested at equal distances. Weiler uses it (as per Ztschr. f. d. phys. u. chem. U. 11. 1898. p. 282) constructed in this manner as a mechanical model for demonstrating the potential drop in electric conductors.	
52,197. **Apparatus for Testing the Torsional Strength** of Metal Bars, Friedr. C. G. Müller's (M. T., p. 50), consisting of a shaft with crank and clamping device on one base-board	1.10.0
52,198. **Torsional Force Model,** Friedr. C. G. Müller's (M. T., Fig. 25)	0.15.0
52,199. **Spring Balance** (Jolly's), Figure (M. P. **I**, Fig. 330 [322]), with three different spiral springs, with metal stand, scale backed with silvered glass for avoiding parallax in reading	3. 0.0
52,200. **Simple Spring Balance for stress,** Figure	0. 5.0
52,201. — idem, **with stand and balance pan,** as suggested by Kleiber, Figure . . .	0.10.0
52,202. **Spring Balance** (Friedr. C. G. Müller's), Figure, going up to 300 g, with two marks for showing maximum and minimum load (M. P., Fig. 7 and 74)	1. 5.0



52 203. 1 : 4.



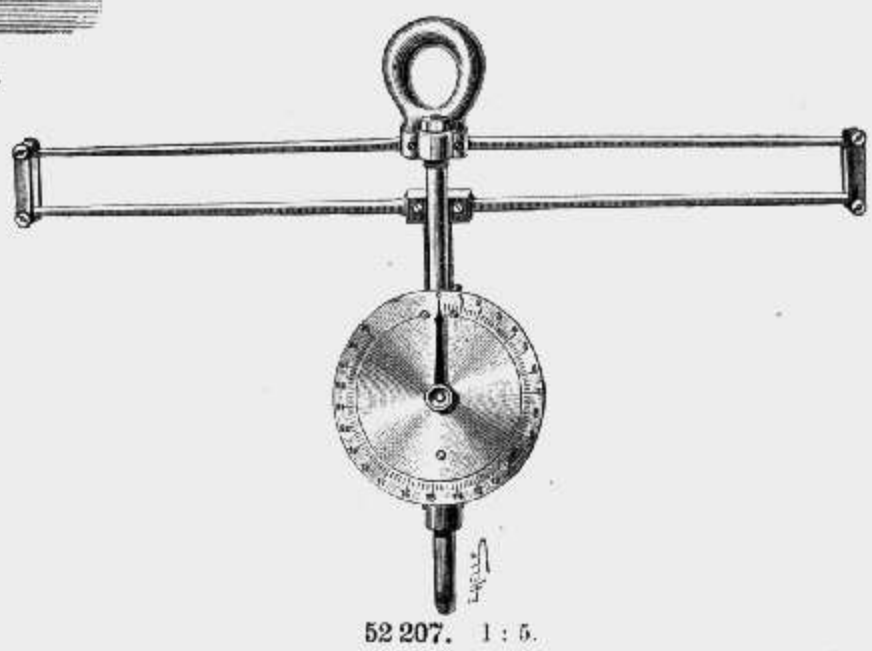
52 204. 1 : 4.



52 206. 1 : 5.



52 205. 1 : 6.



52 207. 1 : 5.

52,203. **Universal Spring Balance with large dial,** Kleiber's, Figure (Fr. phys. Techn. **I, 2,** Figs. 2062, 2103, 2160, 2445; Ztschr. f. d. phys. u. chem. U. **17,** 1904, p. 141) . . . £ 1. 6.0

Two balances are necessary for a number of experiments and should be ordered if opportunity arises.

52,204. **Model of a Spring Balance,** so called Kitchen Balance, with plainly visible mechanism and scale under glass, Figure 1. 5.0

52,205. **Spring Balance,** Figure, with range 0—5 kg and 0—25 kg, nickelled; can also be used as a dynamometer for tensile forces 0. 5.0

52,206. **Dynamometer (Spring Balance) for tensile forces,** as suggested by Hesehus, Figure, with scale from 0—15 kg (Gan.-Man. Figs. 6 and 7) 0.15.0

52,207. **Dynamometer,** Poncelet's, for 25 kg, Figure 3. 0.0

52,208. **Dynamometer with balance pan,** of brass, nickelled 0.15.0

52,209. **Dynamometer with stirrup and handle,** with pointer, Figure, scale 0—250 kg . 3. 0.0

52,210. **Spring Balance for Compression** (M. P. **I,** Fig. 332) 1.12.0

52,211. **Dynamometer for Compression,** round scale, for 0—60 kg, with adjustable pointer, Figure 2. 0.0

52,212. **Dynamometer (Spring Balance) for Compression and Extension,** Figure, scale from 0—250 kg, with adjustable pointer 2. 5.0

The extension hooks are not included in the illustration.

52,213. **Dynamometer for Compression** (to 3 kg) **and extension** to 25 kg (on stand), Figs. A and B, with three hooked weights 2.15.0

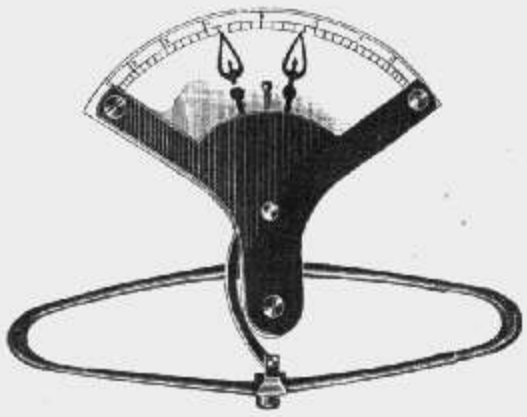
Cl. 3990, 698, 693, 3322, 697.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



52 209. 1 : 10.



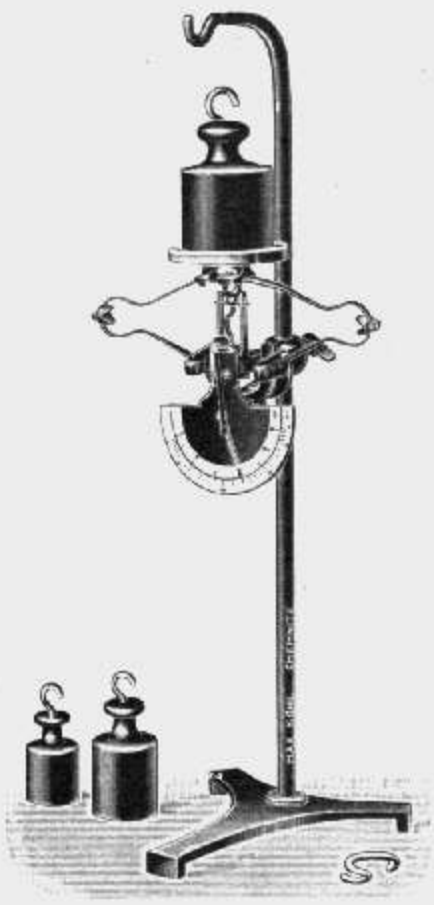
52 212. 1 : 5.



52 219. 1 : 5.



52 211. 1 : 5.



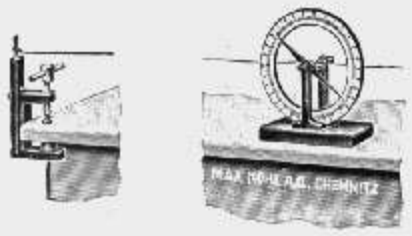
52 213 A. 1 : 6.



52 213 B. 1 : 6.

	£ s. d.
52,215. **6 Pieces of Wire, with lugs, for breaking tests,** as suggested by Friedr. C. G. Müller (M. T., Figs. 31 and 3)	0.10.0
Portable gallows No. 51,152, the indicating cylinder No. 51,452, balance pan No. 52,216 and one set of weights Nos. 51,676—51,684 are necessary for the experiments.	
52,216. **Balance Pan** for heavy load (M. T., Fig. 3), see Figure 52,221	0. 6.0
52,217. **Viscosity Test Pieces** for hammering out; bars of lead, brass, wrought iron, zinc, cast iron, wood and glass (M. T., p. 49), 3 pieces of each, 50 mm long, 10 mm thick . .	0. 8.0
52,218. **Sheet Iron Strip** for Determining **Elastic Limit, Viscosity and Strength** (M. T., p. 49)	0. 5.0
52,219. **U-shaped Bar** for Demonstrating **Expansion and Jolting,** Figure (M. T., Fig. 32)	0. 2.0

Cl. 5525, 695, 5116, 694, 3640, 3641.



52 221, 51 452, 52 216, 51 676



51 681, 51 121. 1 : 14.



52 227. 1 : 3.



52 228. 1 : 9.



52 229. 1 : 8.



52 230. 1 : 9.



52 232. 1 : 8.

	£ s. d.
52,221. **Arrangement for Elasticity, Expansion and Breaking Tests,** as suggested by Friedr. C. G. Müller, for fitting to the lecture table, consisting of **1 screw clamp** for securing the test wires and **1 guide pulley,** also **6 test wires** . . . . . The following are also necessary for the experiments: indicating cylinder No. 51,452, balance pan No. 52,216, 1 set of weights Nos. 51,676—51,681 and 1 American screw clamp No. 51,121. For measuring the expansion the test wire is simply laid over the axis of the indicating cylinder and not slung round it.	1. 0.0
52,222. **Batavian Glass Drops** . . . . . per dozen	0. 0.6
52,223. **Bologna Flasks** . . . . . per 10	0. 1.0
52,224. **Press** (Reusch's), for producing sliding surfaces in calc-spar and rock salt, with preparation	1. 5.0
52,225. **Pressed** and **Unpressed Preparations,** singly . . . . . 2 s. 6 d. to	0. 4.0
52,226. **Press** (Baumhauer's) for producing the calc-spar doublets	1. 4.0
52,227. **Hardness Scale** (Mohr's), Figure, with large stone specimens, porcelain slab, writing diamond and bar magnet, in wood box	0.18.0

Models of Machine Elements and Parts and of complete Machines.

Machine Elements and Simple Machines.

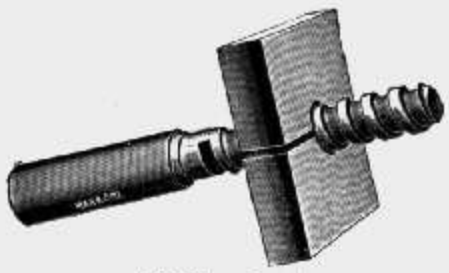
	£ s. d.
52,228. **Prism with its hollow mould,** Figure, of wood, sliding on each other	0.10.0
52,229. **Shoe Guide,** Figure, of wood	0.12.0
52,230. **Journal with bearing,** Figure, of wood, with 2 turning surfaces fitting in each other	0.12.0
52,231. **Circular Groove with Circular Slot** (incomplete journal), of wood	0.18.0
52,232. **Bolt and Nut,** Figure, of wood	0.18.0

Cl. 5751, 3152, 514, 515, 516, 517.

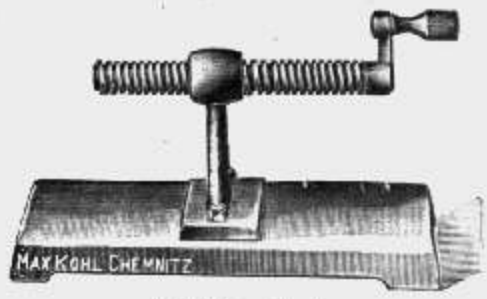
Max Kohl A. G. Chemnitz, Germany.



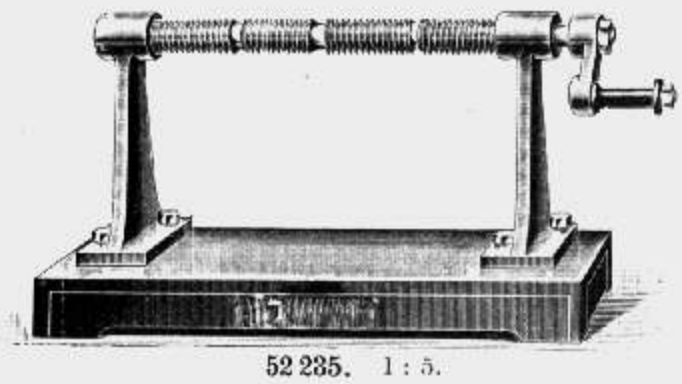
52 233. 1 : 5.



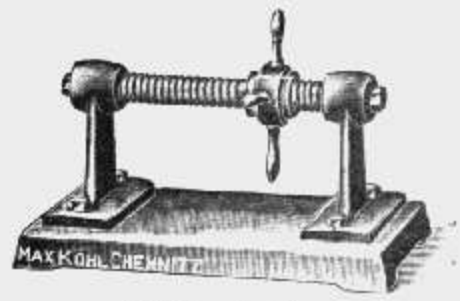
52 234. 1 : 4.



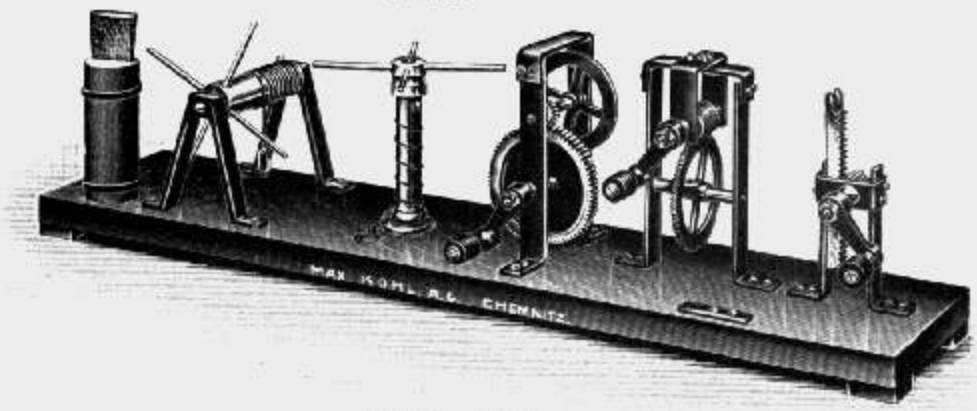
52 237. 1 : 6.



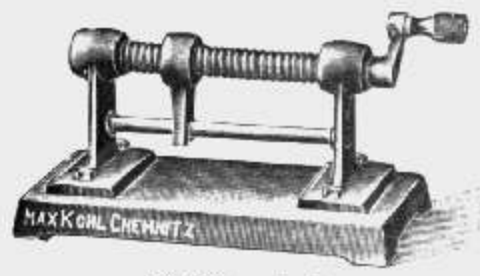
52 235. 1 : 5.



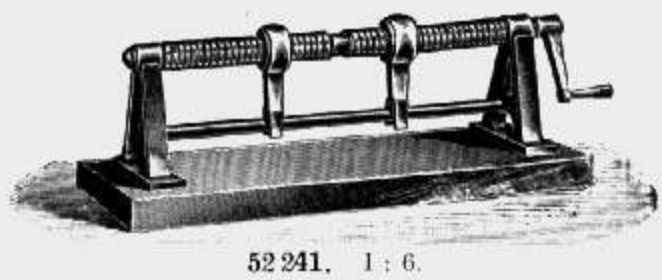
52 238. 1 : 6.



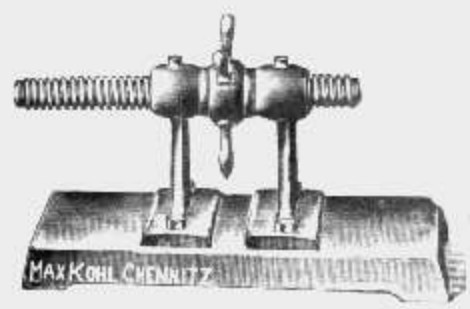
52 236. 1 : 8.



52 239. 1 : 6.



52 241. 1 : 6.



52 240. 1 : 6.

	£ s. d.
52,233. **Triangular Screw Thread with Nut cut through,** Figure, of wood	0. 2.6
52,234. **Square Screw Thead, with Nut cut through,** Figure, of wood	0. 3.0
52,235. **Model of Screw** with 4 threads of different shape and pitch, without nuts, of metal, Figure	1.10.0
52,236. **Simple Machines,** Figure. Wedge, Windlass, Capstan, Toothed Gearing with fly-wheel, Worm Gearing and Screw Jack, mounted on one baseboard	4.15.0

Gearing with Screws, Cranks, Links, Rods, Joints and Discs.

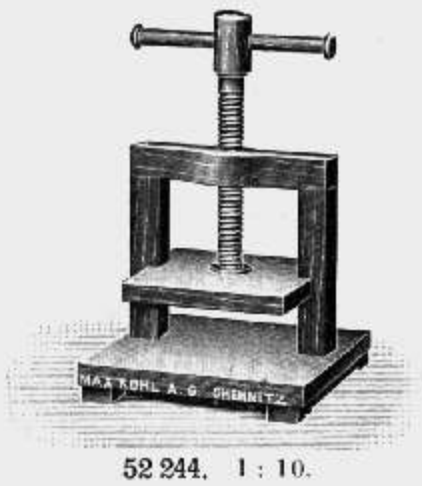
52,237. **Fixed Nut with Rotary Screw Spindle,** Figure, with angular, accurately turned thread, constructed entirely in iron	1. 0.0
52,238. **Fixed Screw Spindle, with Rotary Progressive Nut,** Figure	1. 4.0
52,239. **Screw Spindle, rotary, resting immovably in its bearings, with straight guided, progressive nut,** Figure	1.10.0
52,240. **Rotary Nut, incapable of lateral movement, with straight guided, progressive screw spindle,** Figure	1.10.0
52,241. **Screw with Right-and-Left-Handed Thread,** Figure, with nuts	2.10.0

Apparatus for showing the **formation and mode of action of the screw,** see No. 51,905—51,910, p. 273.

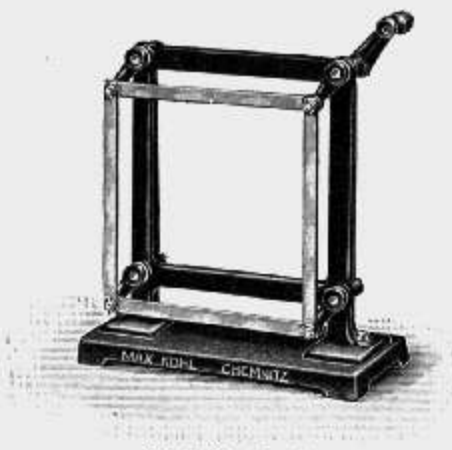
Cl. 518, 519, 3786, 521, 3787, 5805, 3788, 520, 3789



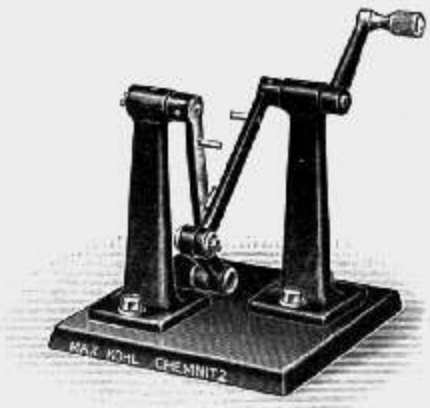
52 243. 1 : 6.



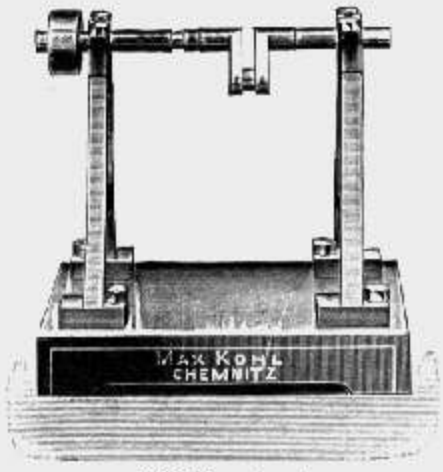
52 244. 1 : 10.



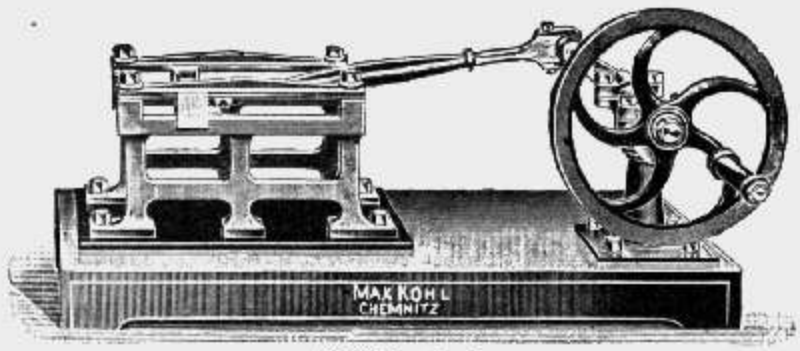
52 248. 1 : 8.



52 250. 1 : 6.



52 252. 1 : 4.



52 253. 1 : 5.

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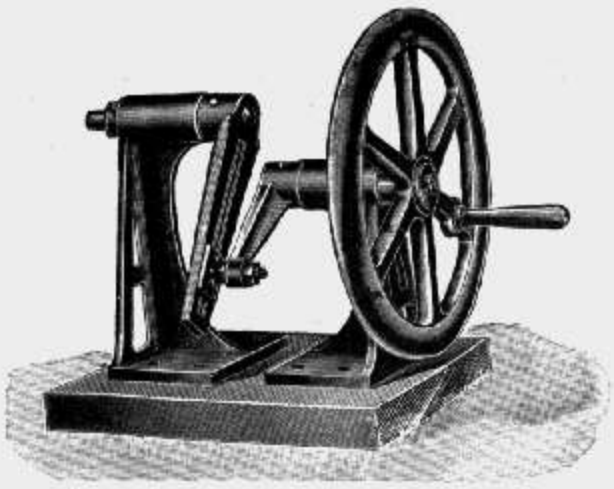
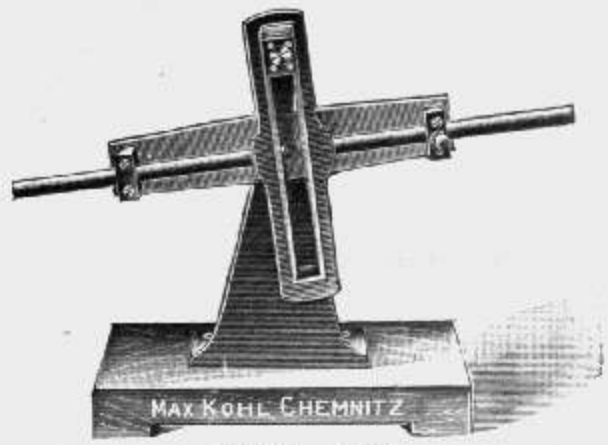
		£ s. d.
52,242.	**Screw with two Threads of Different Pitch,** with nuts (differential gear)	2.10.0
52,243.	**Screw Thread with Ratchet Brace,** of metal, Figure (M. P. I, Fig. 275 [272])	1.16.0
52,244.	**Screw Press,** of wood, Figure	0.10.0
52,245.	**Quadrilateral Crank Gear,** with a rotating and an oscillating crank	4. 0.0
52,246.	**Rotating Double Crank**	4. 0.0
52,247.	**Oscillating Double Crank**	4. 0.0
52,248.	**Parallel Crank,** Figure	4. 0.0
52,249.	**Counter-motion Anti-parallel Cranks**	4. 0.0
52,250.	**Anti-parallel Cranks,** working in same direction, Figure	4. 0.0
52,251.	**Equilateral Crank Gear** (Galloway's)	4. 0.0
	A crank rectangle, in which the two adjacent sides are equal, and the opposite pairs of sides differ in length.	
52,252.	**Crank Shaft,** Figure, of metal	2.10.0
52,253.	**Oscillating Thrust Crank, Driving Wheel with Connecting Rod,** with cross head and guide, Figure, of metal	5. 0.0
52,254.	**Oscillating Slot and Crank,** Connecting Rod in the form of a piston rod, cylinder oscillating	5. 0.0
	This mechanism is also employed in the sectional model of an oscillating cylinder of steam engine to be mentioned later.	

Cl. 5396, 5356, 522, 5344, 524, 525.



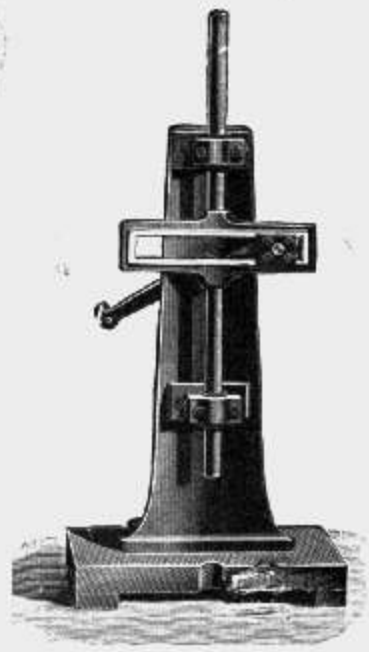
52 255. 1 : 6.



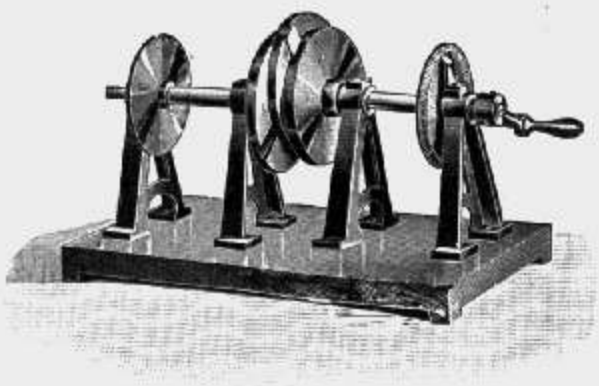
52 259. 1 : 6.



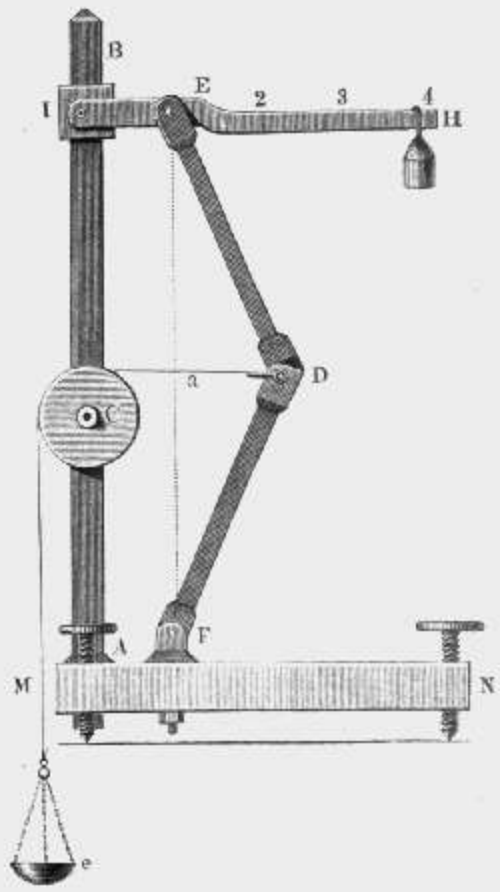
52 256. 1 : 6.



52 258. 1 : 9.



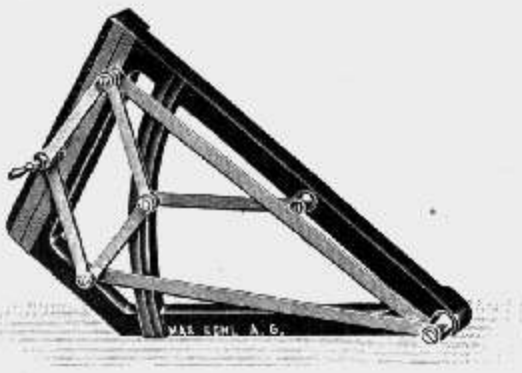
52 260. 1 : 8.



52 261. 1 : 4.

	£ s. d.
52,255. **Rotating Crank and Slot,** Figure, changes uniform rotation into unsymmetrical, periodic rotation . . . . . The axes of the crank and slot are placed so close to each other that the slot rotates.	4. 0.0
52,256. **Crank and Slot,** the slot arranged to rotate, Figure . . . . . This gear is similar to the previous one; the axes of the crank and slot are, however, placed at such a distance apart that the slot can no longer **rotate** but only **oscillate.**	4. 0.0
52,257. **Equal-limb Rotating Crank and Slot**	4. 0.0
52,258. **Oscillating Cross Slot,** for versed sine motion, Figure	4. 0.0
52,259. **Rotating Cross Slot,** Figure	4. 0.0
52,260. **Oldham's Coupling,** Figure, serving as organ of transmission between two parallel axes . . . . . A practical application of the rotating cross slot. The two axes have the same angular velocity.	4. 0.0
52,261. **Model of the Bent Lever,** Figure (Fr. phys. Techn. **I,** Figs. 124—126; M. P. **I,** Figs. 280—282); testing of same by suspending weights. Price without weights . .	3. 0.0

Cl. 526, 3626, 5343, 528, 529, 4866.



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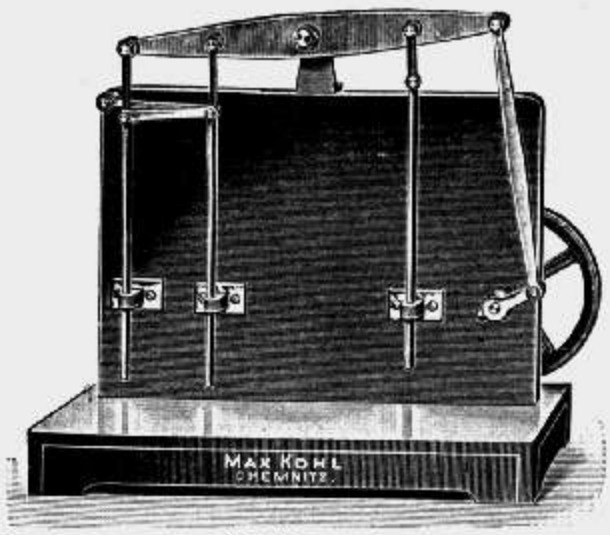
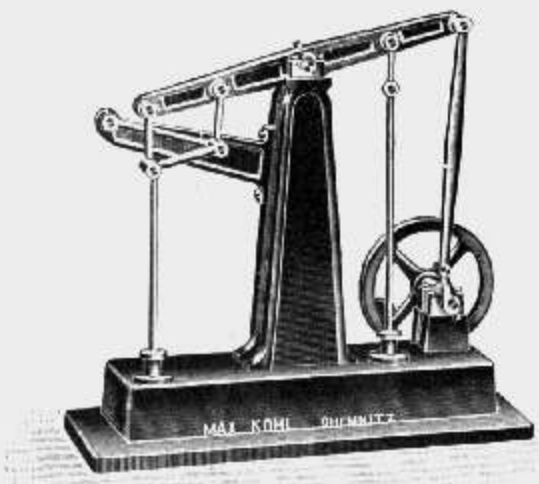
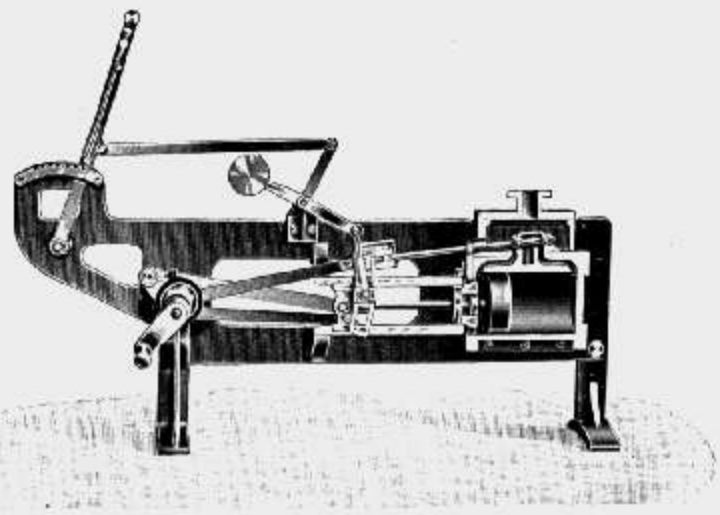


52 263. 1 : 6.



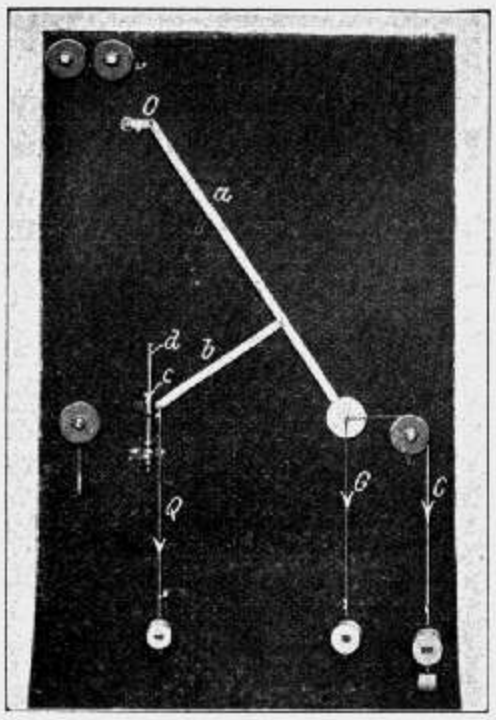
52 264. 1 : 6.



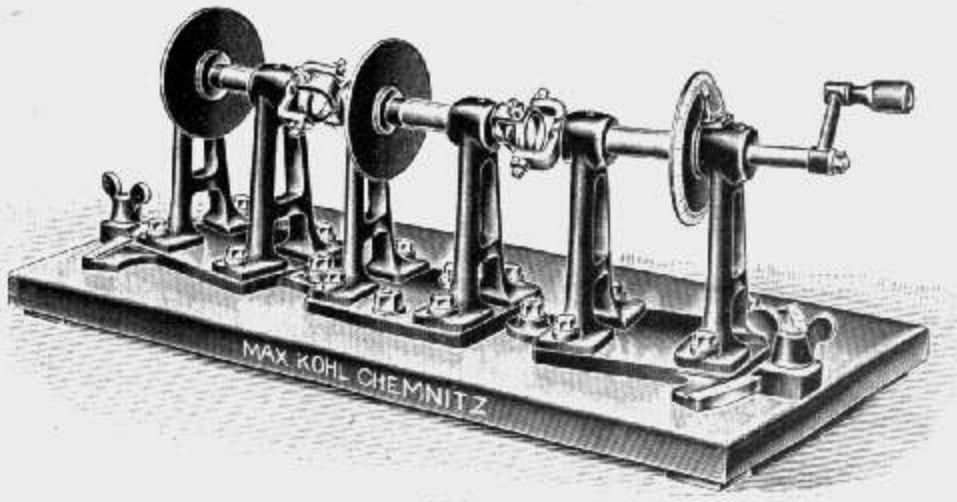
52 266. 1 : 7.

		£ s. d.
52,262.	**Peaucellier's Guide,** Figure, for transforming a circular into a straight motion	6. 0.0
52,263.	**Watt's Parallelogramm,** Figure, of wood and metal	1.16.0
52,264.	**Beam** for Steam Engines **with counter-guide,** Figure	4. 0.0
52,265.	**Beam without Rotating Axis**	4. 0.0
52,266.	**Stephenson's Link,** Figure, with section through a steam engine cylinder with slide valve, of iron (Gan.-Man. Fig. 569)	12. 0.0
52,267.	**Gooch's Link,** of iron	12. 0.0
52,268.	**Model Table** for demonstrating the Static **Equilibrium Conditions of the Centrifugal Governor,** as suggested by Prof. Eugen Meyer, Figure (Ztschr. d. V. d. I., 1909, pp. 1301 et seq., **No. 2,** and text-sheet 13, Figs. 4—7)	6.15.0
	The model shows half of a centrifugal governor. At the points of support of the pendulum a, the rod b and the bush c forces can be applied instead of the bearings. The model serves for determining the quantity of that horizontally directed force C which maintains the equilibrium in the forces Q (half the weight of the socket) and G (weight of the governor balls), this force C acting on the centre of the balls.	
52,269.	**Conical Crank Rectangle,** coupled conical cranks	6. 0.0
52,270.	**Conical Thrust Crank Chain,** connecting rod and guides running on section of cylinder	6. 0.0
52,271.	**Rectangular Cross Sprocket Chain,** simultaneous motion of a sphere about two axes	6. 0.0
52,272.	**Cardan's Coupling** for transmitting a rotary motion at any angle, of metal . . .	1. 5.0
52,273.	— idem, **with graduations** on the axes and on the base-plate	2.10.0
	The angular velocities of the two axes are unequal. In order to show the lead and lag of the driven shaft in front of and behind the driving shaft a dial graduated in degrees is fastened in front of one each fixed pointer, and graduations are put on the base-plate on which the angular position of the two relative axes can be read off. The degree of lead or lag of the axes relatively to each other depends on the angle which the directions of the axes form with each other. If ω and ω_1 are the angles of rotation measured from the same position of rest, of the driving and driven shafts respectively, and a the angle of direction of both, then $\frac{\text{tg } \omega_1}{\text{tg } \omega} = \cos a$.	

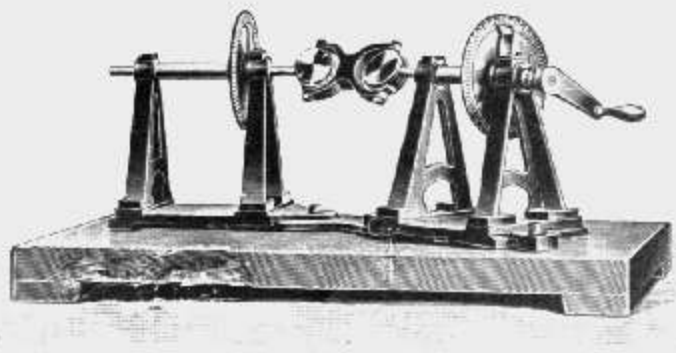
Models of Steam Engines and Steam Engine Parts, see section on **Heat.** Cl. 5787, 531, 4134, 532.



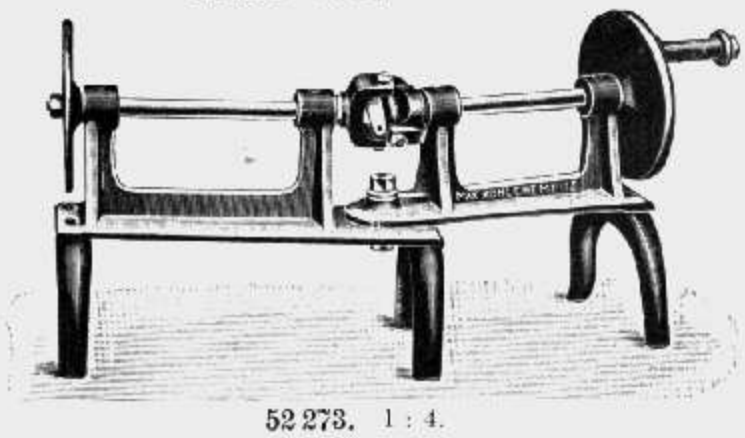
52 268. 1 : 14.



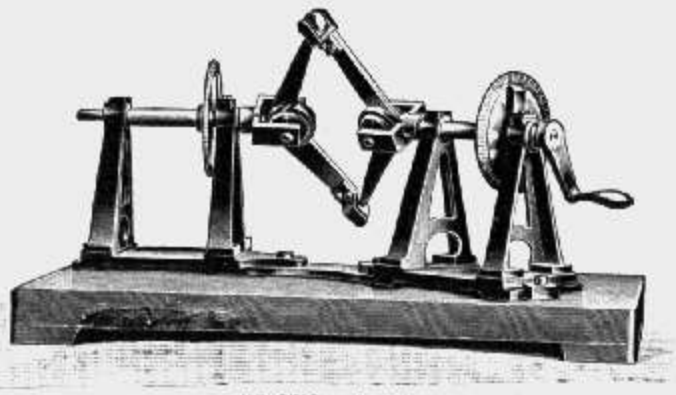
52 274. 1 : 8.



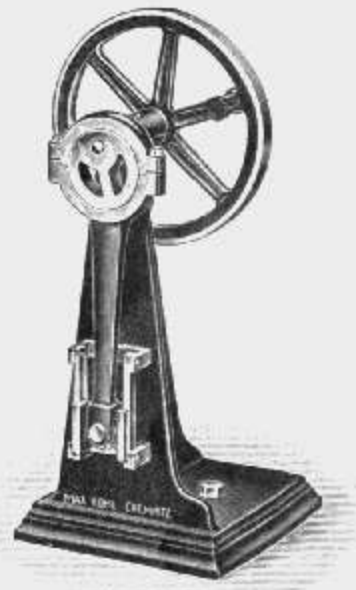
52 275. 1 : 8.



52 273. 1 : 4.



52 276. 1 : 7.



52 278. 1 : 7.

52,274. **Cardanic Double Coupling,** Figure, for the uniform transmission of motion at any angle or on a parallel axis, with degree graduation on the axes and on the base-plate . . . . . £ 7. 0.0

The two cross joints of this model are equally placed. The dissymmetry of the transmission of motion of the single cross joint is obviated by the use of the two equally placed cross joints when the two external axes opposite the centre axes form the same angle either whether they form twice this angle of inclination among themselves or whether they are parallel.

52,275. **Goubet's Coupling (Double Universal Coupling),** Figure, with sleeve, for two intersecting axes, with graduations and pointers 6.10.0

The ratio of rotational speeds of the two axes is constant.

52,276. **Clémens' Coupling,** Figure, with ball and socket joints for two intersecting axes 7. 0.0

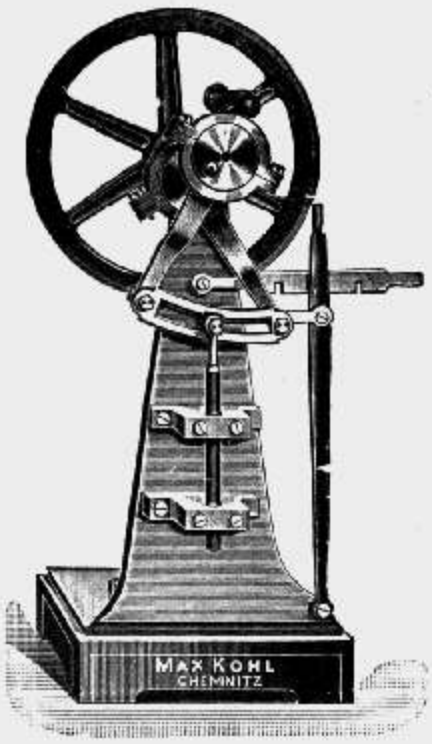
The ratio of rotation of the two axes is constant.

Oldham's Coupling see No. 52,260, p. 315.

52,277. **Excentric Slot** 4. 0.0

52,278. **Excentric Drive with guides,** Figure 4. 0.0

Cl. 5632, 3959, 538, 535, 536, 5347.



52 282. 1 : 5.



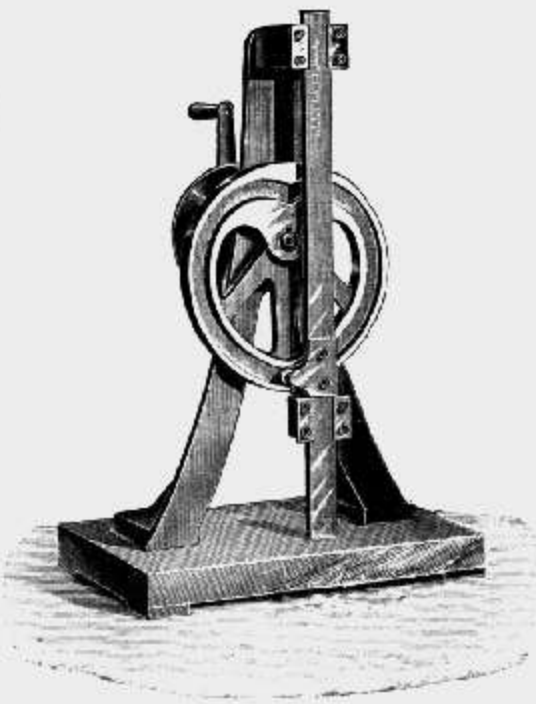
52 279. 1 : 5.



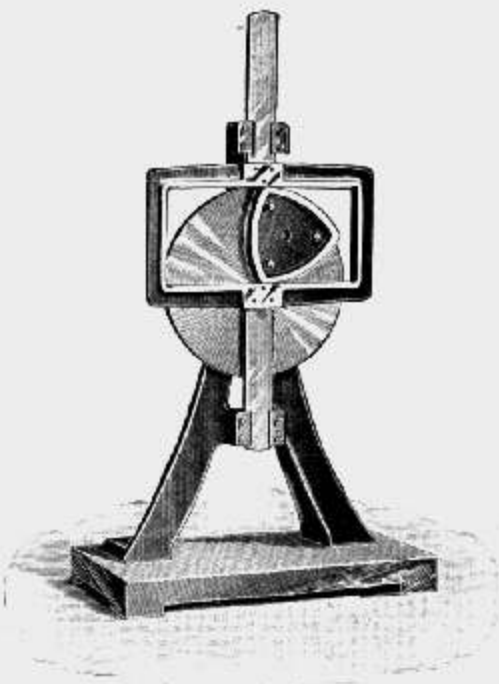
52 283. 1 : 6.



52 284. 1 : 7.



52 285. 1 : 7.



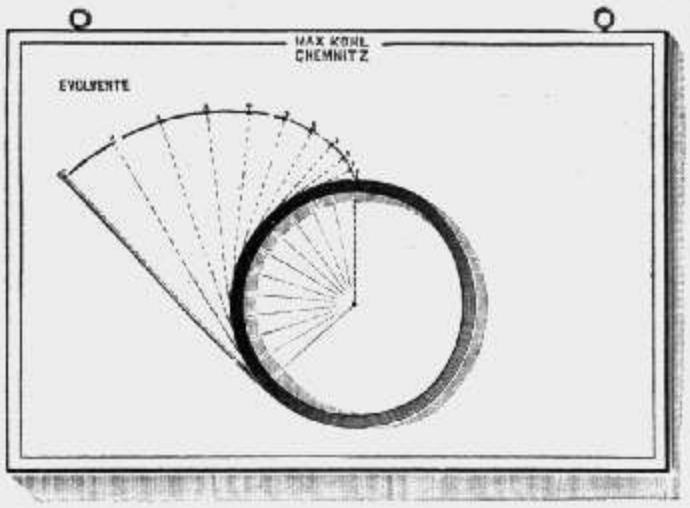
52 286. 1 : 5.

		£ s. d.
52,279.	**Simple Excentric,** the excentricity adjustable, Figure, of metal	2.15.0
52,280.	— idem, adjustable by toothed wheels	7. 0.0
52,281.	**Excentric** with Slot for versed sine motion	6. 0.0
52,282.	**Double Excentric with reverse motion,** for forward and backward running of locomotive, Figure, of metal	5. 0.0
52,283.	**Cam Disc,** Figure, of wood	0.18.0
52,284.	**Cam Motion** (versed sine motion), Figure	2.10.0
52,285.	**Archimedian Spiral Disc,** Figure, for uniform reciprocating motion	4. 0.0
52,286.	**Arc Triangle,** Figure, for intermittent motion	4. 0.0
52,287.	— idem, smaller	2.15.0
52,288.	**Double Heart-Shaped Slot for uniform motion of rods** For two up and down strokes during one revolution of the heart-shaped cam.	4.10.0

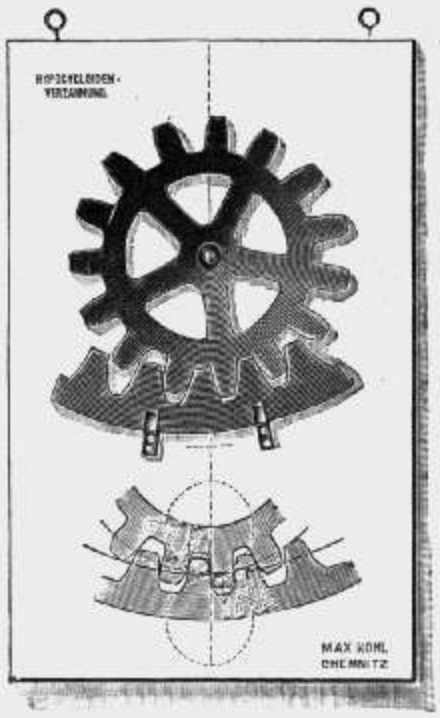
Tooth and Worm Gears.

52,289.	**Model Table,** demonstrating the **formation of the Cycloid,** the rolling curve of the circle on a straight line	1.16.0
52,290.	— idem, the **formation of the Epicycloid** (circle rolled **on** the circle)	1.16.0
52,291.	— idem, the **formation of the Hypocycloid** (circle described **in** the circle)	1.16.0
52,292.	— idem, the **formation of the Involute,** Figure	1.16.0

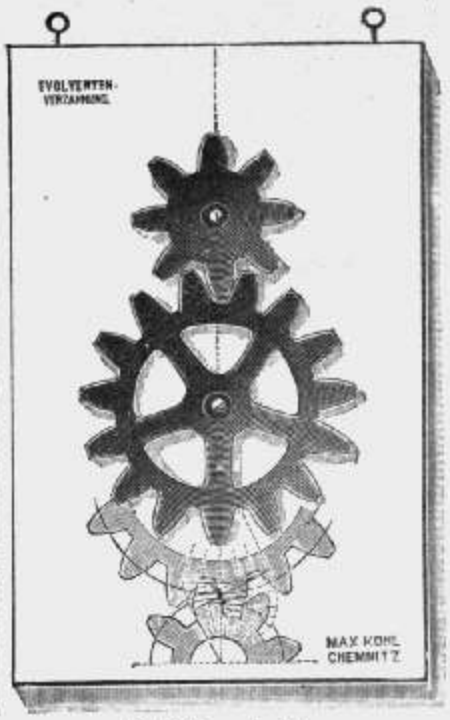
Cl. 538, 537, 3871, 539, 540, 541.



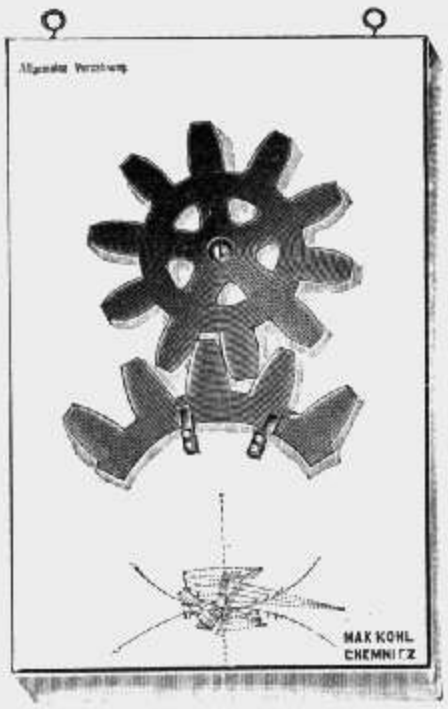
52 292. 1 : 7.



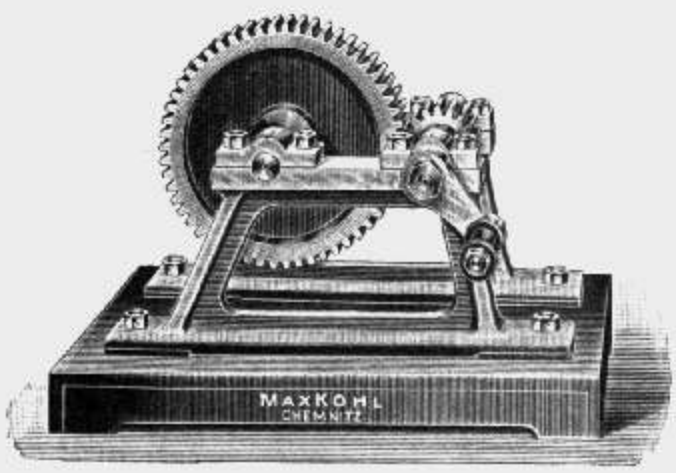
52 295. 1 : 10.



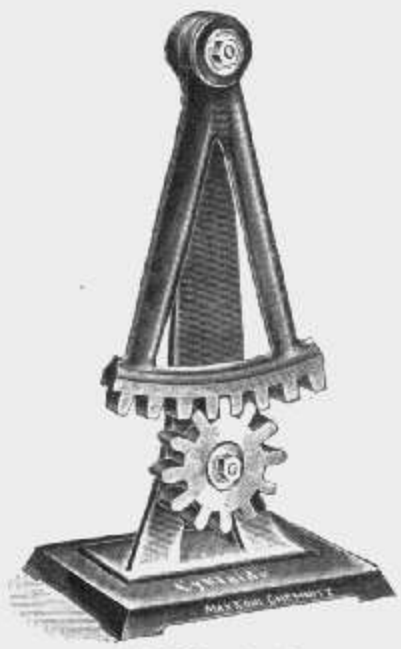
52 296. 1 : 10.



52 300. 1 : 10.



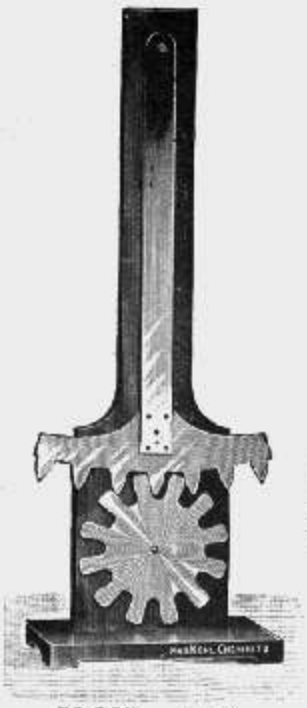
52 301. 1 : 5.



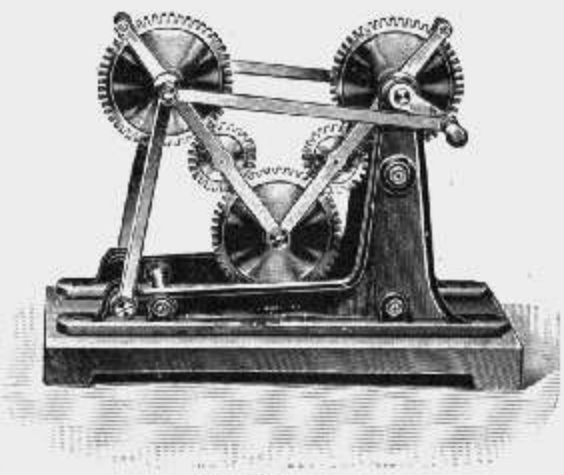
52 302. 1 : 6.

		£ s. d.
52,293.	**Model Table** of a **Cycloidal Gear System,** containing a **movable model** and the precise **constructional drawing** of the gear (ratchet with toothed wheel), cf. Figure 52 295	2.10.0
52,294.	— idem, **Epicycloidal Gear System** of Spur Wheels	2.10.0
52,295.	— idem, **Hypocycloidal Gear System,** with internal toothed wheels, Figure . .	2.10.0
52,296.	— idem, **Involute Gear System** of Spur Wheels, Figure	2.10.0
52,297.	— idem, **Rectilinear Face Toothing** for wheels with external contact	2.10.0
52,298.	— idem, **Double Pin Gearing** with four toothed drive	2.10.0
52,299.	— idem, **Involute System** for Rack and Pinion	2.10.0
52,300.	— idem, **General Gear System** of Spur Wheels, Figure	3. 0.0
52,301.	**Two Spur Wheels with external tooth-contact,** Figure, of metal . . . . . The direction of motion of the two pinions is opposite.	2. 0.0
52,302.	**Spur Wheel Sector and Small Spur Wheel,** Figure, **with cycloidal profile** . . .	3.10.0
52,303.	— idem, **with involute profile**	3.10.0
52,304.	— idem, **with rectilinear face profile**	3.10.0

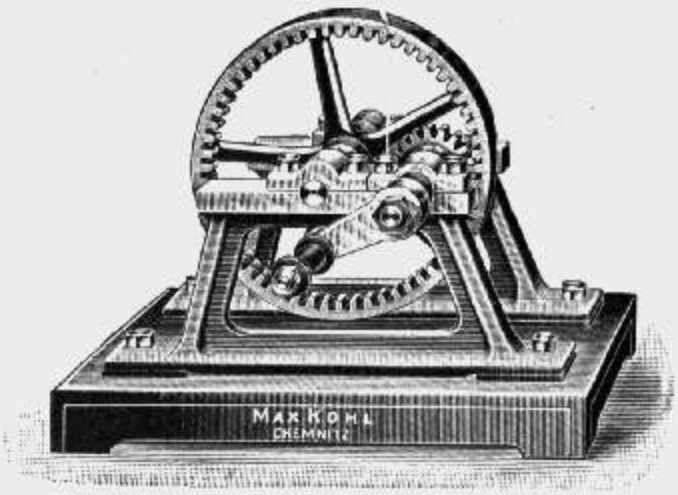
Cl. 3627, 3628, 3629, 3630, 542, 3310.



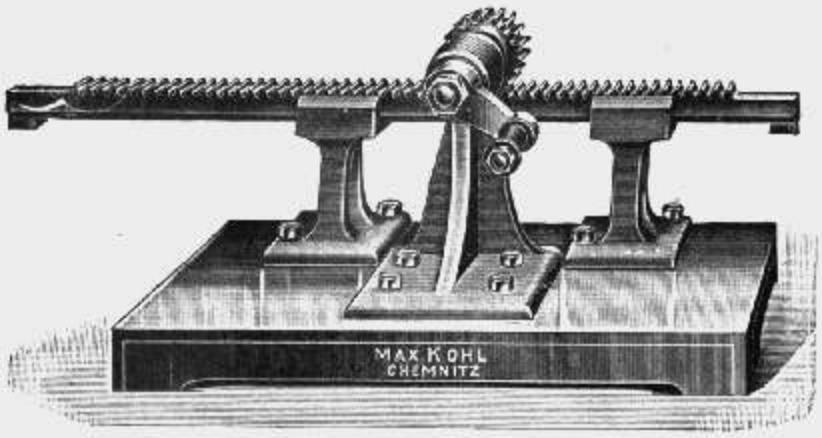
52 305. 1 : 12.



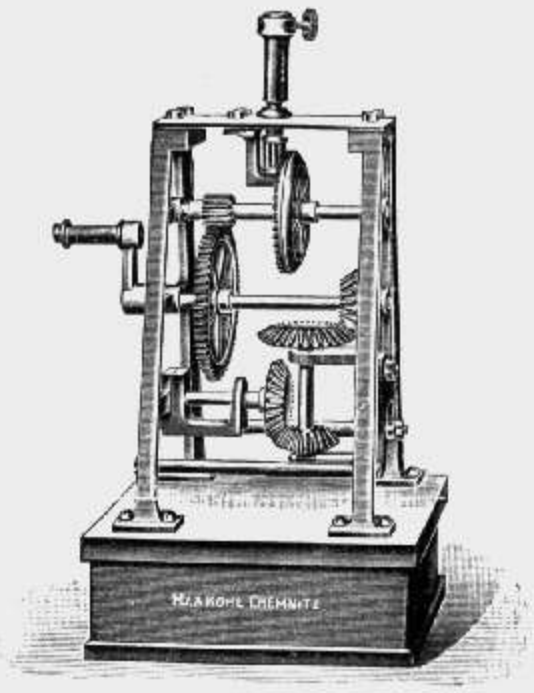
52 309. 1 : 7.



52 310. 1 : 4.



52 311. 1 : 5.



52 312. 1 : 6.

52,305. **Large Spur Wheel Sector with Small Spur Wheel,** Figure, very large pattern, for demonstrating the Rolling of the Tooth-profiles on each other, with cycloidal profile . £ 5.10.0

52,306. — idem, **with involute profile** 5.10.0

52,307. **Two Toothed Wheels, with an intermediate wheel,** for transmission without changing direction or rotation 4. 0.0

52,308. **Two Toothed Wheels with two intermediate wheels,** for transforming into a reverse direction of rotation 4.10.0

52,309. **Wheel Suspension with five toothed wheels,** Figure, for connecting up two parallel axes of variable distance 6. 0.0

52,310. **Internal Toothed Wheel and Spur Wheel,** Figure, of metal 2.10.0
The direction of motion of the two wheels is the same. As a number of teeth are always in contact at the same time greater power can be transmitted by this gear than with spur gearing pure and simple.

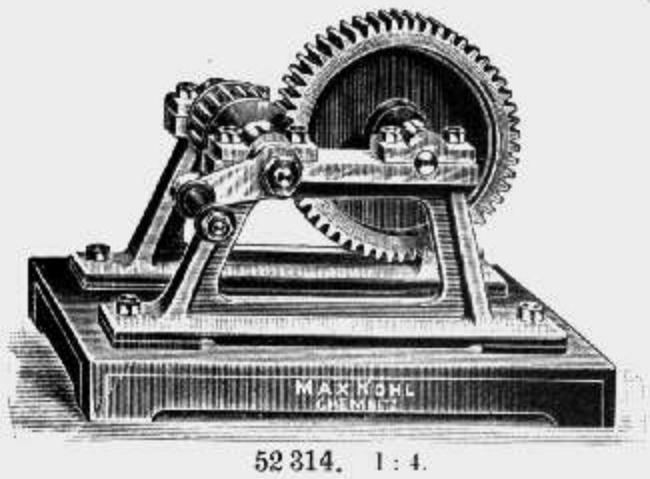
52,311. **Rack with Spur Wheel Motion,** Figure, of metal 2.15.0

52,312. **Universal Wheel Apparatus** (Emsmann's), Figure (Fr. phys. Techn. **I, 2,** Fig. 2042 [I, Fig. 84]; Ztschr. f. d. phys. u. chem. U. **2,** 1885, p. 5) 4. 0.0
Four different kinds of toothed wheels are used on the apparatus, viz., the **spur wheel,** the **bevel wheel,** the **crown wheel** and the **lantern wheel.** The crank can be placed on either the centre or lower horizontal axis, and the ratio of gearing in the former case on the upper vertical axis is 1 : 30, and in the latter case the ratio is 1 : 60.

52,313. **Mangle Gear,** of wood, large model 3. 0.0

52,314. — idem, Figure, of metal 2. 2.0

Cl. 545, 558, 543, 514, 516.



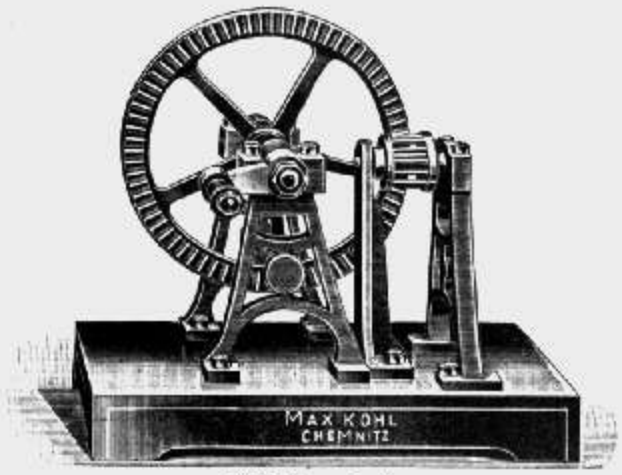
52 314. 1 : 4.



52 317. 1 : 7.



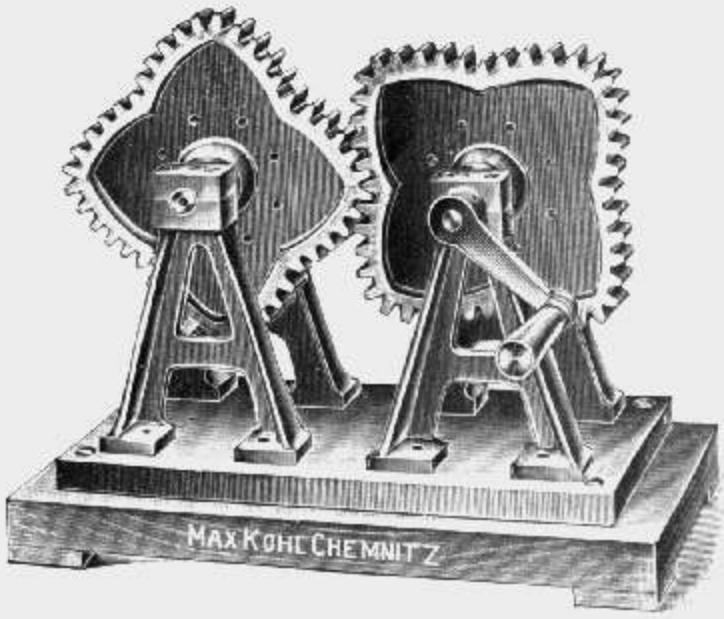
52 322. 1 : 9.



52 318. 1 : 6.

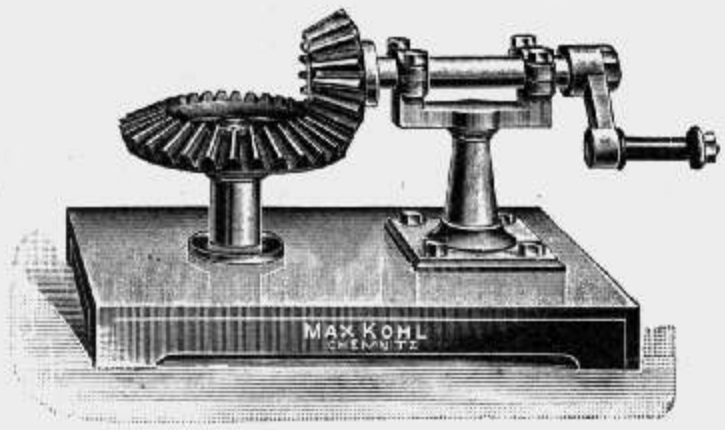


52 324. 1 : 5.

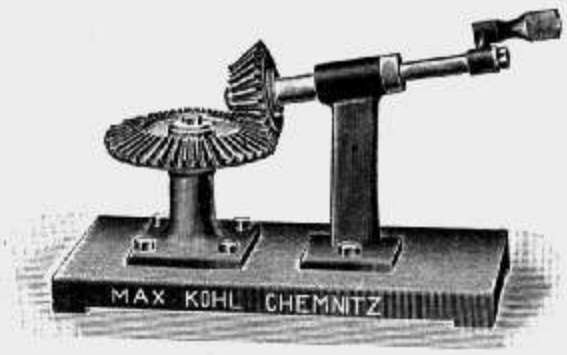


52 323. 1 : 4.

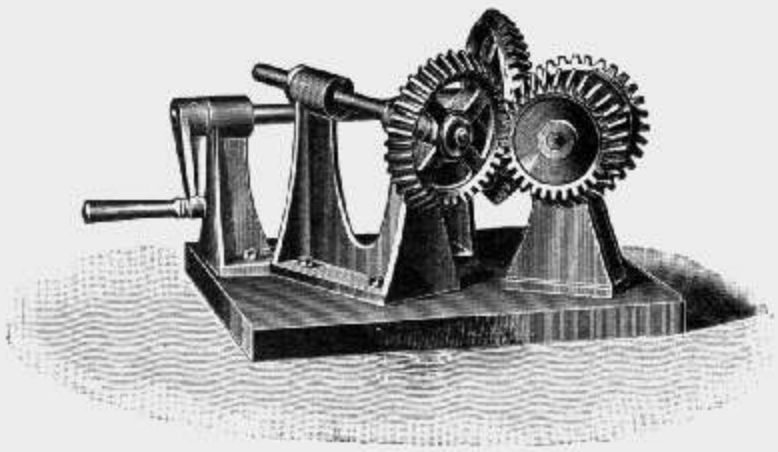
	£ s. d.
52,315. **Mangle Gear** with external teeth: a movable model and accurate constructional drawing of the gearing	2.14.0
52,316. **Mangle Gear, rectangular: Crown Wheel with lantern wheels,** Figure, of metal	5. 0.0
52,317. **Mangle Gear with double lantern wheel drive** and internal contact with 4-toothed channel cross-piece, Figure	4. 0.0
The transmission of motion of this toothed gearing is very smooth and uniform. The ratio of gearing is 1 : 2, the lantern wheels being provided with small rollers.	
52,318. — idem, with 3-wheeled drive and 6-toothed channel cross-piece	5.10.0
52 319. **Two Cam-shaped Cogs with Excentric Axes** for periodic motions	7.10.0
52,320. **Two Toothed Wheels with Excentric Axes** for alternately producing accelerated and retarded motions	6. 0.0
52,321. **Two Cam-shaped Toothed Wheels,** of different shape	10. 0.0
52,322. **Two Congruent Elliptical Toothed Wheels,** Figure	6. 0.0
The model shows the conversion of a uniform rotation into a periodically varying one. For facilitating the drive a spur gearing is fitted. The axes of rotation of the elliptical wheel each pass through a focus of the ellipses.	
52,323. **Two Toothed Wheels shaped according to the logarithmic spiral,** Figure	10. 0.0
52,324. **Mitre Gearing,** small, Figure	1. 0.0



52325. 1 : 4.



52326. 1 : 5.



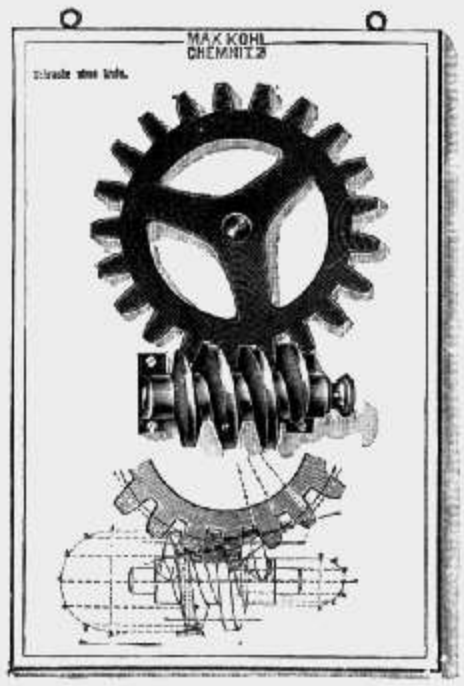
52327. 1 : 6.



52329. 1 : 6.



52331. 1 : 6.



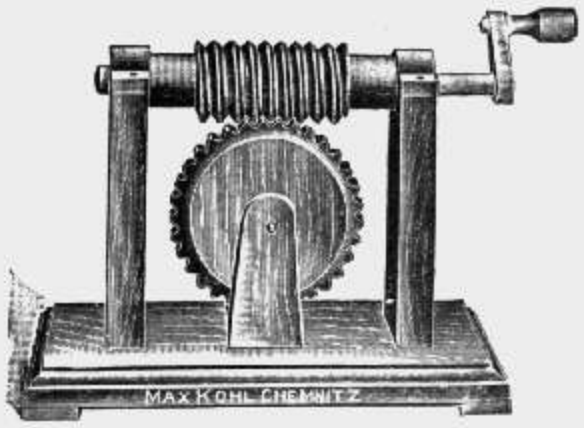
52332. 1 : 10.

	£ s. d.
52,325. **Two Bevel Wheels,** the axes of which intersect at right angles, Figure, of metal	2. 10. 0
52,326. **Two Bevel Wheels,** Figure, the axes of which intersect at an obtuse angle . .	3. 0. 0
52,327. **Gearing with 4 Spur Wheels,** Figure, for connecting two intersecting axes with a third . . . . . The extensions of the two intersecting axes are cut by the extensions of the intermediate axis.	6. 0. 0
52,328. **Spur Wheels with Screw Toothing** (Mitre teeth), **Hook's Gearing** with parallel axes	6. 0. 0
52,329. **Two Wheels with Screw Toothing,** the axes of which are **perpendicular** to each other, Figure	6. 0. 0

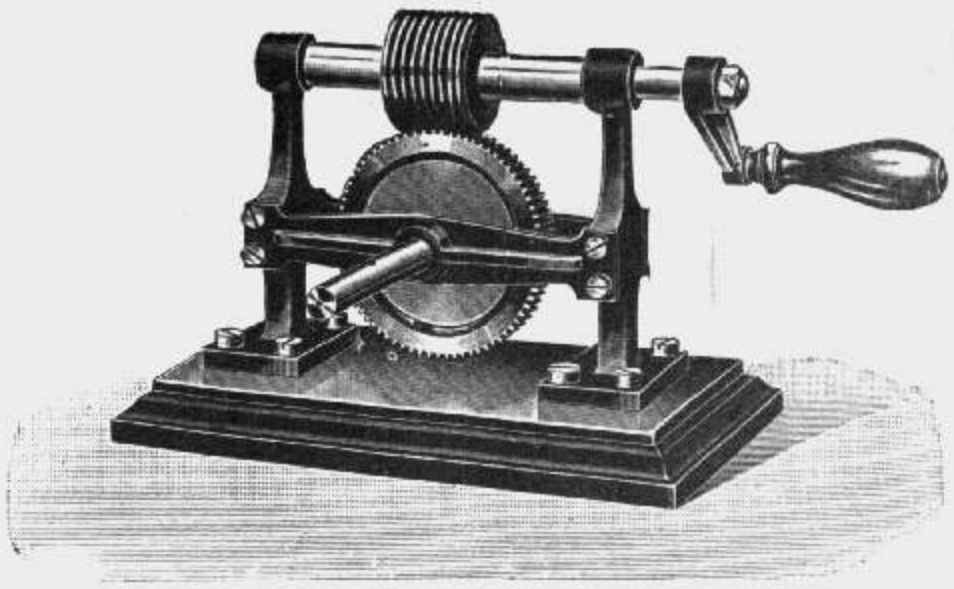
Cl. 550, 3310 1, 564, 551, 552, 3631.

Max Kohl A. G. Chemnitz, Germany.

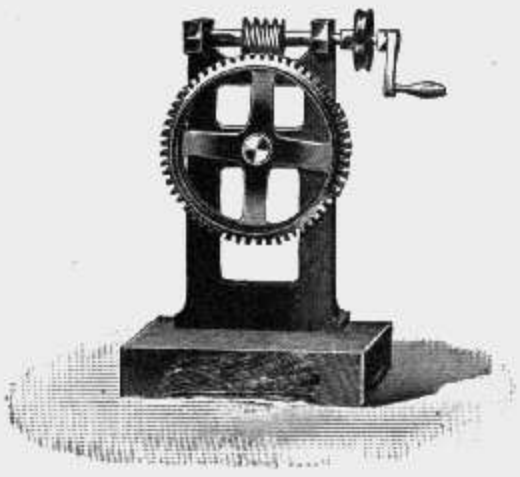
Max Kohl A. G. Chemnitz, Germany.



52 333. 1 : 4.



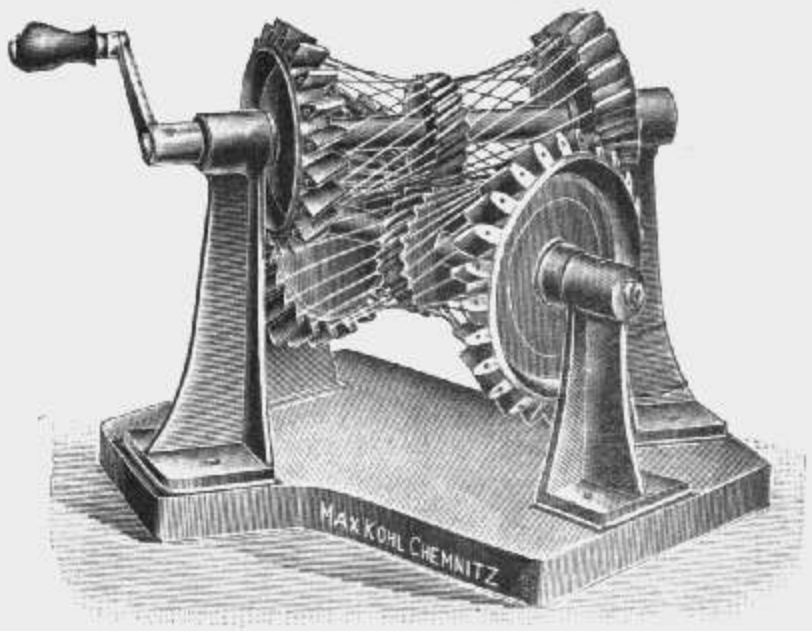
52 335. 1 : 3.



52 338. 1 : 7.

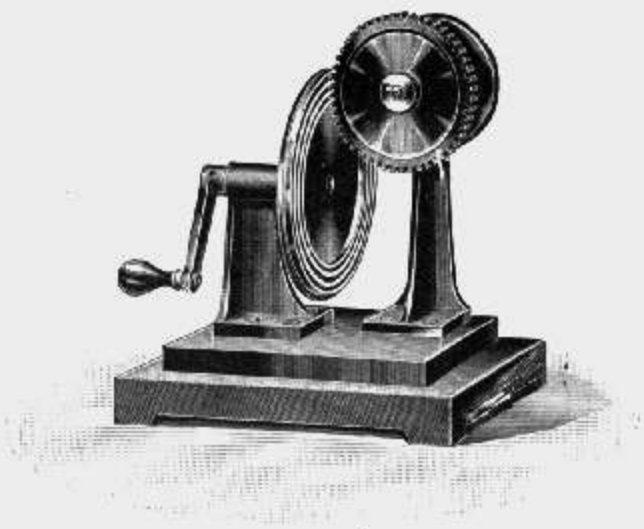


52 339. 1 : 12.



52 340. 1 : 6.

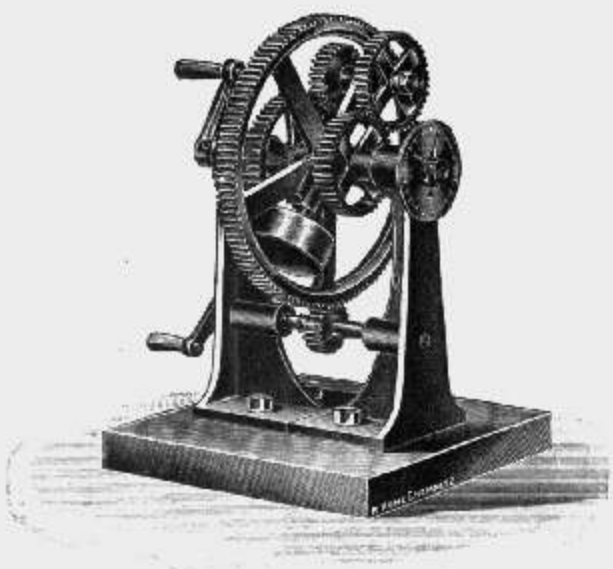
	£ s. d.
52,330. **Two Pairs of Wheels with Screw Toothing,** 1 pair for right hand and 1 pair for left hand motion, driven by 1 shaft	12. 0. 0
The axes of the screw wheels of each pair are perpendicular to each other, the driven wheels rotating in opposite directions.	
52,331. **Two Wheels with Screw Toothing, with inclining axes,** Figure	6. 0. 0
52,332. **Model Table of the Worm, with Worm-Wheel,** Figure, comprising a movable model and constructional drawing	3. 4. 0
52,333. **Worm and Wheel,** very neatly constructed of wood, Figure	0. 12. 0
52,334. — idem, of metal, **simple,** with **V-thread,** wheel with **flat faced teeth**	1. 0. 0
52,335. — idem, with **flat, double thread;** wheel with **concave teeth,** Figure	1. 16. 0
52,336. **Worm with Square Thread,** large; brass wheel 10 cm diameter with concave teeth	3. 0. 0
52,337. — idem, **with V-thread,** large, brass worm wheel with concave teeth	3. 0. 0
52,338. **Double-Thread Worm,** large, Figure	3. 0. 0
52,339. **Screw Thread with Worm,** in cylindrical casing, Figure	2. 10. 0
52,340. **Hyperbolical Toothed Wheels** with inclining axes, Figure	12. 0. 0



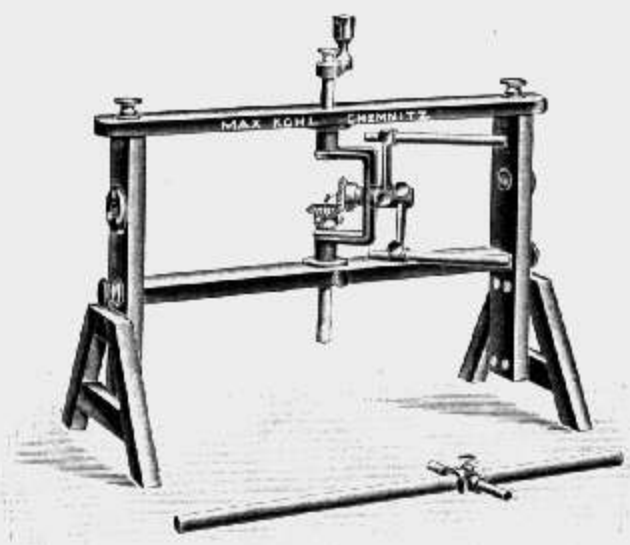
52 341. 1 : 6.



52 342. 1 : 5.



52 344. 1 : 5.



52 346. 1 : 8.

	£ s. d.
52,341. **Spiral Wheel with Toothed Wheel,** Figure The two axes are perpendicular to each other and intersect (without meeting one another).	6. 0. 0
52,342. **Counting Mechanism with Differential Wheels,** Figure	5. 0. 0
52,343. **Reversing Gear with Spur Wheels**	10. 0. 0
52,344. **Differential Epicycloidal Gear** with Spur Wheels, Figure, for the addition and subtraction of two rotary motions The resultant motion can be determined with the aid of a graduation and pointer.	7. 10. 0
52,345. **Simple Epicycloidal Gear** with 2 wheels, for simultaneous rotation of the body about two parallel axes, for proving that this rotation is equivalent to the rolling motion of a cylinder on the jacket of a fixed cylinder	6. 5. 0
52,346. **Cycloidal Gear with Bevel Wheels** (Taudin-Chabot's), Figure, quite free from iron parts	5. 10. 0
52,347. **Lahire Guides,** Figure, for versed sine motion	6. 0. 0
52,348. **Guides with 2 Cranks,** coupled with each other by congruent toothed wheels	7. 10. 0
52,349. **Planet Wheels** (Watt's), Figure	6. 0. 0
52,350. — idem, with counterpoise and fly-wheel	7. 10. 0
52,351. **Rack Motion, Guided Plate with groove, Toothed Wheel and Endless Rack;** a toothed piston with movable axis which engages alternately in both sides of the rack, for converting a continuous rotary motion into a uniform reciprocating motion	10. 0. 0
52,352. **Rack Motion, partially Toothed Wheel and double Toothed Rack** in slotted guide, for reciprocating motion	8. 10. 0

Cl. 557, 559, 560, 4136.

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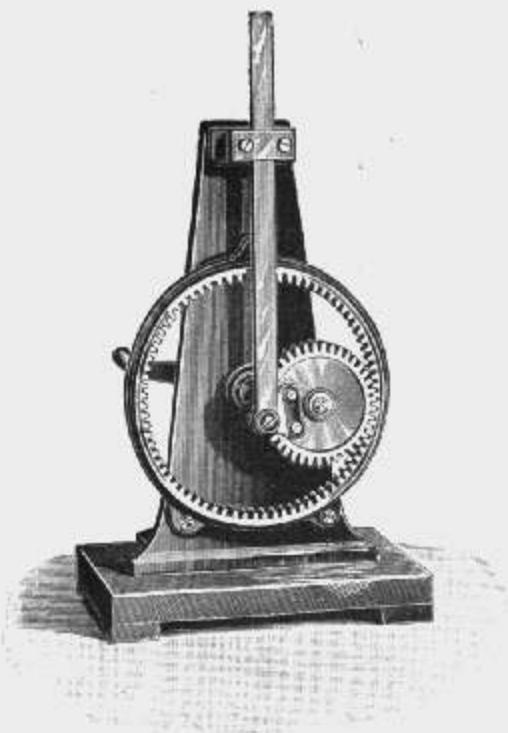
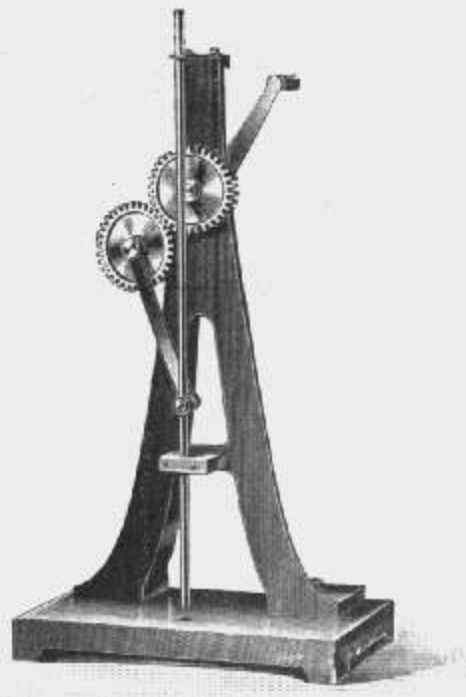
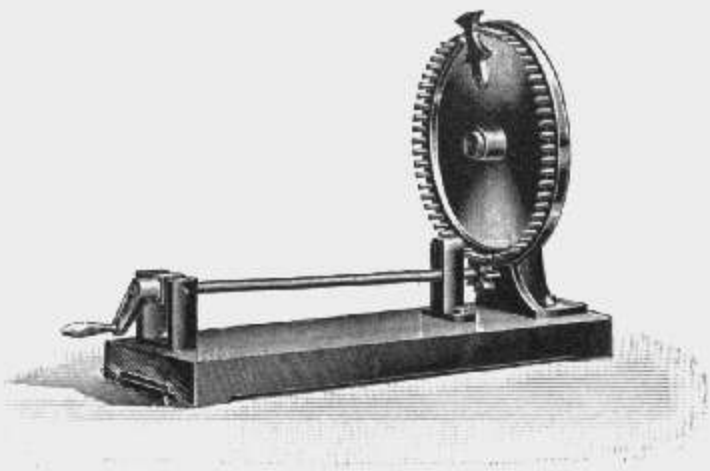


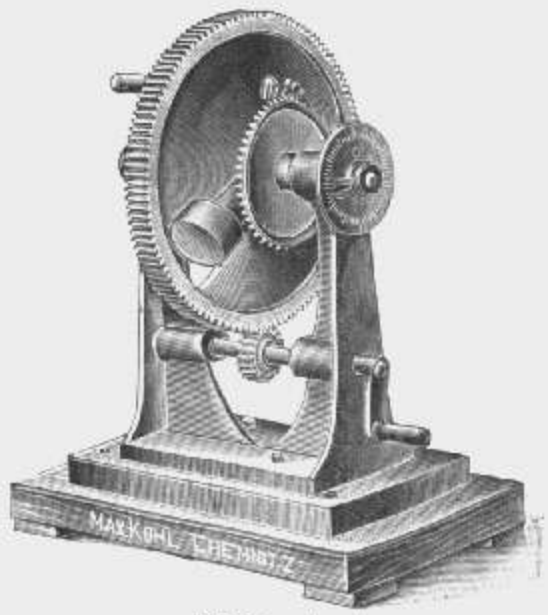
52347. 1 : 7.



52349. 1 : 9.



52357. 1 : 7.



52360. 1 : 8.

52,353. **Connecting Rod with Guides, Toothed Wheel and Toothed Racks,** for doubling the stroke of alternating motion . . . . . £ 8. 10. 0

52,354. **Interference Mechanism,** for the addition and subtraction of 2 oscillating versed sine motions, for explaining interference phenomena 10. 0. 0

Two toothed wheels, one having 66 and the other 67 teeth, are mounted on parallel axes and fitted with cranks and connecting rods joined up to the same beam. The latter is fixed to the rectilineally reciprocating rod.

52,355. **Masked Rotating Slot and Crank** 7. 10. 0

This mechanism corresponds in its action to the rotating slot and crank No. 52,255; the motion is, however, transmitted by toothed wheels instead of by a slot and crank.

52,356. **Toothed Gear for Oscillating Movement,** Curved Rack and partially Toothed Wheel 8. 0. 0

52,357. **Mangle Wheel,** Figure, for reciprocal rotation at constant speed 6. 0. 0

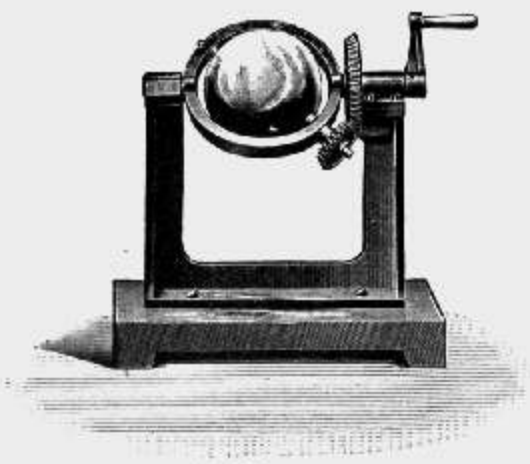
52,358. **Intermittent Wheel with External and Internal Teeth,** for reciprocal rotation at different speeds; the teeth traverse each other in two places by small semi-circles. . . 12. 10. 0

52,359. **Reversing Gear,** with Bevel Wheels 13. 0. 0

52,360. **Differential Epicycloidal Gear with Bevel Wheels,** Figure, for the addition and subtraction of two rotary motions 7. 10. 0

The resultant motion can be followed by a pointer rotating in front of a circular graduation.

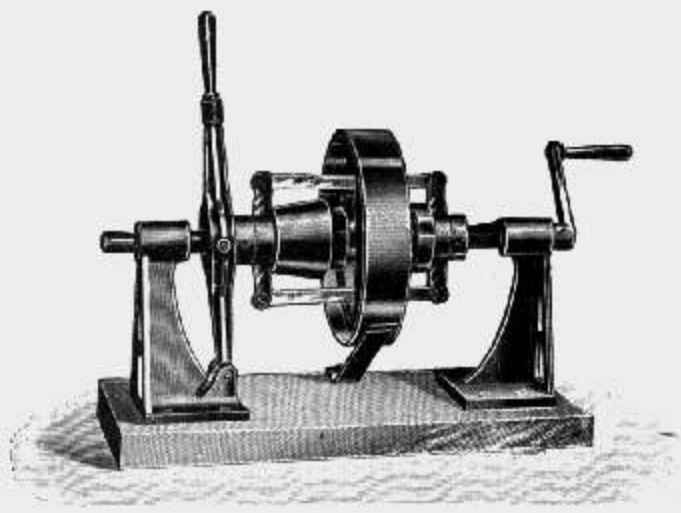
Cl. 561, 562, 563, 3634.



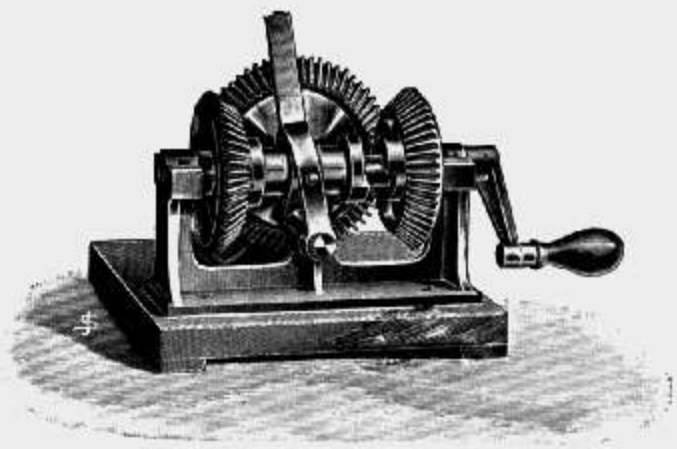
52 361. 1 : 7.



52 365. 1 : 7.



52 371. 1 : 4.



52 373. 1 : 6.

	£ s. d.
52,361. **Epicycloidal Gear** with Bevel Wheels, Figure, for demonstrating the simultaneous rotation of a sphere about two intersecting axes . . . . . The model shows the simultaneous rotation of a sphere about two intersecting axes, also, the fact that this rotation is equivalent to the rolling of a cone on a fixed cone. The sphere in this system of wheels rotates about a momentary axis which is continually altering its position with reference to the sphere.	7. 10. 0
52,362. **Turning Gear with partially Toothed Bevel Wheels**	8. 0. 0
52,363. **Single-tooth Wheel and Star Wheel (Maltese Cross)**	6. 10. 0
52,364. **Counting Mechanism with single Tooth Wheels**	10. 0. 0
52,365. **Ratchet Gear, working with half teeth,** Figure	4. 10. 0
52,366. **Ratchet Gear, with continuous motion**	3. 10. 0
52,367. **Switch for Machine Tools**	6. 10. 0

Couplings, Connecting and Disconnecting Devices.

52,368. **Toothed Wheel connecting and disconnecting arrangement** for two parallel axes, with auxiliary wheel	6. 10. 0
52,369. **Coupling with Friction Cone**	7. 10. 0
52,370. **Coupling with Brake and Claws,** for engaging slowly and smoothly by friction and firmly coupling by means of the claws	7. 10. 0
52,371. **Coupling with Friction Cone and Claws,** Figure, for engaging slowly and smoothly by friction and obtaining a firm coupling by means of the claws	9. 10. 0
52,372. **Coupling with Brake and Planet Wheel,** for smoothly engaging, with spur wheels .	10. 10. 0
52,373. **Change Gear with Bevel Wheels and Claw Coupling,** Figure, for changing the direction of rotation	9. 10. 0
52,374. **Clutch Engager with Screw** for toothed wheels, Figure	6. 0. 0
52,375. **Engaging and Disengaging Arrangement for toothed wheels** by means of an intermediate wheel	13. 0. 0

Cl. 565, 566, 567, 568.

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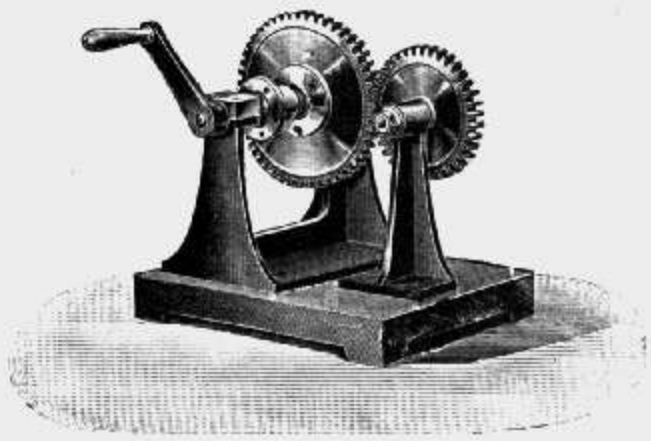
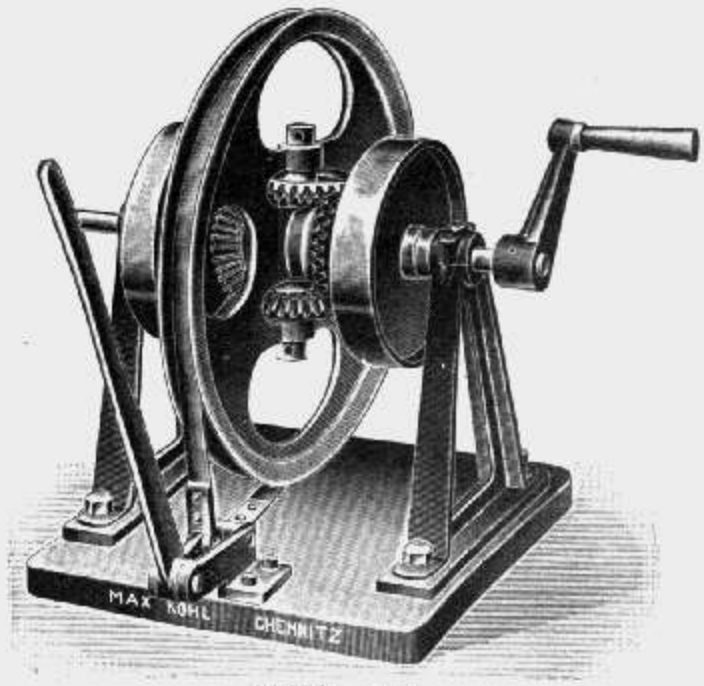
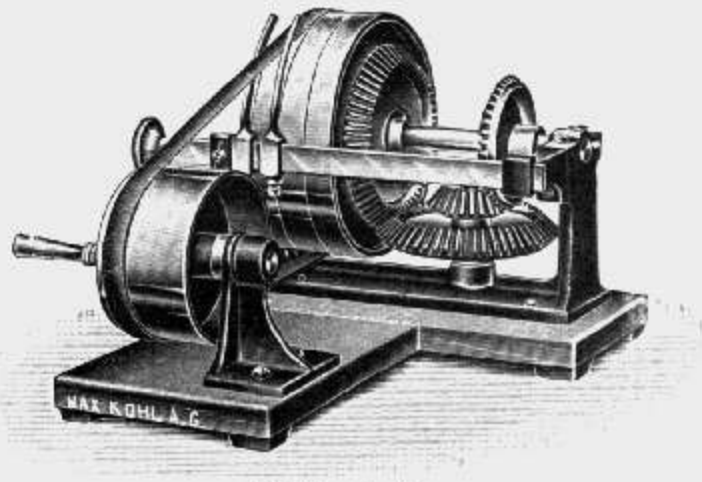


52 374. 1 : 6.

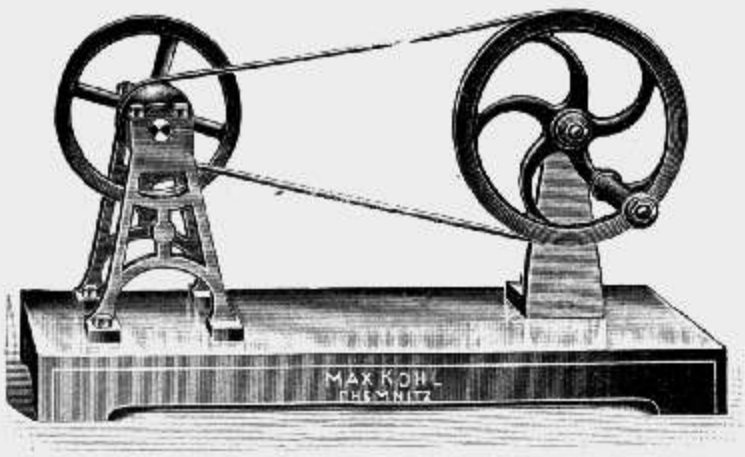


52 376. 1 : 5.

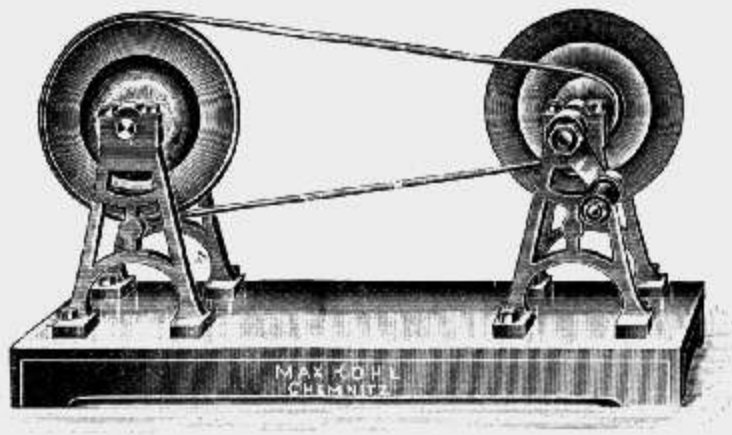


52 379. 1 : 6.

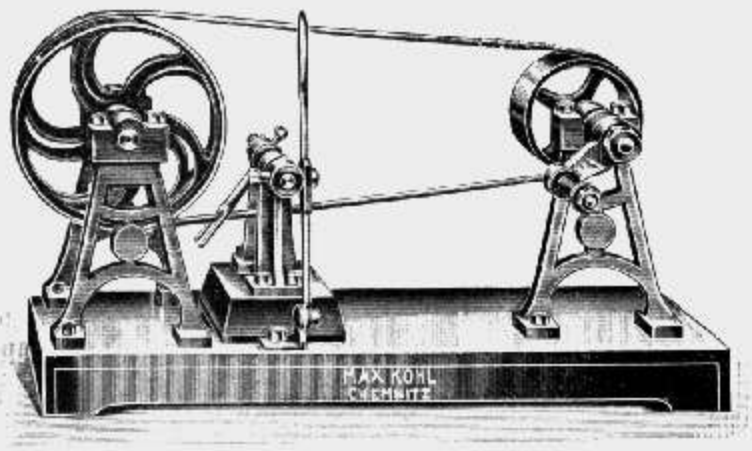
	£ s. d.
52,376. **Engaging Gear with Brake,** Figure	9. 0. 0
The belt pulley visible to the left of the illustration and connected with the driving mechanism is only moved by the crank fitted at the right hand side when the brake is put on, i. e., when the brake pulley is held fast. So long as the brake remains loose the belt pulley remains at rest consequent on the resistance of the driving machine, and the brake pulley rotates with its driving mechanism. The action of engaging can be carried out smoothly by carefully manipulating the brake. The brake (contrary to the illustration) is applied by means of a handwheel and screw; it can therefore be put on slowly and be left on at any position affording a more or less tight grip.	
52,377. **Engaging Gear for any Direction of Rotation,** with spur wheels and pulley stand, triple broad belt pulley with crank, moving fork for engaging, and driving belt . .	9. 0. 0
52,378. **Engaging Gear** for engaging in any Direction of Rotation by means of bevel wheels, with pulley stand, triple broad belt pulley with crank, moving fork for engaging, and with driving belt	10. 0. 0
The engaging gear consist of three pulleys fitted on the same axis. The no-load pulley is in the centre; one pulley for full load is fixed on the axis, the other pulley being connected to the last by a spur wheel gear in such manner that it always rotates in the opposite direction. According as the belt is thrown on to one or other of the two outer pulleys, the shaft runs in either direction.	
52,379. — i d e m, **with Intermediate Gearing,** in order to obtain another velocity in the one direction of rotation	12. 0. 0
52,380. **Band Brake**	8. 0. 0
52,381. **Wedge Friction Wheels**	3. 12. 0



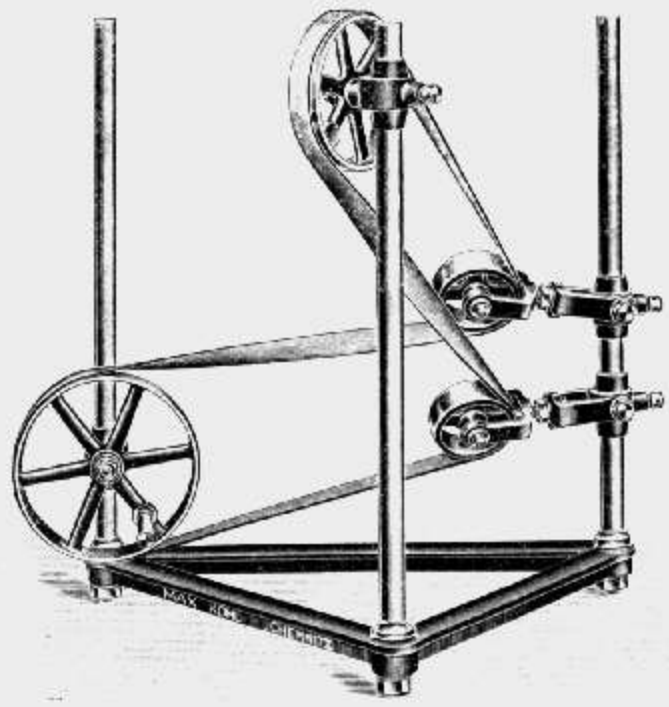
52 382. 1 : 5.



52 383. 1 : 5.



52 386. 1 : 5.



52 389. 1 : 5.

Transmission of Motion by Belt, Cord and Chain.

	£ s. d.
52,382. **Cord Drive,** Figure, with metal pulleys	1. 4. 0
52,383. **Step Cone Transmission by Belt,** for two parallel axes, Figure	3. 10. 0
52,384. **Cone Pulley Drive** with automatically fed belt guide for producing an unsymmetrical rotary motion	10. 0. 0
52,385. — idem, **with curvilateral cones** for uniformly accelerated motion	14. 0. 0
52,386. **Belt Gear disengaged by a loose pulley,** for two parallel axes, Figure	4. 0. 0
52,387. **Belt Gear for two axes which intersect**	6. 5. 0
One of the belt pulleys, in addition to rotating about its own axis, can rotate about one which is perpendicular to the same and to the axis of the other pulley.	
52,388. **Belt Gear for two axes inclined towards each other,** with two belt pulleys lying in one plane, one of these being connected with its axes by a Hook joint	7. 10. 0
52,389. **Belt Transmission with two Belt Pulleys with variable angles,** Figure, with guide pulley	5. 0. 0
52,390. **Transmission by Cylindrical Spring** between two axes in any positions	3. 10. 0
52,391. **Gall Chain Transmission** for two parallel axes, Figure	3. 10. 0

Hoisting and Transporting Machines.

52,392. **Simple Windlass,** of wood	0. 10. 0
52,393. **Simple Windlass,** Figure, of metal	0. 18. 0

For **Models of Tackle,** see Nos. 51,851 d—f, p. 266, 51,894—51,899, p. 271, and No. 50,116, p. 21.

Cl. 573, 574, 575, 3636.

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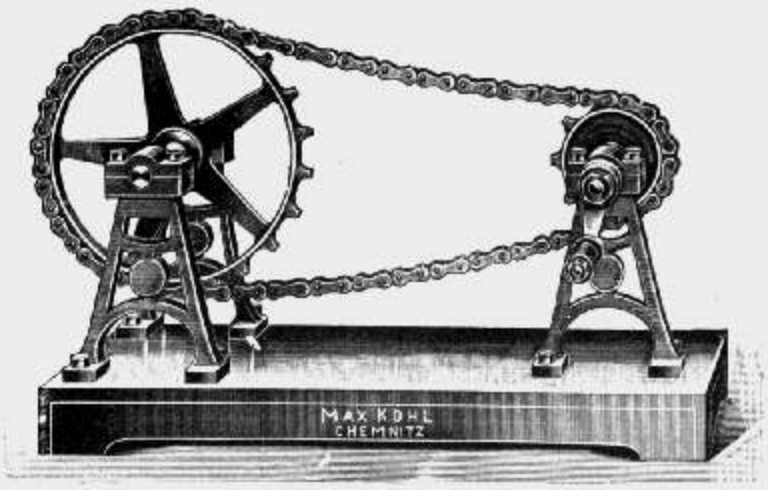
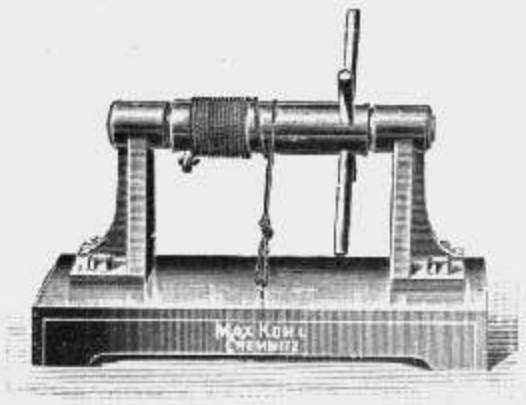


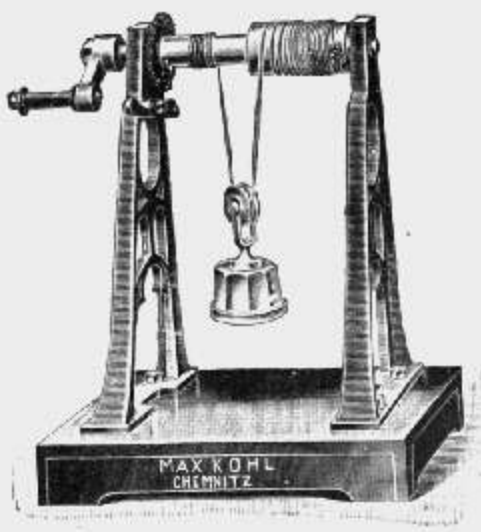
52 391. 1 : 5.



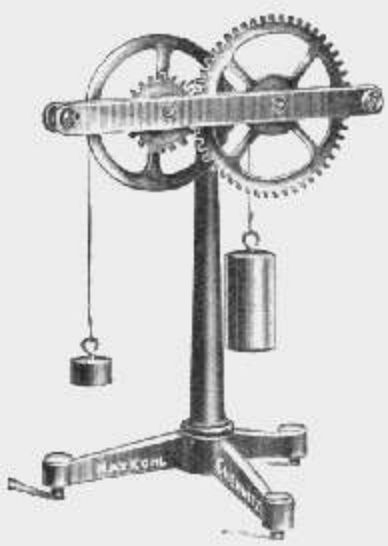
52 393. 1 : 4.



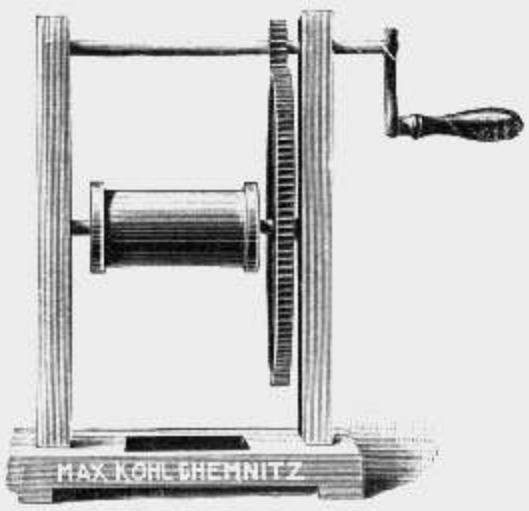
52 395. 1 : 8.



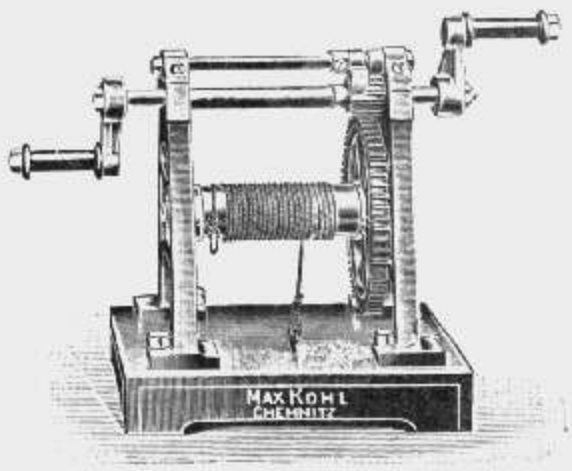
52 396. 1 : 5.



52 397. 1 : 6.



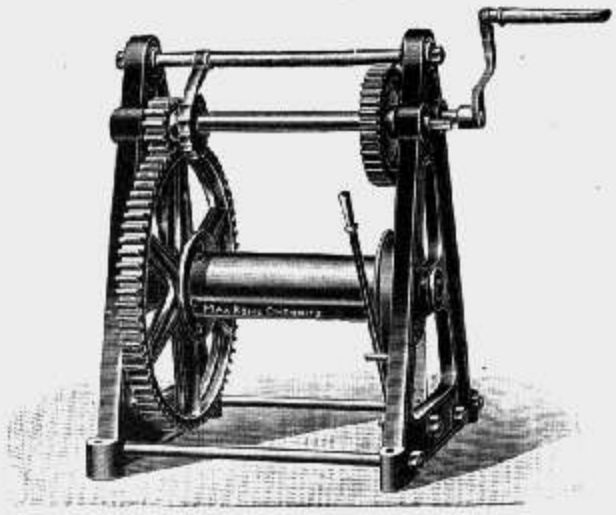
52 398. 1 : 7.



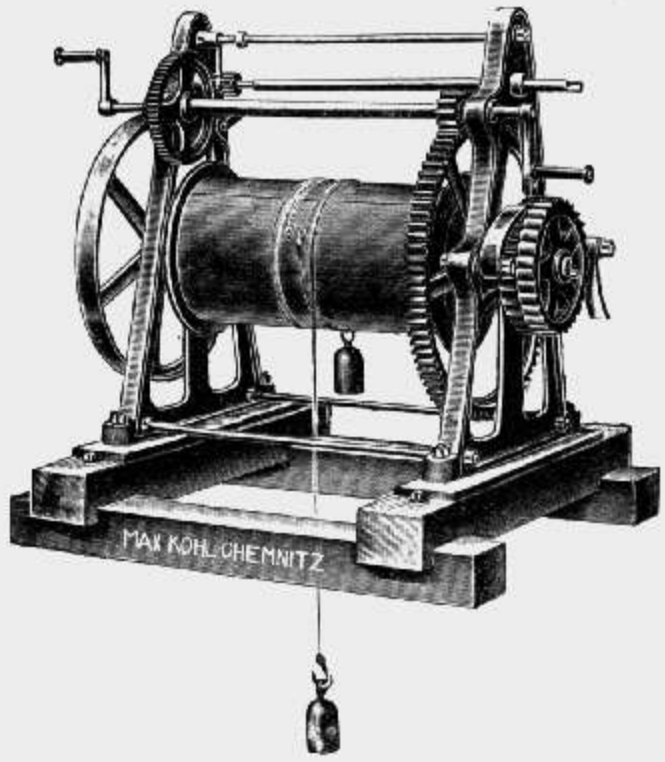
52 399. 1 : 4.

		£ s. d.
52,394.	**Windlass with Crank,** of wood	0. 16. 0
52,395.	**Differential Windlass,** Figure, of wood (M. P. **I**, Fig. 242 [237])	1. 0. 0
52,396.	**Differential Windlass,** Figure, of metal	1. 14. 0
52,397.	**Pair of Spur Wheels with Weights, on stand,** Figure, for explaining the windlass	1. 14. 0
52,398.	**Windlass with simple Toothed Gearing,** Figure, of wood	0. 18. 0
52,399.	**Windlass with Toothed Wheel and Gearing,** Figure, of metal (M. P. **I**, Fig. 245 [239])	2. 0. 0
52,400.	— idem, of metal, with brake pulley, brake band, lever and catch	6. 0. 0

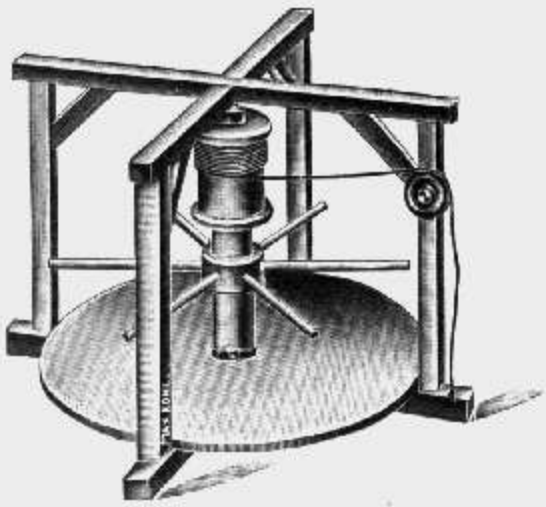
Cl. 576, 577, 3311, 578, 3308, 579, 580.



52401. 1 : 7.



52402. 1 : 8.



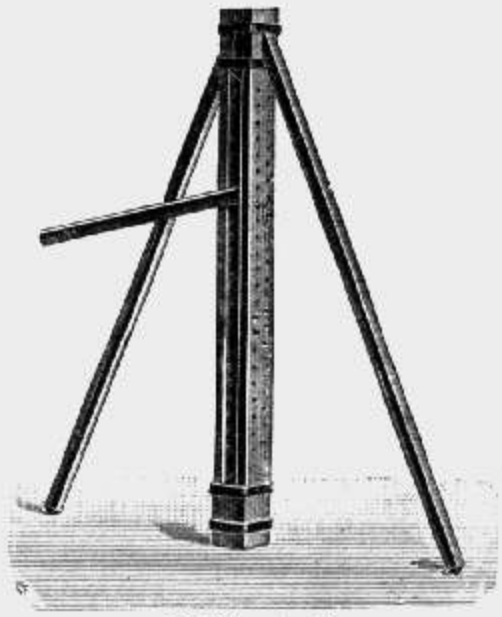
52404. 1 : 5.



52405. 1 : 4.



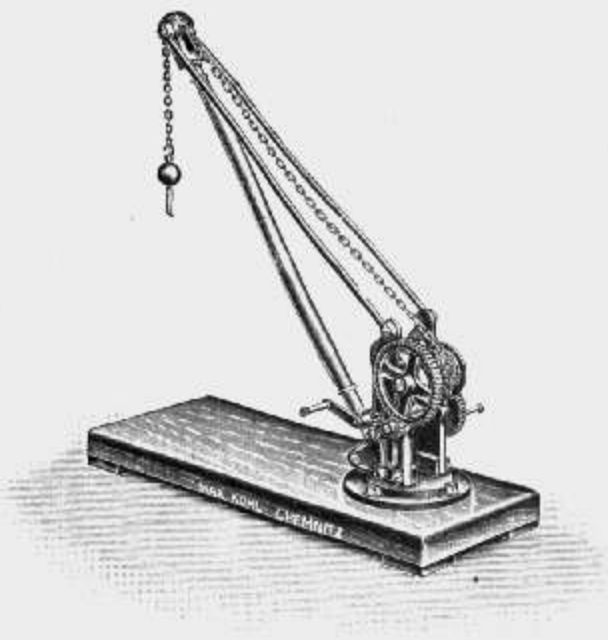
52406. 1 : 8.



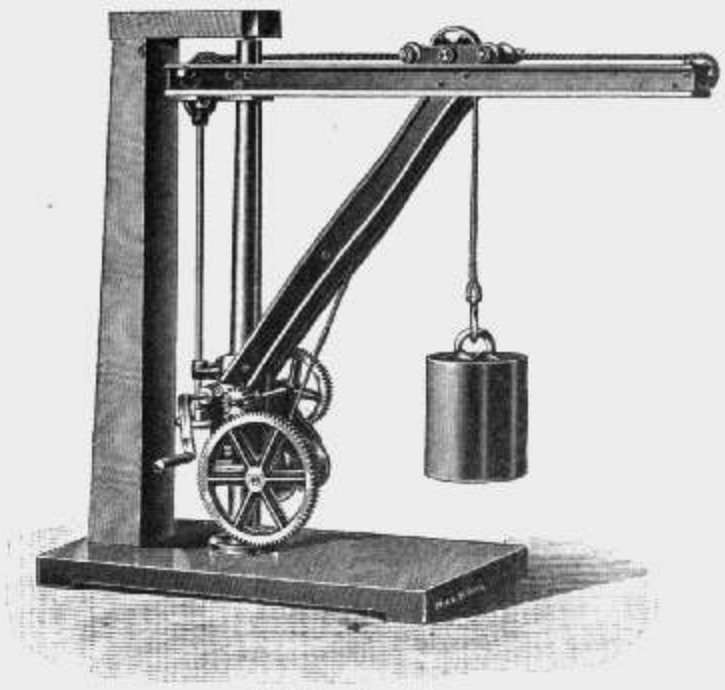
52408. 1 : 9.

		£ s. d.
52,401.	**Windlass with Double Gearing,** Figure, with brake pulley, brake band and lever; also with ratchet and pawl	7. 0. 0
52,402.	**Windlass with Double Intermediate Gearing,** Figure	8. 0. 0
52,403.	**Rung,** of wood	1. 15. 0
52,404.	**Ship's Capstan,** Figure, of wood	1. 0. 0
52,405.	— idem, Figure, of metal	0. 18. 0
52,406.	**Jack,** with 3 legs, Figure, with wood winding gear	1. 0. 0
52,407.	— idem, with 4 legs, wheel winding gear and tackle, of wood	2. 10. 0
52,408.	**German Hoisting Jack,** Figure, of wood	2. 0. 0
52,409.	**Screw Winding Gear,** of metal, see No. 52,243, p. 314 (M. P. **I**, Fig. 275 [272]) .	1. 16. 0
52,410.	**Crane with Invariable Jib**	10. 0. 0
52,411.	— idem, different pattern, of metal, on wood base, with chain, Figure . .	6. 0. 0

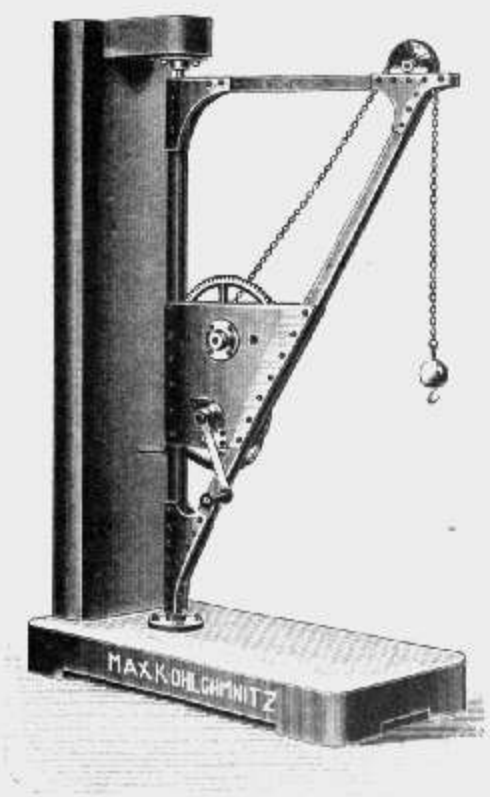
Cl. 581, 582, 3312, 583, 3637, 584.



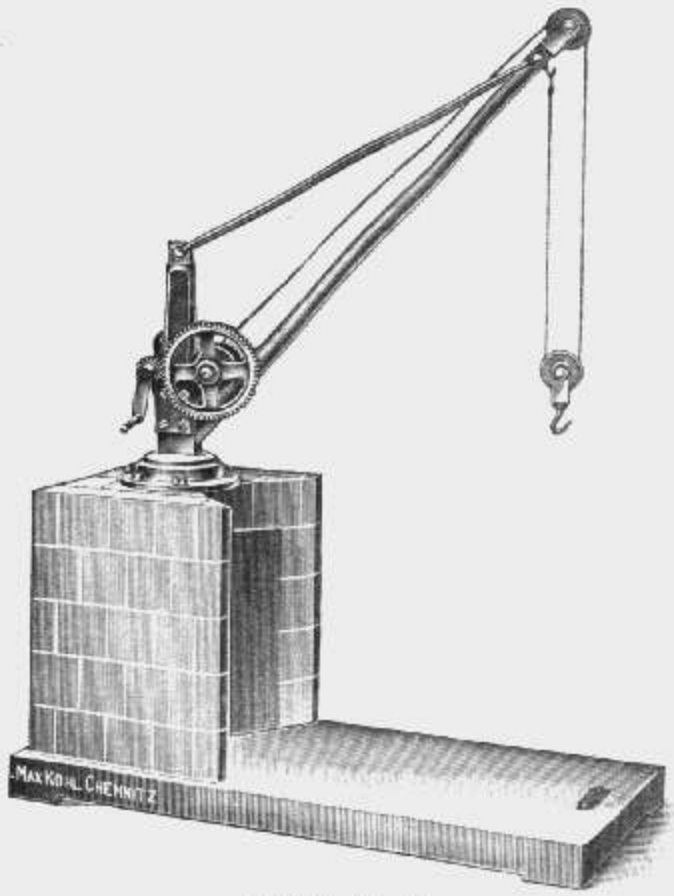
52411. 1 : 7.



52413. 1 : 10.

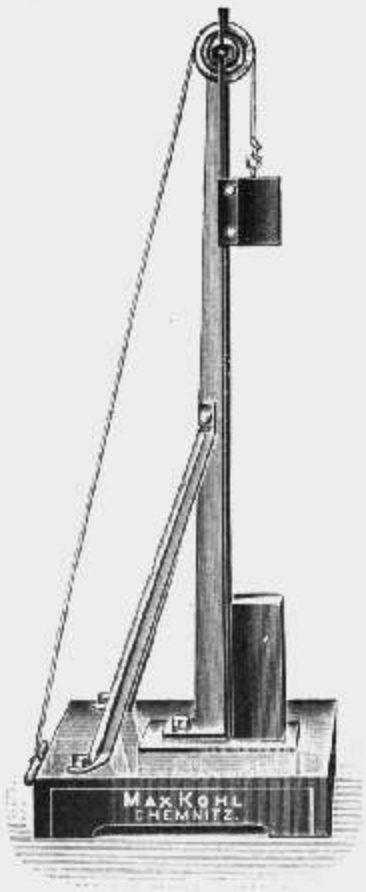


52414. 1 : 9.

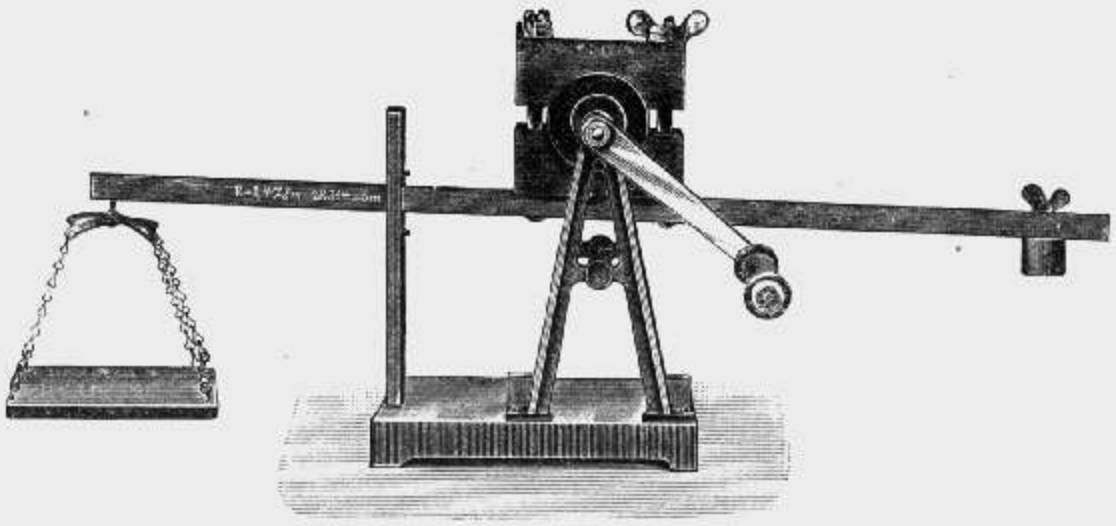


52416. 1 : 8.

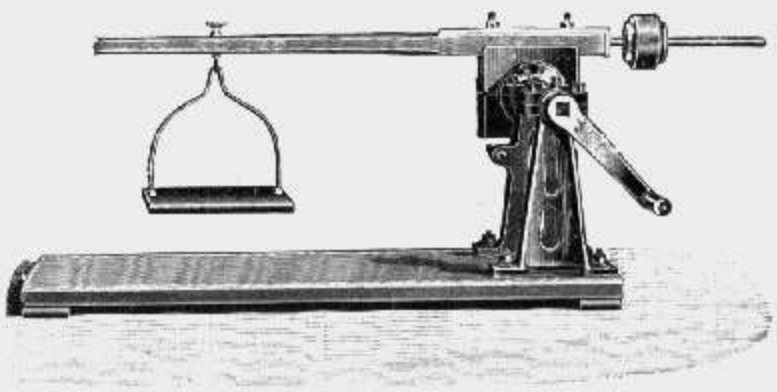
		£	s.	d.
52,412.	**Crane without Strut**	10.	0.	0
52,413.	**Crane with Variable Jib,** Figure	12.	0.	0
52,414.	**Wall Crane,** constructed of iron, Figure	12.	0.	0
52,415.	**Shore Turning Crane,** with fixed rotary axis	15.	0.	0
52,416.	**Shore Turning Crane with a Rotary Axis sunk under the bottom,** Figure	15.	0.	0
52,417.	**Shore Turning Crane with Sheet Iron Staging**	21.	10.	0
52,418.	**Turning Crane,** rotary on wheels	17.	10.	0
52,419.	**Travelling Crane,** of iron	21.	0.	0
52,420.	**Traverser with Pit**	17.	10.	0
52,421.	**Turntable**	17.	10.	0



52 422. 1 : 5.



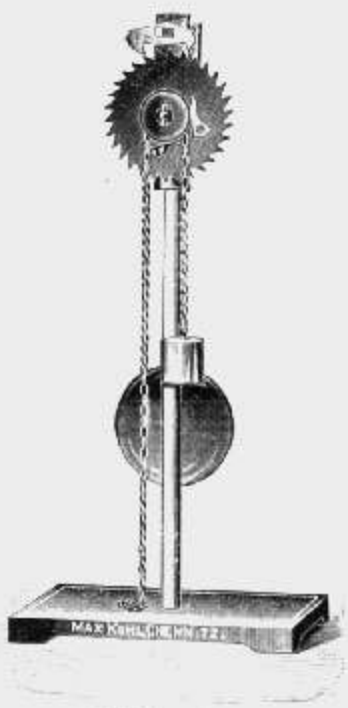
52 424. 1 : 8.



52 425. 1 : 7.



52 423. 1 : 7.



52 427. 1 : 5.

	£ s. d.
52,422. **Pile Driver,** Figure, of **wood** and **metal**	1. 2. 0
52,423. **Straight Pile Driver,** Figure, of wood, finest construction	8. 0. 0

Dynamometers.

52,424. **Brake Dynamometer** (Prony's Friction Brake), Figure (cf. M. P. **I**, Fig. 351 [337])	2. 0. 0
52,425. — idem, different pattern, Figure	3. 0. 0
52,426. **Friction Brake,** as suggested by Friedr. C. G. Müller (M. T., Fig. 219)	0. 10. 0

Spring Dynamometers: see Nos. 52,206—52,213, p. 310.
Brake Dynamometers: see Nos. 51,773—51,776, p. 252.

Cl. 572, 587, 5721, 588, 834.

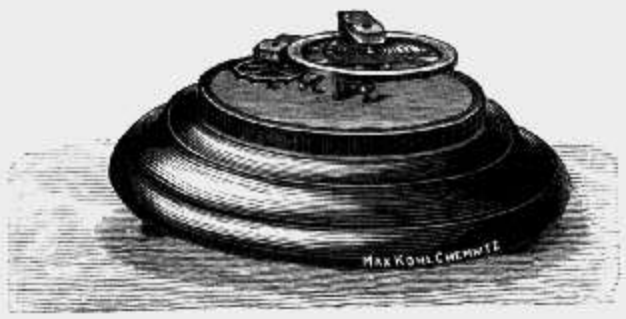
Max Kohl A. G. Chemnitz, Germany.



52 428. 1 : 10.



52 430. 1 : 12.



52 431. 1 : 3.

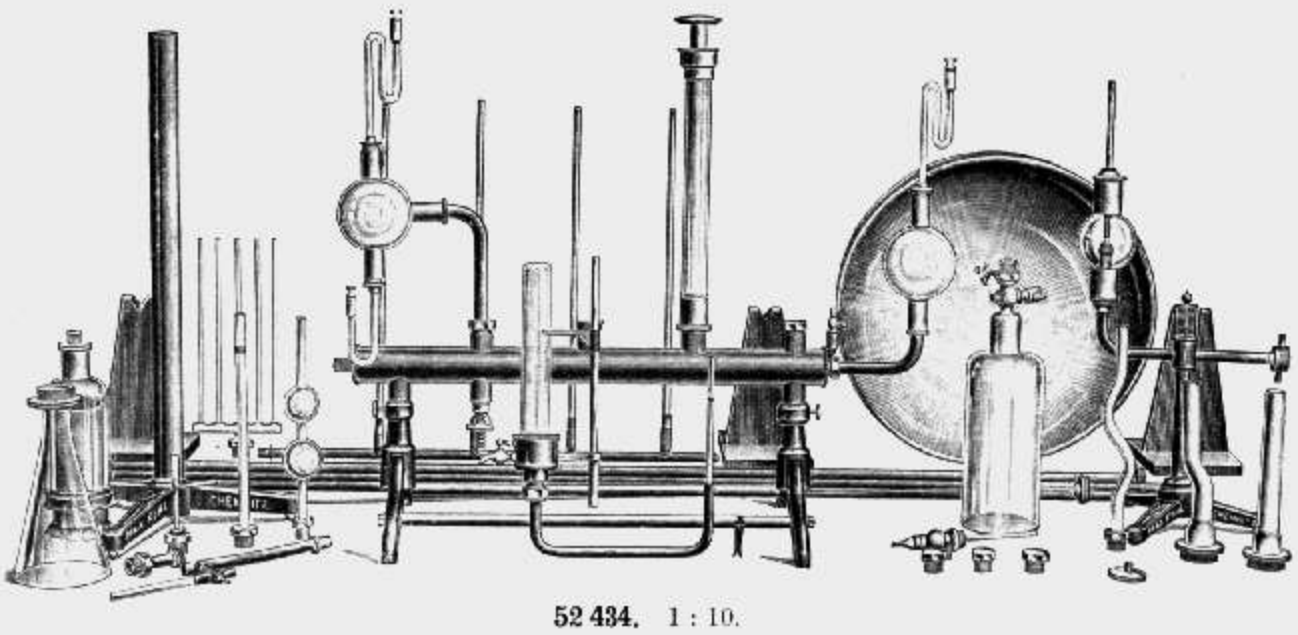


52 433. 1 : 10.

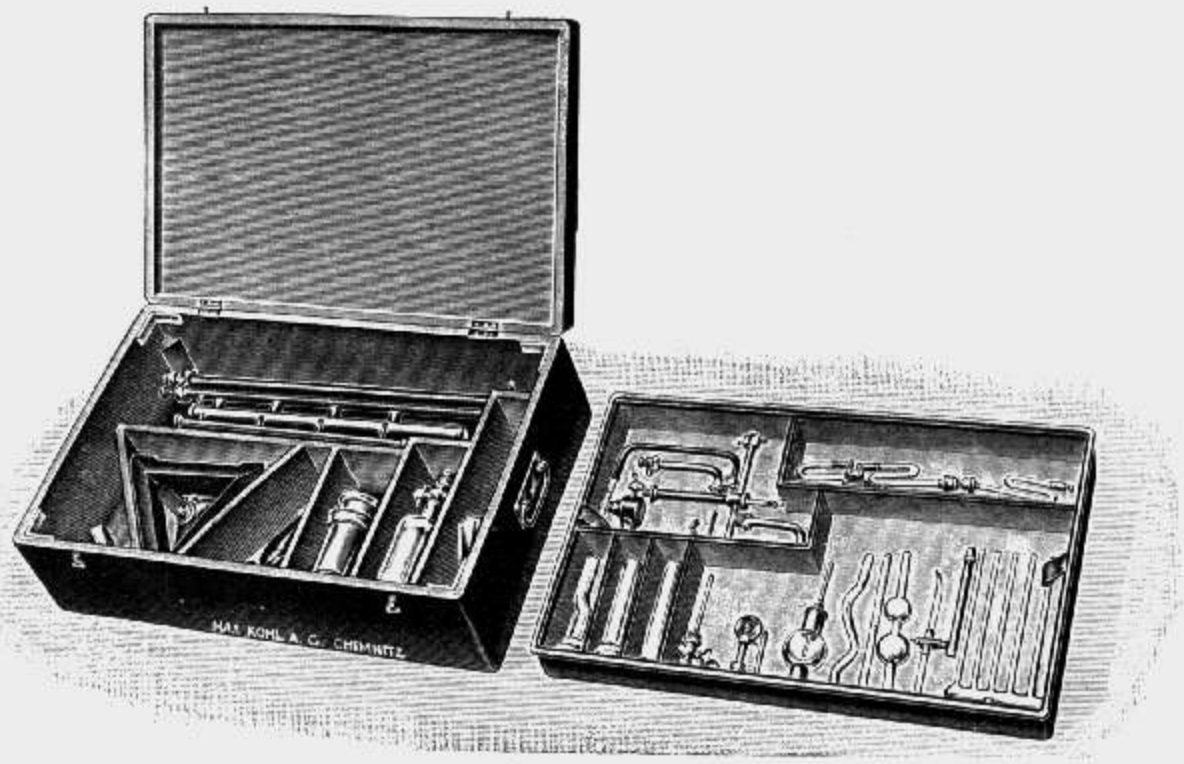
Clock Movements.

	£ s. d.
52,427. **Model of a Pendulum Escapement,** Figure, with detachable escapement; swing $^1/_2$ second; can also be used as a **chronometer**	1. 0. 0
52,428. **Model of a Clock,** with complete movement and perforated dial 20 cm diameter, Figure	2. 10. 0
52,429. — idem, **with electric minute contact,** see No. 51,701, for connecting up with an electric dial	3. 0. 0
52,430. **Model of a Clock from an old specimen dating back to the year 1640,** Figure, of wood, iron and stone . . . . . A stone is used for the weight; the hook has a circular motion and releases the escape wheel, whose teeth lie in the horizontal plane.	0. 16. 0
52,431. **Model of an Anchor Escapement,** with spring drive, Figure	3. 4. 0
52,432. **Model of a Cylindrical Escapement**	3. 10. 0
52,433. **Model of a Turret Clock Movement,** Figure (Fr. phys. Techn. **I, 2,** Fig. 3286)	9. 0. 0

Models of Water-Wheels, Turbines, Valves, Steam Cylinders, Steam Engines, etc. are listed further on in this Catalogue. Cl. 5767, 636, 637, 5020.



52434. 1 : 10.



52435. 1 : 16.

Equilibrium, Motion and Molecular Effects of Liquids.

52,434. **Universal Hydrostatic Apparatus,** Figure, suitable for a large number of experiments in the Mechanics of Liquids and Gases; can be used in a horizontal and vertical position . . . . . £ 10. 0. 0

The apparatus can be used: (1) for the propagation of pressure of liquids and gases in all directions; (2) as a hydraulic press; (3) for buoyancy experiments; (4) as a Pascal apparatus; (5) as communicating tubes; (6) with capillary tubes; (7) as well-springs; (8) for outflow experiments; (9) for decrease of pressure in cylindrical tubes; (10) as Segner's water wheel; (11) for the hydraulic ram; (12) as Heron's ball; (13) Cartesian diver.

Complete description and directions for use on application.

52,435. — idem, in box, Figure 11. 10. 0

52,436. **Apparatus as No. 52,434,** but constructed half as large again 14. 0. 0

52,437. — idem, in box 16. 10. 0

52,438. **Apparatus for showing Pressure Drop in Tubes of** various widths, for use in conjunction with one of the universal hydrostatic apparatus Nos. 52,434—52,437 . . . . . 1. 0. 0

52,439. **Hartwich's Apparatus for the Hydrostatic Paradox** (Ztschr. f. d. phys. u. chem. U. **16.** 1903, p. 275) 3. 0. 0

This apparatus can also be used in conjunction with the universal hydrostatic apparatus.

Cl. 723, 5530.

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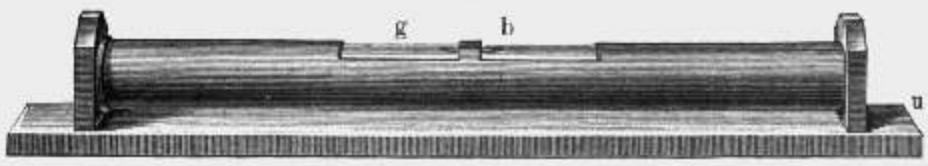
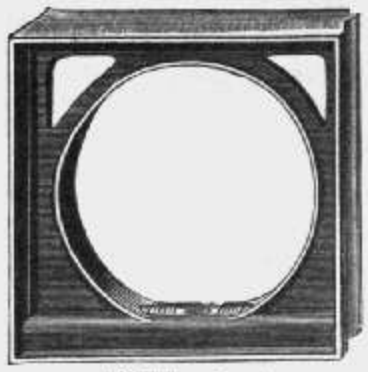
52 440. 1 : 5.



52 442. 1 : 3.



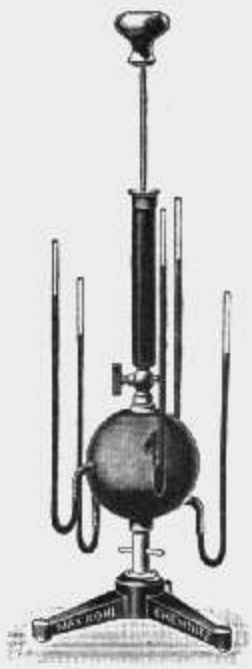
52 444. 1 : 4.



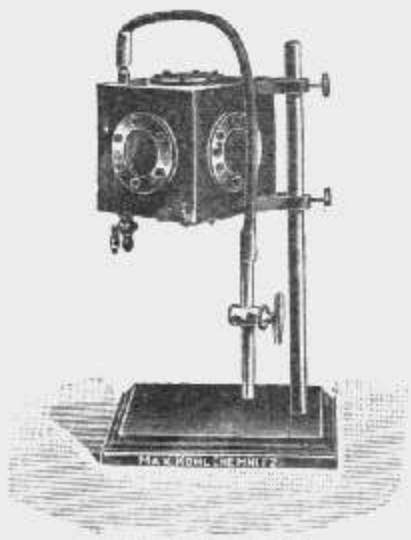
52 446. 1 : 1.



52 452. 1 : 7.



52 453. 1 : 8.



52 454. 1 : 6.

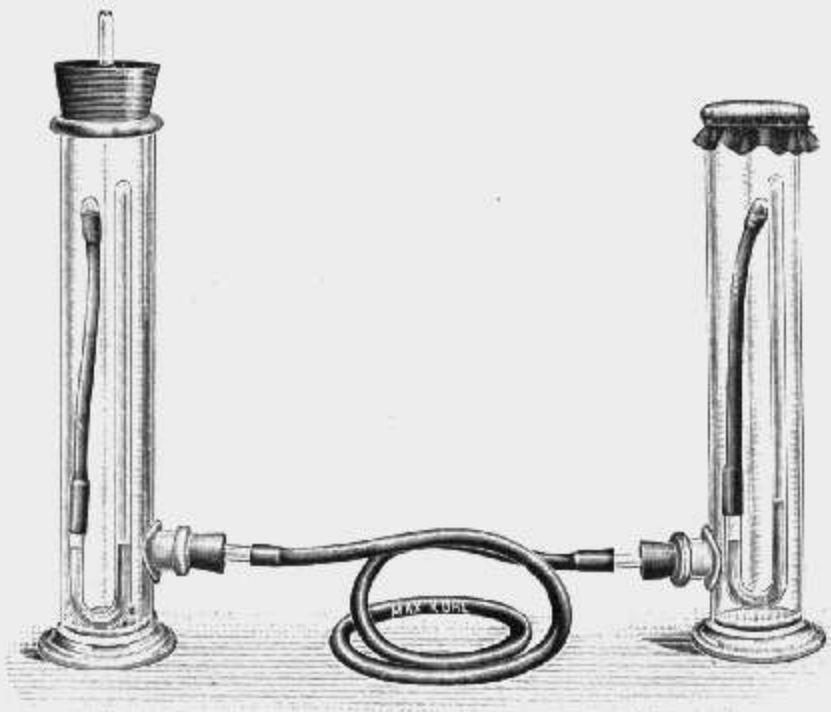
Equilibrium of Liquids.

	£ s. d.
52,440. **Tube Level Model** (Weinhold's), Figure (W. D., Figs. 104 and 105 [93 and 94]), length 40 cm, with polished stand	0. 11. 0
52,441. — idem, stand unpolished	0. 9. 0
52,442. **Tube Level** with metal base, Figure (W. and E. phys. Prakt., Fig. 12)	0. 7. 0
52,443. — idem, smaller and simpler pattern, with iron base	0. 3. 0
52,444. **Spirit Level** in cast iron case, Figure, for perpendicular and horizontal surfaces, shafts, etc.	0. 8. 0

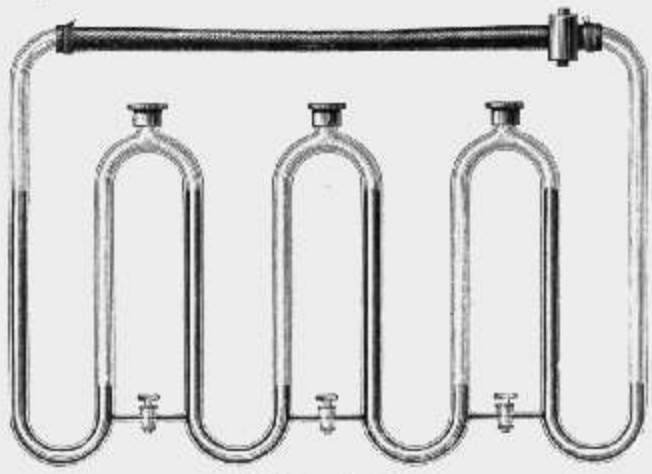
Round Spirit Level, of brass, nickelled, Figure.

List No.	**52,445**	**52,446**	**52,447**	**52,448**
Diameter mm	25	30	40	50
£	**0. 3. 6**	**0. 4. 6**	**0. 5. 0**	**0. 5. 6**

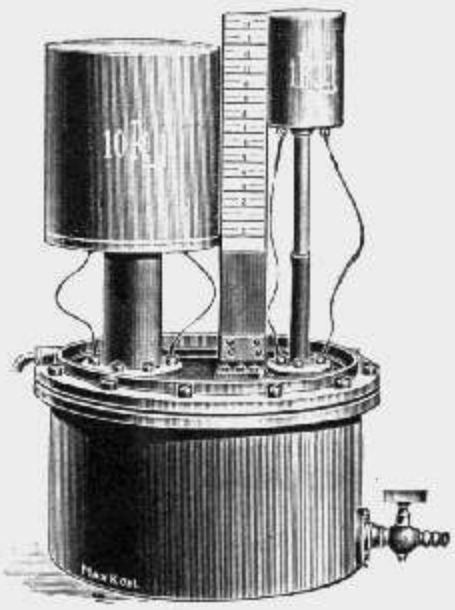
52,449. **Pressure Tube with Piston and Plugs,** for showing the invariability in volume of liquids and the difference between liquids and gases (M. T., p. 95)	0. 2. 0
52,450. **Apparatus for Propagation of Pressure, hollow brass sphere with fine holes** and force pump placed on same, similar to Fig. 52,452 (W. D., Fig. 106 [95]), without pressure gauge	0. 13. 0
52,451. — idem, of **glass (spherical squirt)**	0. 3. 0
52,452. **Apparatus for the Propagation of Pressure in Liquids and Gases, of brass, with Pressure Gauges,** Figure	1. 0. 0
52,453. — idem, **on stand,** Figure, with pressure gauges and stop-cock (Fr. phys. Techn. **I, 2,** Fig. 2692)	1. 16. 0
52,454. **Brass Cube for Pressure Propagation,** Figure, with six thin rubber membranes, as suggested by Browne, with 2 stop-cocks for leading in and taking off the water or air, on stand (Fr. phys. Techn. **I, 2,** Fig. 2333)	2. 0. 0



52 455. 1 : 5.



52 456. 1 : 6.



52 458. 1 : 6.



52 459. 1 : 12.

	£ s. d.
52,455. **Apparatus for demonstrating the Distribution of Pressure in Long Tubes,** Figure Two communicating glass cylinders, one being closed by a rubber membrane and the other by a rubber plug, have each a closed pressure gauge with rubber tubing (Piezometer). When pressure is applied to the membrane the coloured liquids in the two gauges rise to the same height.	0. 16. 0
52,456. **Wave Tube** (Maxwell's), Figure, for explaining the **formation of the residuum, slow equalisation of pressure;** can be used as an **analogue for the charge and discharge of a condenser** (Fr. phys. Techn. **I**, 2, Fig. 2392)	2. 10. 0
52,457. **Tube with closed Pressure Gauges,** for pressure distribution, as suggested by Friedr. C. G. Müller (M. T., Fig. 57)	0. 1. 0
52,458. **Hydrostatic Apparatus** (Recknagel's), modified by Friedr. C. G. Müller, Figure, for showing the distribution of pressure in liquids and the regularity of action on the area of the walls of vessels (**Pascal's Law**); the apparatus can be used also as a demonstration model for the Hydraulic Press (Ztschr. f. d. phys. u. chem. U. **7**, 1893/94, p. 7; M. T., Fig. 58)	3. 6. 0
52,459. **Hydraulic Bellows,** Figure (W. D., p. 148 [127]), comprising rubber cushion with hose, funnel tube and supporting board, without weight and stand . . . . . A few litres of water are first poured into the tube, and the supporting board and a 25—50 kg weight are placed on the cushion, and the result shows that the weight is raised by slowly filling with water.	1. 12. 0

Cl. 3324, 5022, 3325, 3839.

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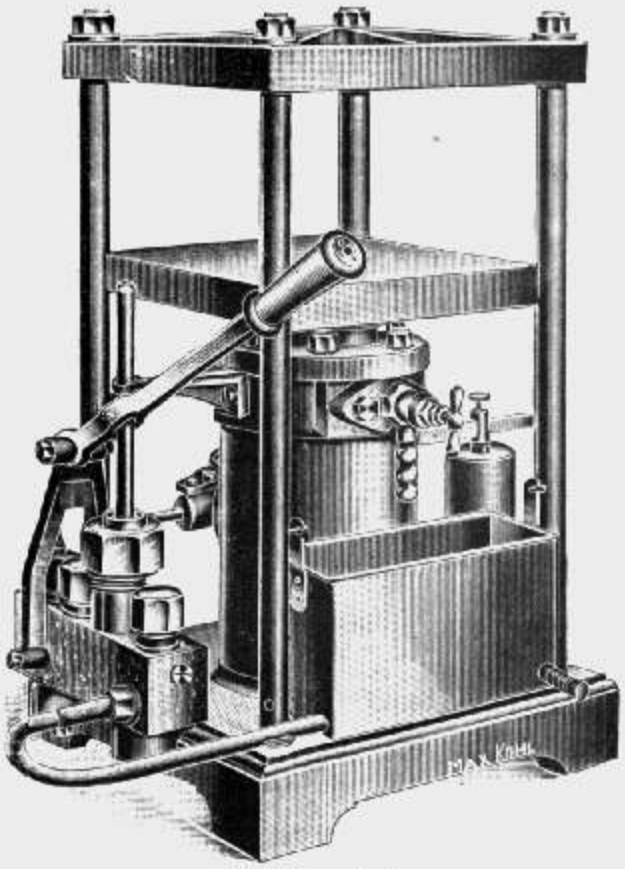
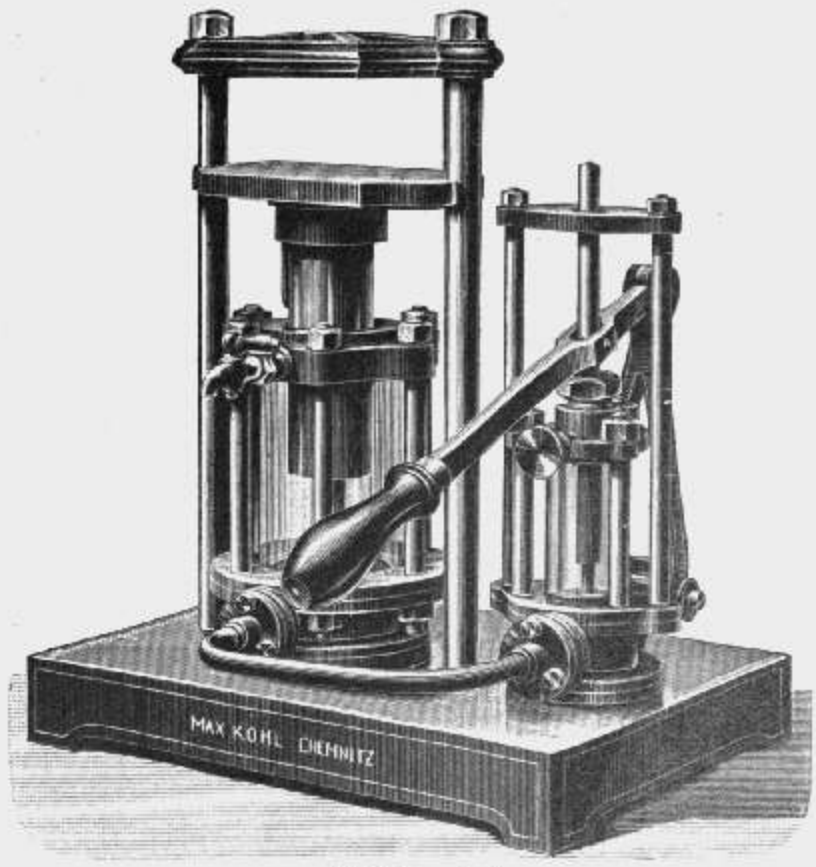
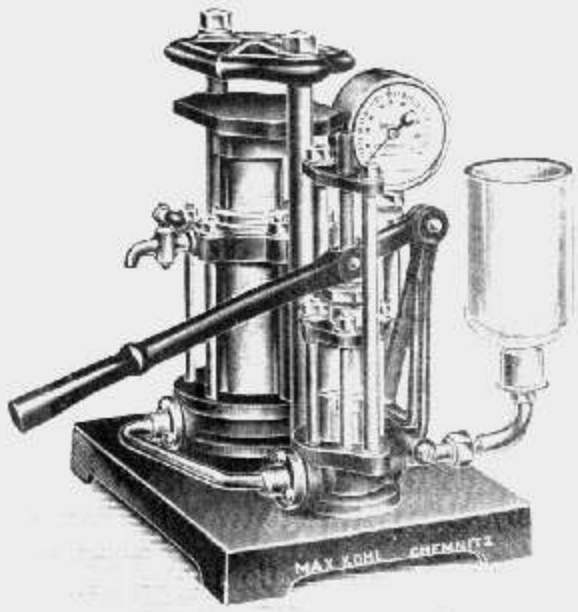


52461. 1 : 6.



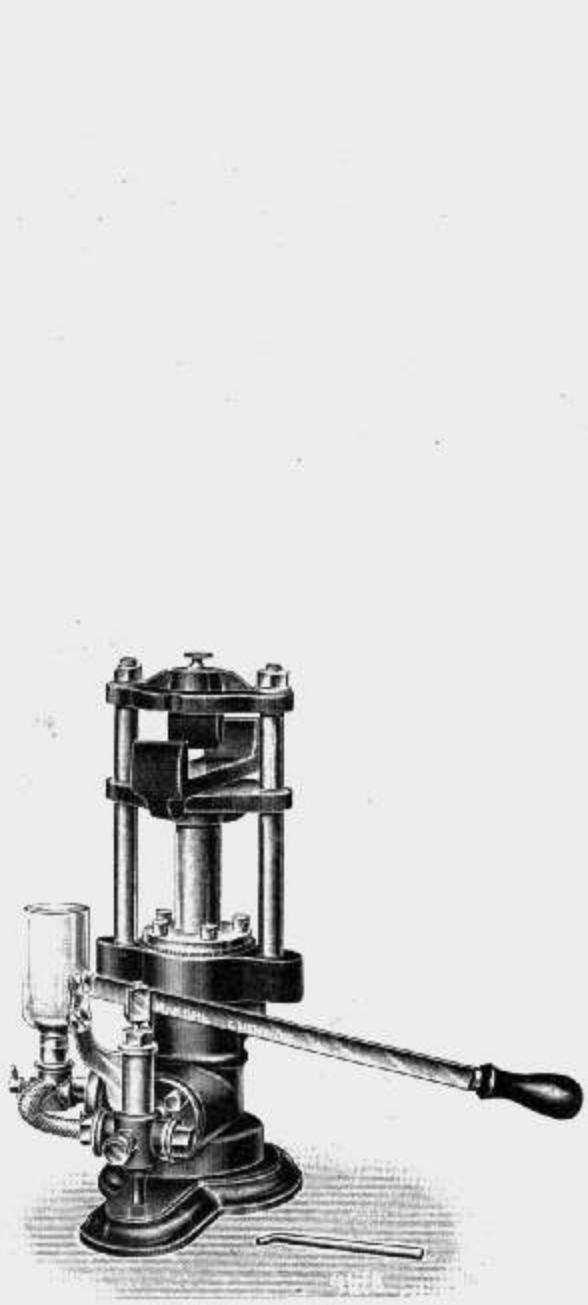
52465. 1 : 4.

52463. 1 : 7.

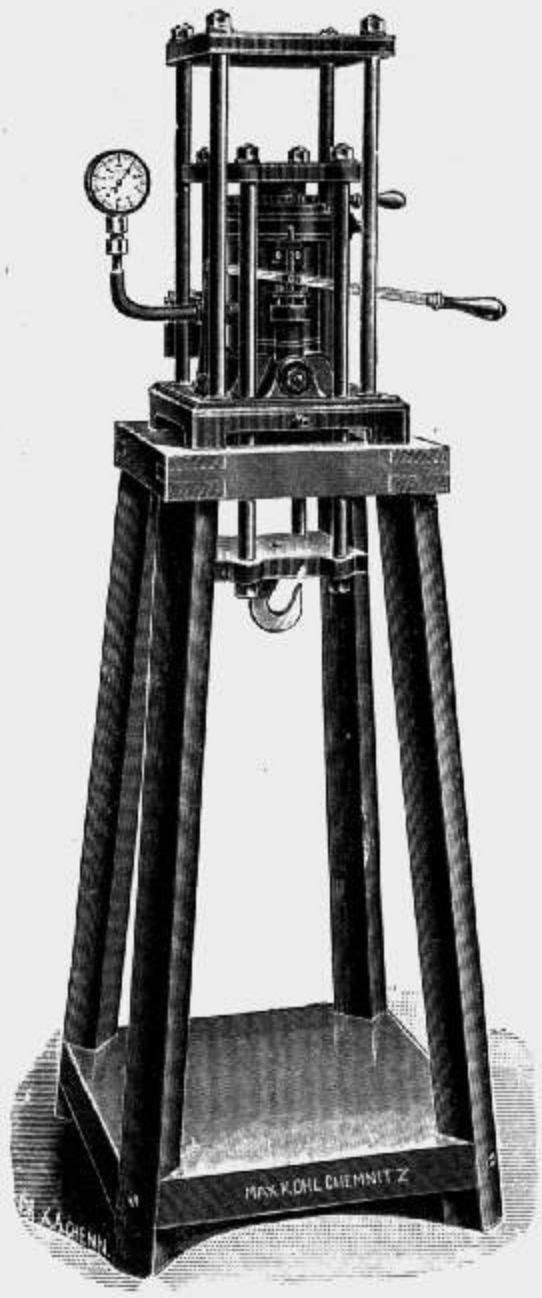


52466. 1 : 8.

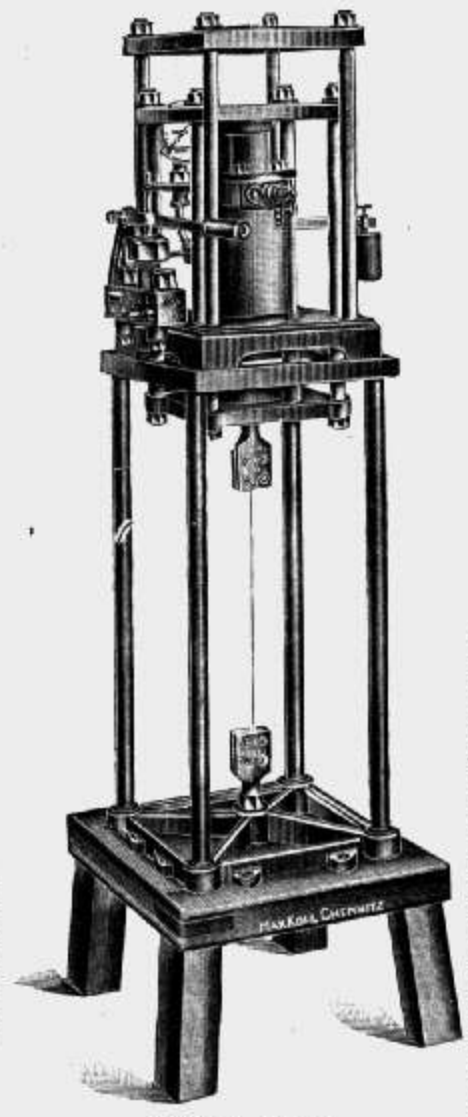
	£	s.	d.
52,460. **Flat Sheet Iron Box,** for storing the rubber cushion (W. D., p. 148)	0.	8.	0
52,461. **Hydraulic Press,** Figure (W. D., Fig. 107 [96]), massively constructed of iron and steel; valves fitted, so as to be detachable, in special valve chambers, giving 3000 kg pressure, with safety valve for 60 atmospheres	12.	0.	0
The ram has a cross-section of 50 sq. cm; each atmosphere of pressure thus corresponds to a 50 kg pressure. The press has an efficiency of 60 ats., which is equivalent to 3000 kg pressure.			
52,462. — idem, **with Pressure Gauge**	14.	10.	0
52,463. **Hydraulic Press,** of metal, for a pressure of 1500 kg, Figure	8.	10.	0
52,464. — idem, **with Pressure Gauge**	11.	0.	0
52,465. **Hydraulic Press with Glass Cylinder** and visible valves, Figure, with safety valve for 25 Atm., for preventing bursting of the cylinder, for 500 kg pressure	8.	0.	0
52,466. — idem, **with Pressure Gauge,** Figure	10.	10.	0



52 467. 1 : 7.



52 468. 1 : 11.



52 469. 1 : 13.

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	£ s. d.
52,467. **Hydraulic Press,** Figure, with lever, arranged so as to be rotary, for moving same from any side; arranged for breaking wood rods, etc.	6. 0. 0
52,468. **Hydraulic Press for Compression and Lift, on wood stand,** with safety valve, pressure gauge and hook for weights, Figure	18. 10. 0
The press is mounted on a thick oak stand, is of the same type and efficiency as No. 52,461, and is intended to be used for showing the considerable loads which can be lifted by means of the press.	
52,469. **Hydraulic Press, for Compression, Lift and Extension,** with iron frame, Figure, with safety valve and pressure gauge, suitable for strength tests	22. 10. 0
The press has a massive iron frame and is fitted with two stout clamps for gripping wires, bands, etc. in elasticity experiments. Type and efficiency as in No. 52,461. Iron wire 7 mm in diameter can easily be broken in the press.	
52,470. **Model for explaining the Hydraulic Press,** Figure, of glass in metal frame, lifting 100 g	0. 12. 0
52,471. — idem, without framework	0. 3. 6
52,472. — idem, as No. 52,470, **Double Size,** with mount and vessel	1. 10. 0
52,473. **Rubber Vessel,** for showing the Increase of Pressure downwards, Figure (W. D., Fig. 109 [98]), to be filled with mercury	0. 8. 0
52,474. **Sheet Iron Cylinder with holes at different heights,** Figure, for showing the increase of pressure downwards (W. D., Fig. 108 [97])	0. 6. 0

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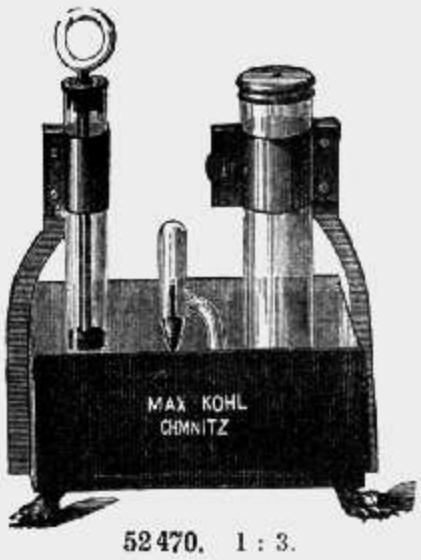
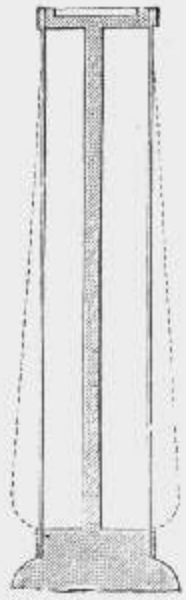


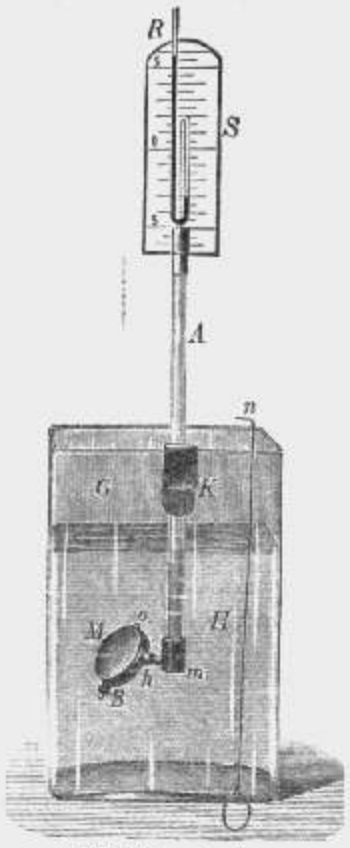
52 470. 1 : 3.



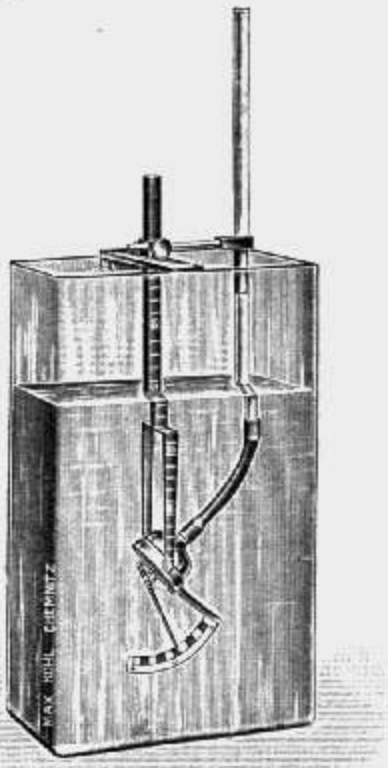
52 473. 1 : 3.



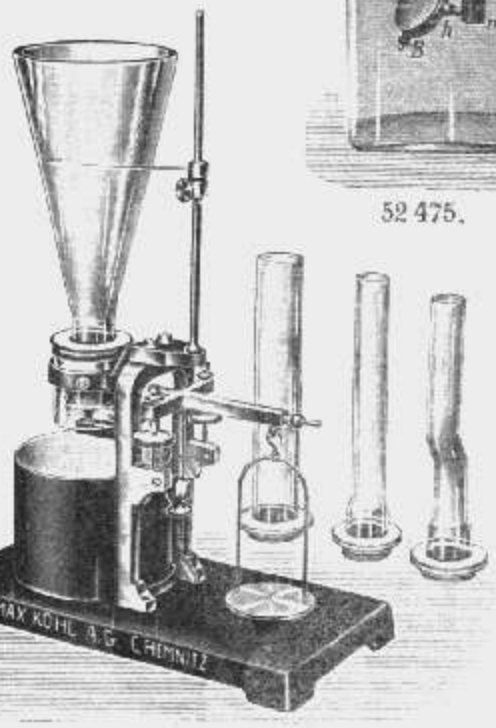
52 474. 1 : 12.



52 475. 1 : 6.



52 476. 1 : 8.



52 479. 1 : 5.

52,475. **Pressure-Increase Apparatus** (Hartl's), Figure, for showing the internal pressure-relations in a liquid (Ztschr. f. d. phys. u. chem. U. **9**, 1896, p. 120) . . . . . £ 1. 0. 0

The inferior part of a glass tube is connected to a pressure-chamber shut by 2 membranes and turnable about a horizontal axis; in the superior part is fixed a manometer with scale.

52,476. **Pressure-Increase Apparatus,** after Hartl, **with Pointer Reading,** Figure (Ztschr. f. d. phys. u. chem. U. **8**, 1895, p. 204), complete, with glass vessel and bridge . . £ 3. 0. 0

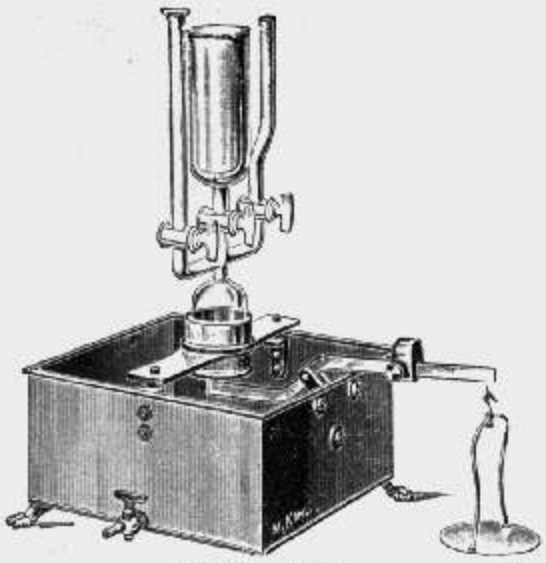
The apparatus is used for showing (1) the increase of pressure downwards, (2) the independence of pressure on the inclination of the compressed surface towards the level, (3) the dependence of pressure on the density of the liquid.

52,477. **Weighted Flask with Gauze Seal,** after Rebenstorff, for depth measurement and demonstrating the inertia of water (Ztschr. f. d. phys. u. chem. U. **21**, 1908, p. 107); capacity of flask, 100 ccm . . . . . £ 0. 5. 0

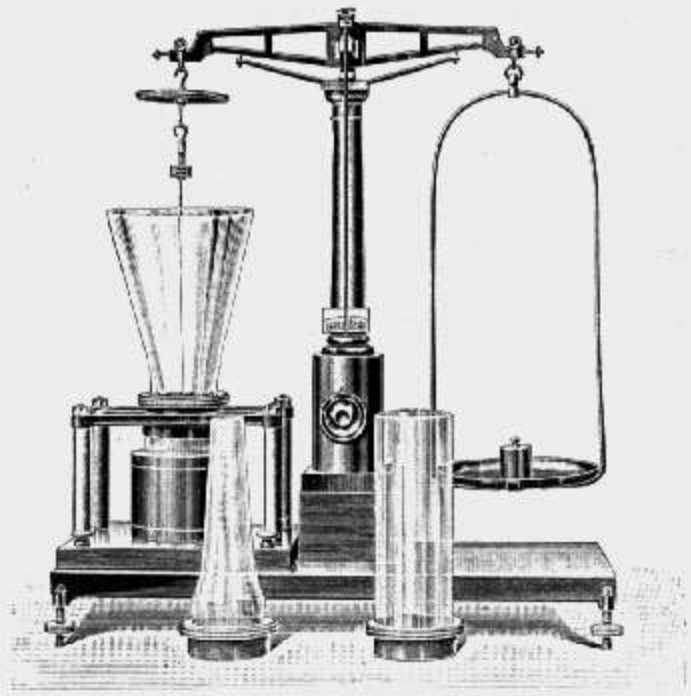
52,478. **Apparatus for proving Pascal's Law,** after Friedr. C. G. Müller (M. T., Fig. 62 and 119), to be used as an analogon of the **Ordinary Barometer** and of the **Siphon Barometer**. £ 0. 8. 0

The following are immersed in an upright cylinder filled with water: (1) 1 barometer tube open at both ends, this being placed under the water in a dish containing mercury; and (2) 1 unequal-limb hooked tube, which has to be filled with some mercury.

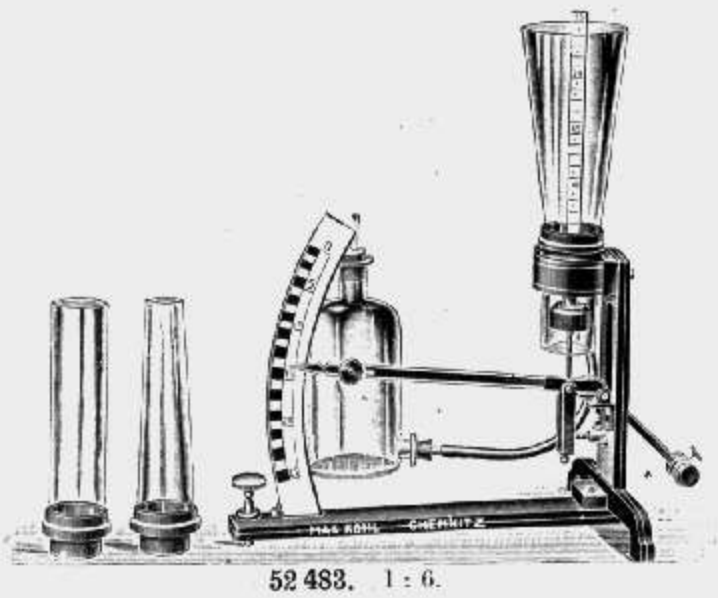
52,479. **Pascal's Apparatus,** for showing that the pressure of liquids depends on their height and the surface of the bottom of the columns and not upon the capacities of the vessels, improved by Weinhold, Figure (W. D., Fig. 110 [99]), with 4 different tubes . . £ 3. 5. 0



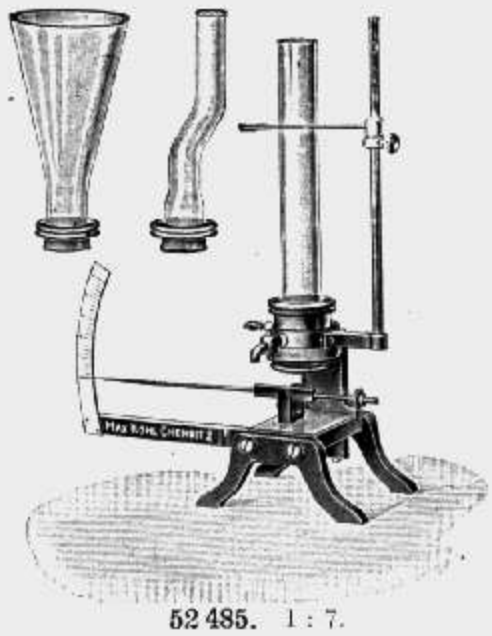
52 481. 1 : 7.



52 482. 1 : 8.



52 483. 1 : 6.



52 485. 1 : 7.

52,481. **Pascal's Apparatus,** for showing that the pressure of liquids depends on their height and the surface of the bottom of the columns and not upon the capacities of the vessels, Figure, with triple tube, the parts of which can be shut off by cocks, with 3 bottom pieces of different sizes . . . . . £ s. d. 2. 5. 0

52,482. **Pascal's Apparatus,** for showing that the pressure of liquids depends on their height and the surface of the bottom of the columns and not upon the capacities of the vessels, Figure, can also be used as a **Hydrostatic Balance,** on board with levelling screws, with 3 tubes (M. P. **I**, Fig. 366 [360]) 7. 0. 0

52,483. **Hartl's Apparatus,** for showing that the pressure of liquids depends on their height and the surface of the bottom of the columns and not upon the capacities of the vessels, with 3 different tubes. The height scale is fitted to the movable piston so that the pressure-altitude and the magnitude of the pressure can be read off simultaneously (the latter on the pointer of the balance) 4. 0. 0

52,484. — idem, with 3 different rams, with plane, concave and convex surfaces . . . 4. 10. 0

52,485. **Pellat's Apparatus,** for showing that the pressure of liquids depends on their height and the surface of the bottom of the columns, Figure (Ztschr. f. d. phys. u. chem. U. **3**, 1889/90, p. 55) 3. 0. 0

The apparatus consists of a metal ring fitted to a massive stand, this ring being provided with a cock and a closing membrane acting on a pointer lever. An adjustable pointer is fitted to a vertical lever which permits of 3 differently shaped vessels, fitting the ring and pertaining to the apparatus, to be filled to the same level. The piston is packed with mercury.

52,487. **Apparatus,** for showing that the pressure of liquids depends on their height and the surface of the bottom of the columns and not upon the capacities of the vessels, with Spring Balance after Zahlbruckner, Figure, with 3 different tubes 5. 0. 0

The spring balance is contained in a brass tube with plain, two-coloured scale and pointer; a

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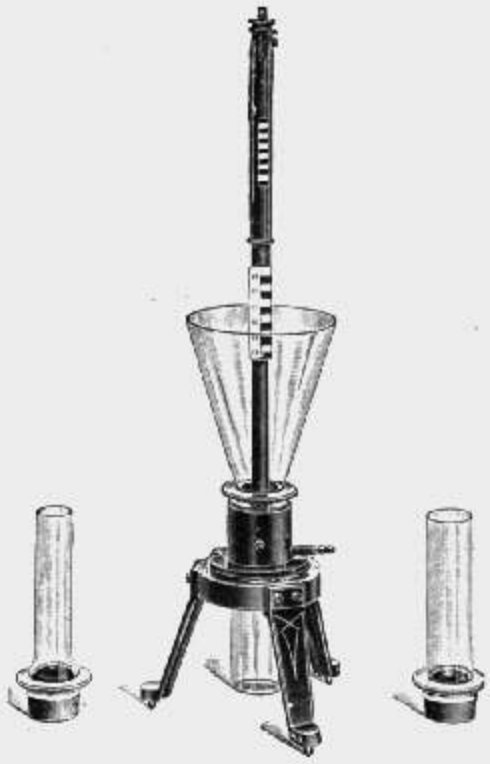
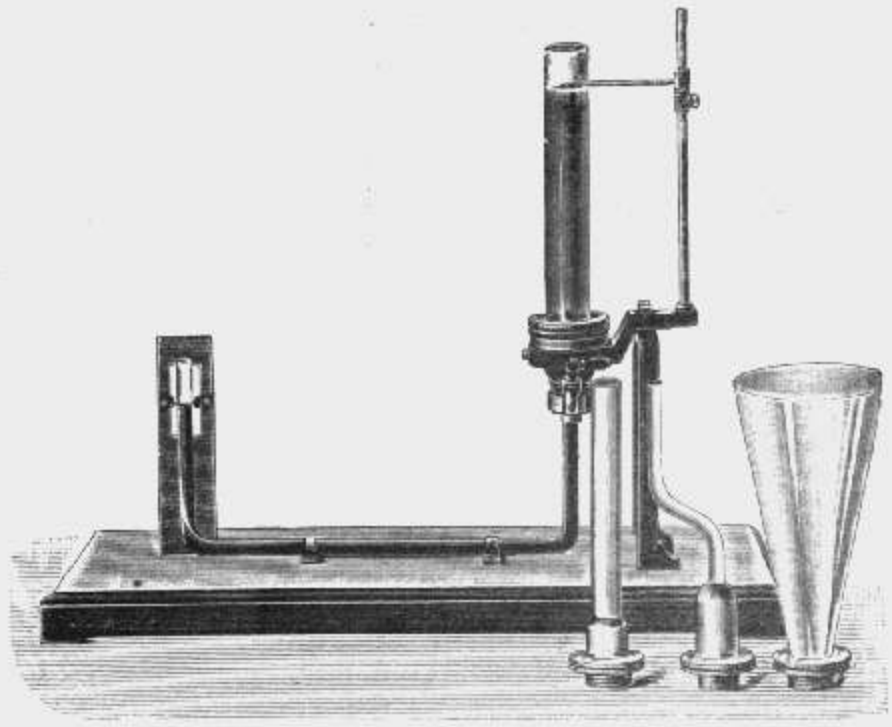
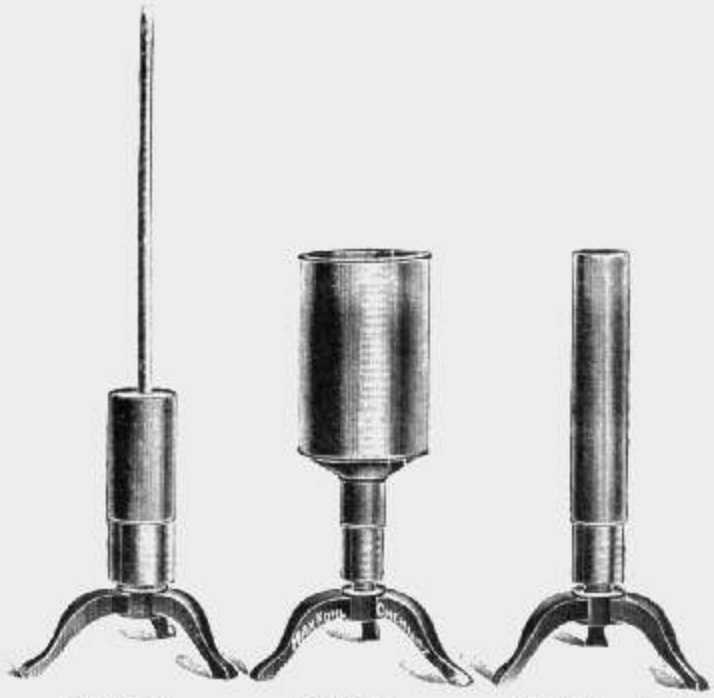


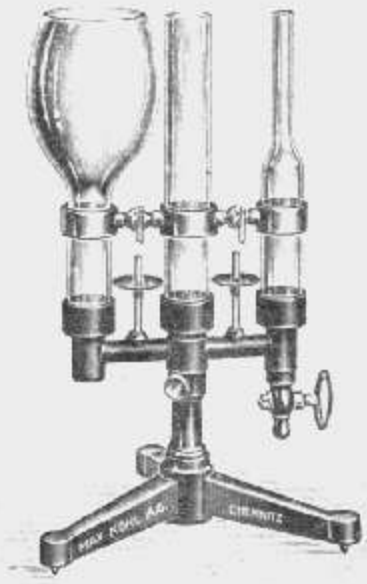
52 487. 1 : 6.



52 488. 1 : 6.



52 489 A. 52 489 B. 52 489 C. 1 : 8.



52 490. 1 : 7.

special scale is provided for showing the level of the liquid. The different annexes have conical brass mounts and can therefore easily be interchanged. The apparatus has a lateral annex-tube so as to be able to connect it with another vessel.

The piston packing is of mercury; the regulating screw fitted at the top of the apparatus should be turned in order to bring the pointer to zero.

£ s. d.

52,488. **Haldat's Apparatus,** for showing that the pressure of liquids depends on their height and the surface of the bottom of the columns and not upon the capacities of the vessels, Figure, with 4 different tubes 2. 10. 0

52,489. **Hartwich's Apparatus for the Hydrostatic Paradox,** Figs. A, B and C (Ztschr. f. d. phys. u. chem. U. **16**, 1903, p. 275), consisting of 3 single pieces of apparatus . . . 4. 0. 0

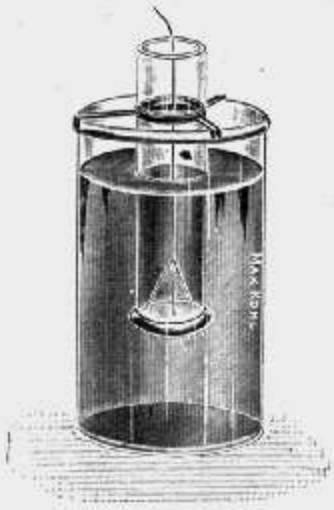
If the vessels are filled with water, the vessel A is lifted up by buoyancy, vessel B sinks on account of the action of bottom pressure, while the cylindrical vessel, Fig. C, remains motionless as neither pressure at base nor buoyancy bring any action to bear on this.

52,490. **Sire's Apparatus,** Figure, for showing the Hydrostatic Paradox, with 2 connecting cocks and 1 discharge cock 2. 10. 0

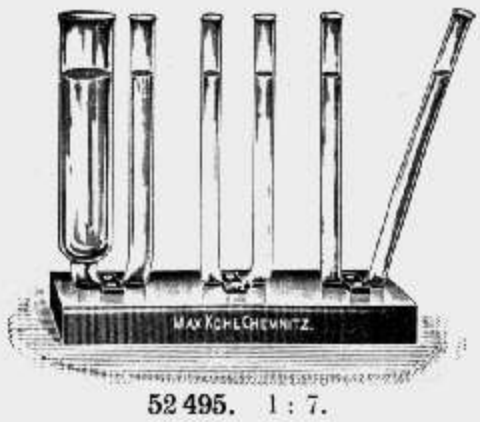
The following can be shown by the apparatus: (1) that the pressure at the base is independent of the quantity of liquid; (2) that the pressure at base depends on the extent of surface at base and on the level of the liquid; and (3) that this pressure is equal to the weight of a column of liquid whose base is the compressed surface and whose height is the height of compression.



52 492.



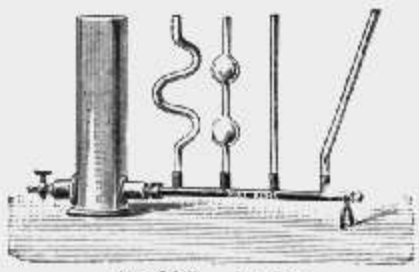
52 494. 1 : 6.



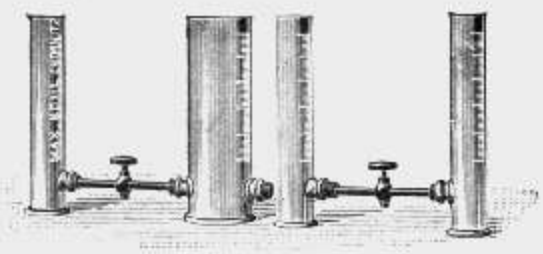
52 495. 1 : 7.



52 496. 1 : 7.



52 497. 1 : 18.



52 499. 1: 14.



52 500. 1 : 12.

52,492. **Buoyancy Apparatus,** simple, Figure, open glass cylinder closed by plane aluminium plate . . . . . £ 0. 4. 6

52,494. — idem, Figure, open glass cylinder with metal mount, aluminium plate and glass vessel (Fr. phys. Techn. **I**, 2, Fig. 2395 [**I**, Fig. 169]; Gan.-Man., Fig. 97; Gan.-Akt., Fig. 78) 0. 6. 0

The bottom plate of the inner cylinder is drawn up by a thread, the outer cylinder being filled with water; the plate is then firmly held in place by the pressure at base. If now the inner cylinder is filled with water to the level of the outer, the plate falls down.

52,495. **3 Communicating Tubes,** on one wood board, Figure 0. 8. 0

52,496. **Communicating Tubes,** on stand, 4 different width and differently bent tubes, Figure 0. 4. 0

52,497. — idem, with large glass vessel and stopcock, Figure 1. 12. 0

52,498. **Communicating Vessels** (M. T., Fig. 59) 0. 2. 0

52,499. **Communicating Water Vessels,** Figure (Kolbe-Skellon, Introduction to Electricity, Part I, Figs. 64 to 66), with graduation, two of equal and two of unequal diameter, connecting tube with cock, also suitable for Capacity Comparisons, with centimetre graduations 1. 4. 0

52,500. **Channel Balance,** with simple stand, Figure 1. 0. 0

52,501. — idem, better type, dismountable, stand with ball bearings, in box, Figure 1. 10. 0

52,502. **Model of the Channel Balance,** after Friedr. C. G. Müller (M. T., Fig. 60) 0. 8. 0

52,503. **U-shaped Tubes for liquids of different gravity,** Figure, on wood stand, with graduation, simple 0. 5. 0

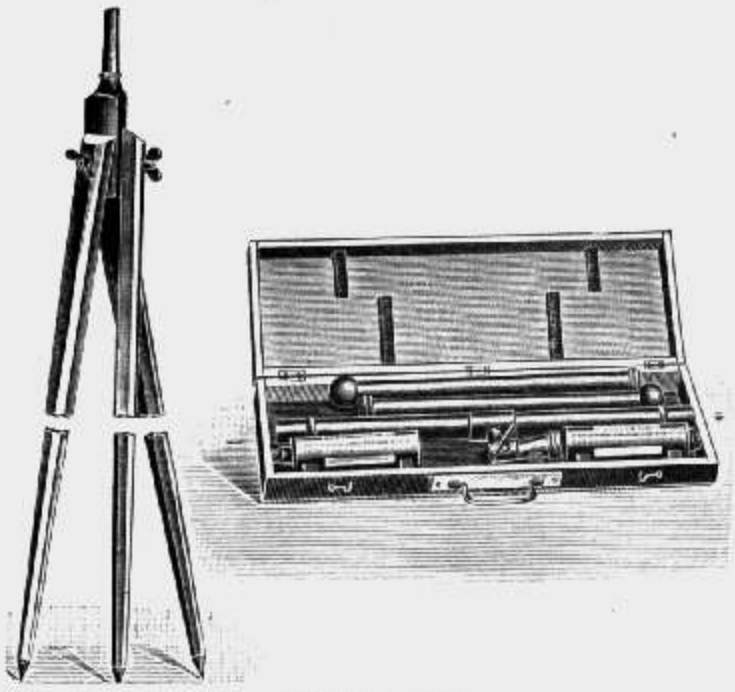
52,504. — idem, 500 mm long, Figure, with white and red graduations, with polished wood stand 0. 10. 0

52,505. — idem, with levelling screws (Gan.-Man., Fig. 104; Gan.-Akt., Fig. 84). . . . 1. 4. 0

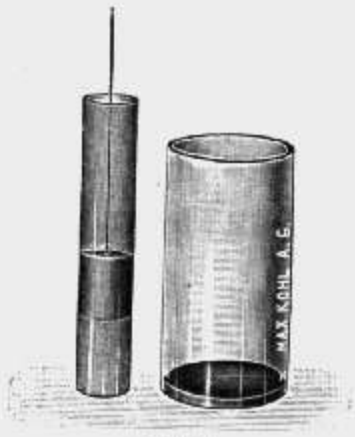
52,507. — idem, after Friedr. C. G. Müller, with discharge cock (M. T., Fig. 61) . . . 0. 10. 0

Cl. 5834, 730, 739, 5828, 741, 2121, 745.

Max Kohl A. G. Chemnitz, Germany.



52 501. 1 : 12.



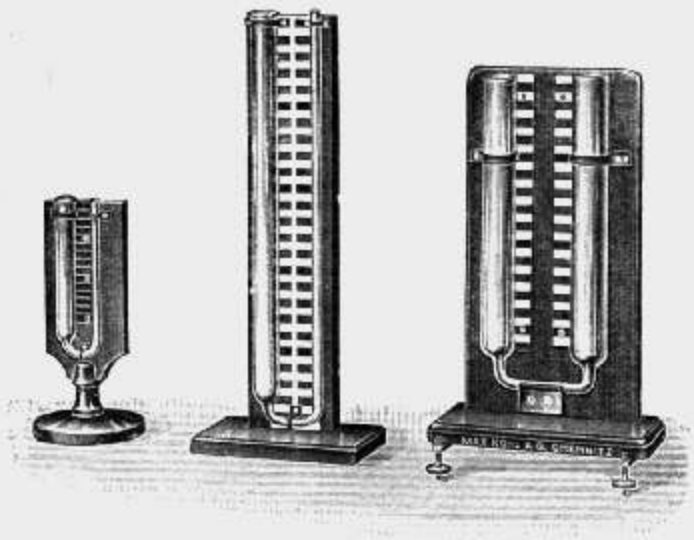
52 508.



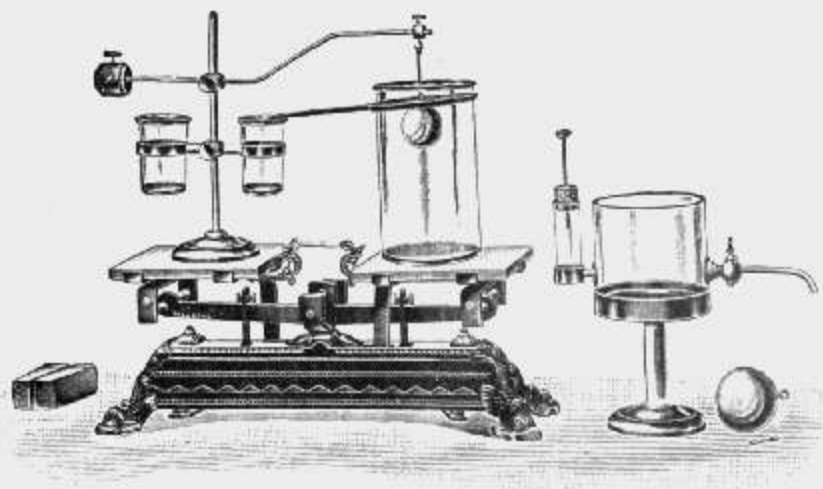
52 509. 1 : 1.



52 511. 1 : 3.



52 503. 1 : 10. 52 504. 1 : 10. 52 505. 1 : 10.



52 512. 1 : 8.

£ s. d.

52,508. **Apparatus for proving the Archimedian Law,** Figure 0. 14. 0

The apparatus consists of 1 wide glass vessel and 1 glass cylinder 250 mm long, into which a 50 mm wide hollow brass cylinder fits so as to be liquid-tight. If the cylinder is sunk in a vessel containing water, the piston is raised up, and it should now be noted that the piston is hollow, but is heavier than the water which it displaces. The action of the suction pump can also be explained with the apparatus.

52,509. **Solid and Hollow Cylinders** for explaining the Archimedian Principle, Figure (M. P. I, Figs. 375, 376 [373, 374]) 0. 10. 0

52,510. — idem, smaller 0. 8. 0

52,511. **Apparatus for explaining the Archimedian Principle,** after Weinhold, Figure, in order to enable the experiment to be made with dissymmetrically shaped bodies as well (W. D., Fig. 111 [100]; Ztschr. f. d. phys. u. chem. U. **2**, 1888/1889, p. 35) . . 0. 9. 0

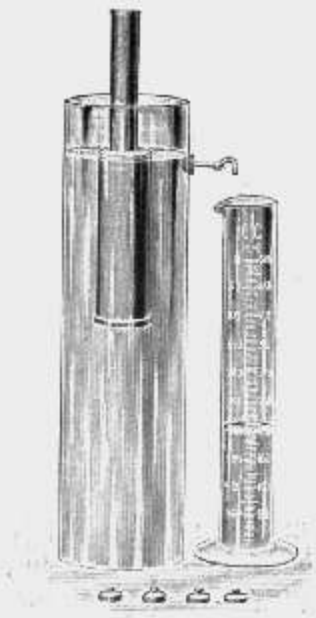
Metal Cube with Hollow Cube: see Nos. 51,511—51,513, p. 230.

52,512. **Apparatus for demonstrating the Archimedian Principle,** after Sire, Figure (Carls Repertorium **10**, p. 451) 3. 5. 0

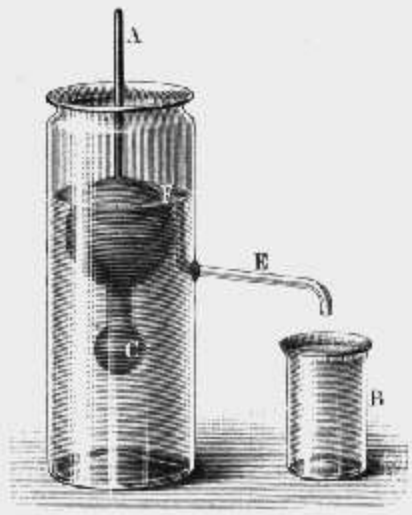
The apparatus comprises: 1 flat balance with upper dish, 1 stand with 2 beakers and carrier (adjustable) for the body to be immersed; 1 overflow vessel and 1 discharge vessel with cock. It is possible to show with the apparatus: (1) that a body plunged in a liquid is submitted to an upward pressure which is equal in magnitude to the weight of the quantity of liquid displaced; (2) that the increase of pressure on the bottom of the vessel is equal to the pressure of the liquid on the immersed body; (3) that a body floats when it displaces a volume of water whose weight is just as great as that of the body itself.

Hydrostatic Balances: see Nos. 51,573—51,602, pp. 236—240.

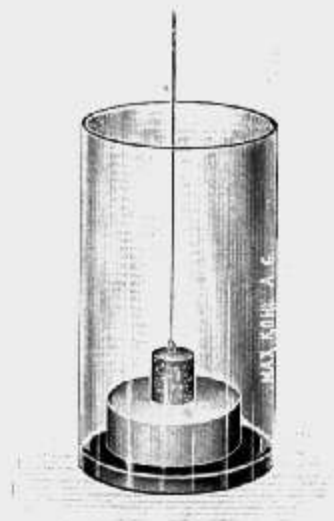
Cl. 746, 5774, 747, 748, 5821, 749.



52 513. 1 : 8.



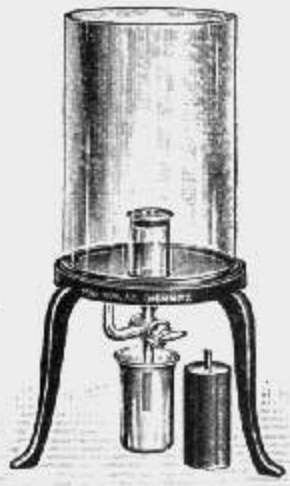
52 514. 1 : 5.



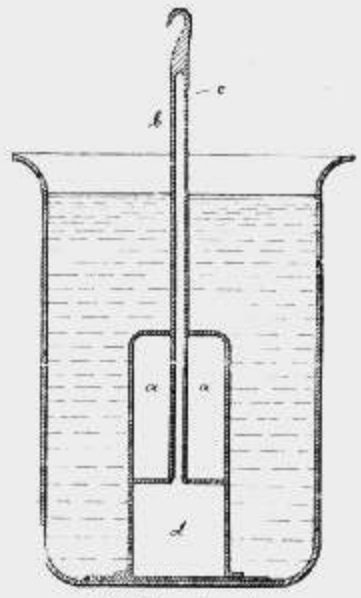
52 516. 1 : 6.



52 517. 1 : 3.



52 519. 1 : 10.



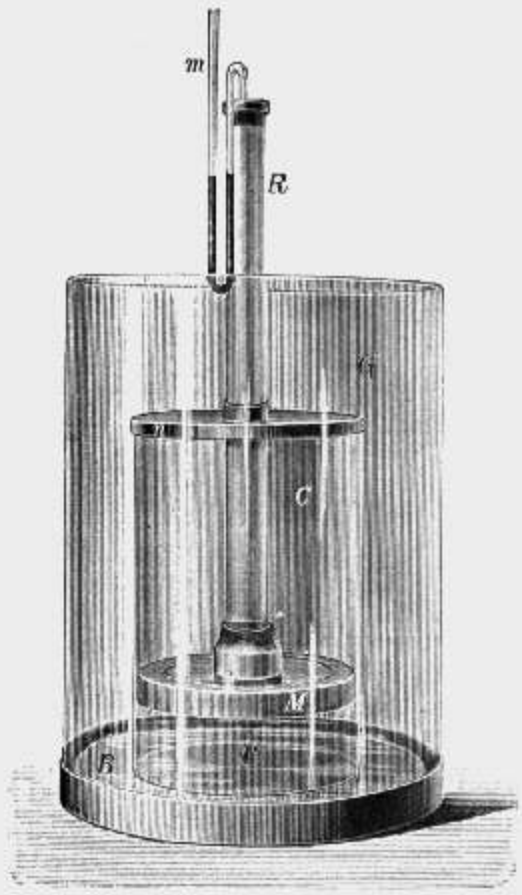
52 520. 1 : 4.

	£ s. d.
52,513. **Float Apparatus,** after Schellen, Figure, for showing that a floating body becomes immersed in the liquid until the volume of liquid displaced by it becomes equivalent to its own weight (explanation of the hydrometer) . . . . . The apparatus consists of 1 glass cylinder with eduction tube, a 200 ccm hollow displacing float, 4 loading weights of 20 g and a measuring glass.	0. 15. 0
52,514. — idem, simpler, Figure (W. u. E. phys. Prakt., Fig. 46)	0. 10. 0
52,515. **Float and Glass Cylinder with plane base,** for float experiments (W. D., Fig. 116 [105])	0. 6. 0
52,516. — idem, in form shown in Fig. 52,516, for showing that the force compressed by the body on the bottom depends on the height of the liquid column bearing on it .	0. 1. 0
52,517. **Float,** Figure, after Haedicke, with Cylindrical Vessel, Glass Cylinder and Glass Plate (W. D., Fig. 117 [106])	0. 8. 0
52,518. **Apparatus for showing that a floating body displaces a certain quantity of water when loaded corresponding to the weight of the load** (Fr. phys. Techn. I, 2, Fig. 2420) . . The floating body carries a collecting vessel, which is placed under the water trough, and into this vessel water can flow out of the trough. The quantity of water bearing on the floater causes the floater to sink down into the trough to such extent that the position of the water in the trough, as shown by a water gauge, remains unchanged in spite of the loss of water which occurs when it flows out.	3. 10. 0
52,519. **Float Apparatus,** after Vogel, Figure, with arrangement for eliminating buoyancy (Fr. phys. Techn. I, Fig. 2417)	1. 14. 0
52,520. **Float and Glass Cylinder,** after Haedicke, **new construction,** Figure . . . . . The bell is placed loosely on the bottom of the full vessel and a current of air blown through the orifice c. The bell thereupon remains fixed as though attracted by suction.	0. 12. 0

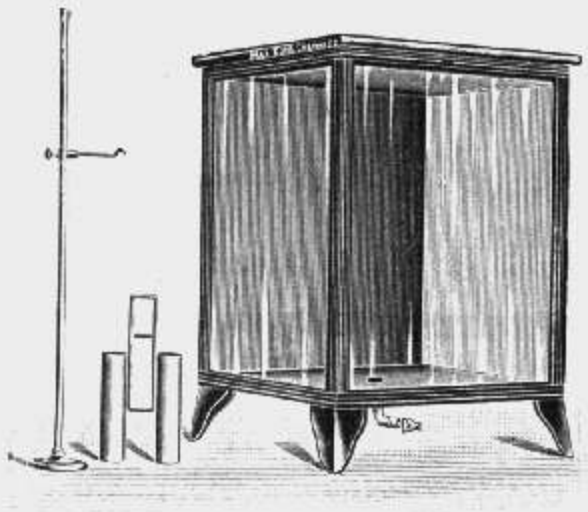
Cl. 3330, 764, 5778, 735, 5771, 736.

Max Kohl A. G. Chemnitz, Germany.

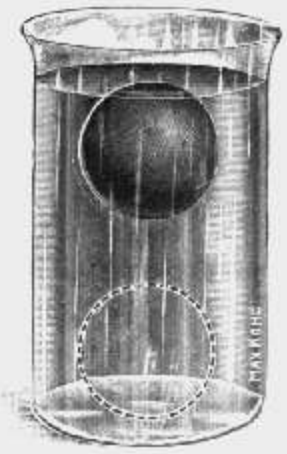
Max Kohl A. G. Chemnitz, Germany.



52 521. 3 : 10.



52 523. 1 : 12.



52 526. 1 : 3.

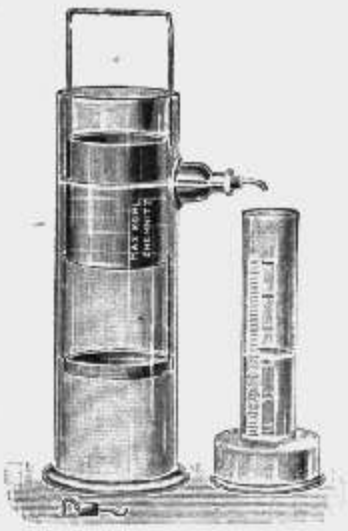


52 528. 1 : 2.



52 529. 1 : 2.

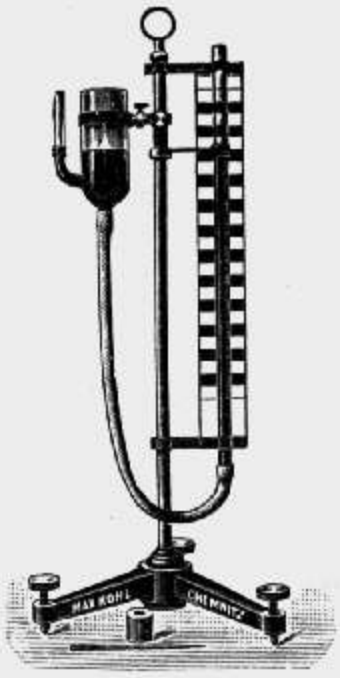
	£ s. d.
52,521. **Float**, after Hartl, Figure (Ztschr. f. d. phys. u. chem. U. **9**, 1896, p. 121) . The apparatus is used for explaining the conditions for the floating of the body, and also for explaining the difference between hydraulic and hydrostatic pressure.	0. 18. 0
52,522. — idem, different pattern (Ztschr. f. d. phys. u. chem. U. **9**, 1896, p. 122; Fr. phys. Techn. **I**, 2, Fig. 2419)	0. 18. 0
52,523. **Buoyancy and Metacentre Apparatus,** as suggested by Haedicke, Figure, glass vessel with discharge cock, floating body with adjustable web and stand with holder (Fr. phys. Techn. **I**, 2, Fig. 2422)	3. 0. 0
52,524. **Half-Cylinder for the Metacentre,** of wood, as suggested by Friedr. C. G. Müller (M. T., Fig. 70)	0. 2. 0
52,525. **Section of Cylinder with 2 equilibrium positions** (Fr. phys. Techn. **I**, 2, Fig. 2423).	0. 3. 0
52,526. **Cold Water Float, Hollow Brass Sphere,** Figure, for demonstrating the change in specific gravity of water by heat, floating in cold water and sinking in warm, 40 mm diameter, without glass vessel	0. 4. 0
52,528. **Glass Body,** Figure, floating in cold water, sinking in warm water or alcohol .	0. 1. 6
52,529. **Small Flask and Watch Glass,** as suggested by Al Birûni, for determining the specific gravity of solids, Figure (W. u. E. phys. Prakt., Fig. 36; Fr. phys. Techn. **I**, 2, Fig. 2303)	0. 2. 0
51,746. **Displacing Cylinder,** for determining the specific gravity of solids, Fig. 51,746, p. 250, with lateral eduction pipe (W. D., Fig. 57 [52])	0. 5. 0
52,531. **Displacing Apparatus** as suggested by Rebenstorff, cf. Fig. 52,533; specially suitable for rapid density determinations on pieces of mineral as large as a man's fist, also for students' use (Ztschr. f. d. phys. u. chem. U. **19**, 1906, p. 149); small pattern . The apparatus comprises: 1 vertical cylindrical glass with lateral tubulure, 3 stoppers with different discharge tubes, 1 float going to 350 grams, 1 calibrated receiving vessel for 600 ccm, graduated every 5 ccm, 1 linoleum disc for protecting the bottom of the cylindrical glass.	1. 16. 0



52 533. 1 : 10.



52 534. 1 : 10.



52 536. 1 : 9.



52 542. 1 : 6.



52 544. 1 : 8.

	£ s. d.
52,532. **Glass Bell with lead weight, for determining volume of gases,** for preceding Displacing Apparatus, cf. Figure 52,534	0. 5. 0
52,533. **Displacing Apparatus,** as suggested by Rebenstorff, **large pattern,** for pieces to 1 kg weight, with 1000 ccm measuring glass, Figure	2. 8. 0
52,534. **Large Glass Bell with lead weight,** for volume determinations of gases, Figure	0. 6. 0
52,535. **Measuring Cylinder** for 200 ccm, for accurately measuring small pieces	0. 2. 0
52,536. **Burette with Communicating Vessel,** after Mühlenbein, Figure, for determining the sp. gravity of solids (Ztschr. f. d. phys. u. chem. U. **7**, 1893/94, p. 23; Fr. phys. Techn. **I**, 2, Fig. 2304), with 3 test pieces of lead, brass and iron, each 150 g weight Before starting the experiment the glass vessel is sunk until the coloured water contained in it is at zero both in the glass tube and the observation tube; the body is then immersed and the liquid surface is prevented from rising, by raising the glass vessel, until the meniscus is again on the mark in the observation tube. The water displaced is now in the burette and the volume of the body can be read direct in ccm. It is now only necessary to divide the absolute weight of the test body, in grams, by the volume in ccm, in order to get the sp. gravity.	2. 0. 0

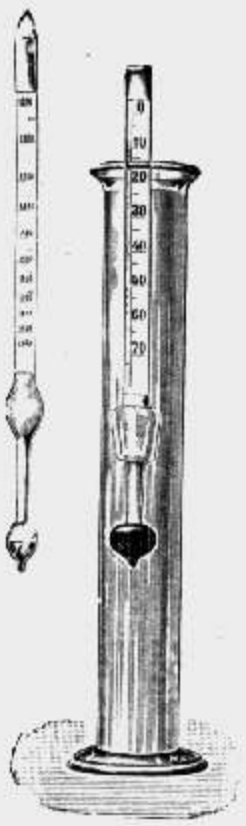
Overflow Vessels: see Nos. 51,746—51,748, p. 250.

Displacing Bodies.

List No.	**52,537**	**52,538**	**52,539**	**52,540**	**52,541**
Adjusted at	15° C.	17.5° C.	27.5° C.	100° C.	60° Fahr.
Displaces	5 g	5 g	5 g	5 g	100 grains
£	**0. 4. 0**	**0. 4. 0**	**0. 4. 0**	**0. 4. 6**	**0. 4. 6**

52,542. **Hydrometer,** after Nicholson, Figure, of brass, with wide tube for obtaining considerable buoyancy, and with arrangement for determining the specific gravity of solids lighter than water; also suitable for determining the sp. gravity of liquids (M. P. **I**, Fig. 392 [383]; Fr. phys. Techn. **I**, 2, Fig. 2408)	0. 16. 0
52,543. — idem, of glass	0. 5. 0
52,544. — idem, after Tralles (W. D., Fig. 118 [107]), Figure	1. 0. 0
52,545. — idem, after Fahrenheit, Hydrometer for liquids (Gan.-Akt.-Rein., Fig. 102), with glass cylinder	0. 5. 0
52,546. **2 Hydrometers,** after Baumé, for light and heavy liquids respectively	0. 3. 0
52,547. **2 Hydrometers** for heavy and light liquids, simple pattern, with glass cylinder, Figure, the scale of the first is from 0.7—1.0 and of the second 1.0 to 2.0	0. 4. 0
52,548. **Hydrometer of high Sensitivity,** Figure, with marks for density 1.000, 1.001 and 1.002, for demonstrating the different densities of pure water and of salt solutions, with unscrewable mercury bulb	0. 15. 0

Max Kohl A. G. Chemnitz, Germany.



52 547. 1 : 5.



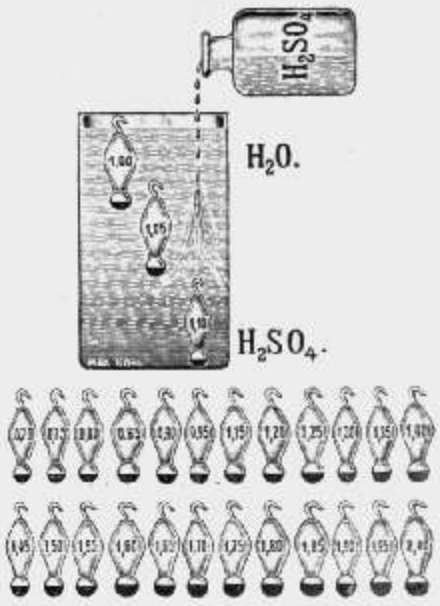
52 548. 1 : 5.



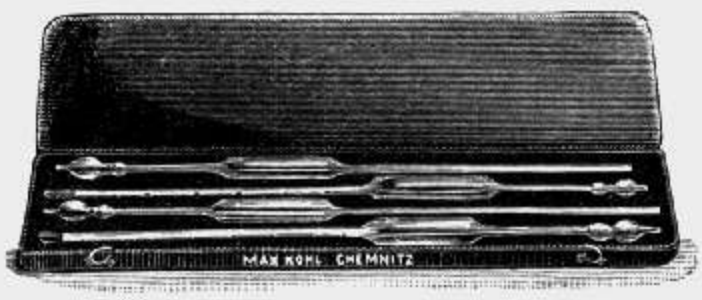
52 553. 1 : 5.



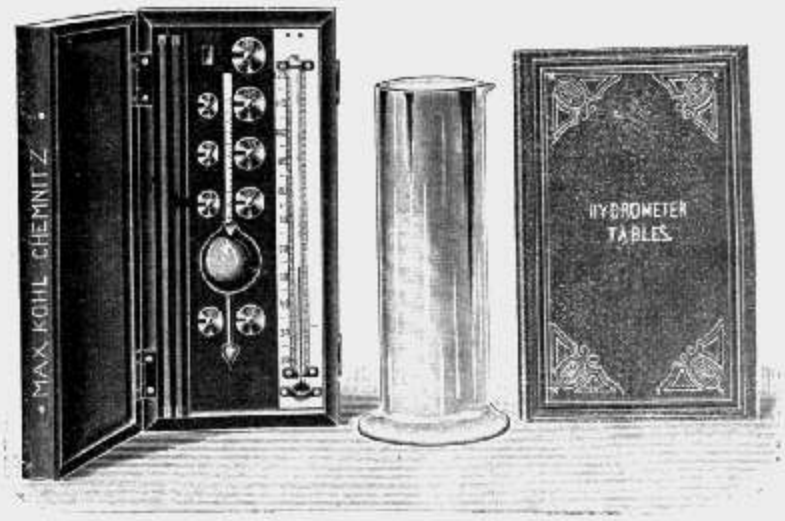
52 554. 1 : 5.



52 555. 1 : 9.



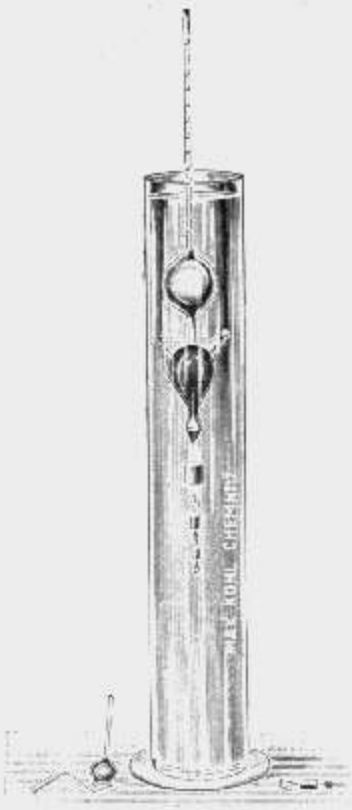
52 552. 1 : 5.



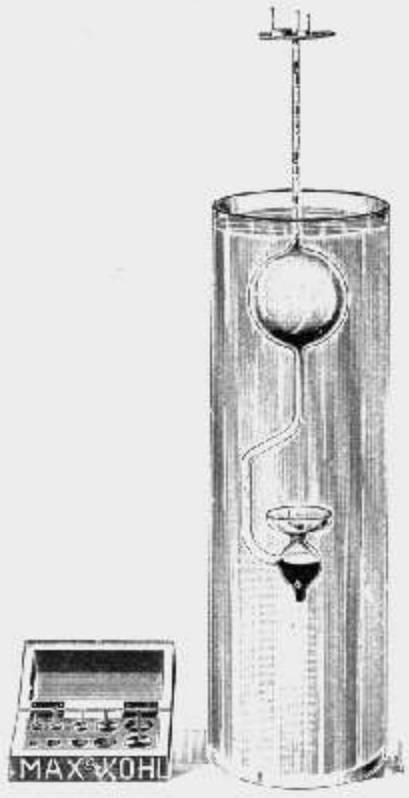
52 556. 1 : 6.

	£ s. d.
52,549. **Hydrometer, high Sensitivity Pattern,** for specific gravities of 0.997, 0.998, 0.999 and 1.000, for measuring the density of water between 0° and 25° C. and for showing the Density Maximum	0.15.0
52,550. **Universal Hydrometer,** from 0.700 to 2.000, with thermometer.	0. 4.6
52,551. — i d e m, without thermometer	0. 3.6
52,552. **Hydrometer,** for very accurately determining the sp. gravity from 0.700 to 2.000, comprising 4 spindles with thermometer in elegant case, and 1 measuring jar, F i g u r e	0.18.0
52,553. **Large, Flat Hydrometer** for measuring the Density of Acids, F i g u r e, with large, plain black and red scale from 1.180 to 1.240	0. 3.0
The Hydrometer is quite flat in shape, thus enabling it to be immersed between the accumulator plates of stationary batteries. The scale indicates thousandths. Not suitable for portable accumulators.	
52,554. **Specific Gravity Indicator,** F i g u r e, Hydrometer with glass vessel, rubber ball and tubing, for conveniently determining the sp. gr. of the acid in portable accumulators	0. 7.0
If acid is sucked up by the rubber ball into the glass vessel the density of the acid can be easily read off on a hydrometer contained in the vessel.	
52,555. **27 Indicators,** of glass, differently loaded, F i g u r e, each Indicator plunges into a liquid when the sp. gr. of the latter is equal to that marked on the indicator (Fr. phys. Techn. **I,** 2, Fig. 2471)	1. 0.0
The Indicators correspond to the sp. gravity of 0.7 to 2.0 in stages of 0.05.	
52,556. **Sike's Hydrometer,** F i g u r e, heavily gilt, with thermometer, instructions, tables and comparison rule, in elegant mahogany box and with test glass	4.10.0
52,557. **Alcoholimeter,** after Tralles, for 30—100%, graduated in $^1/_2$%	0. 2.0

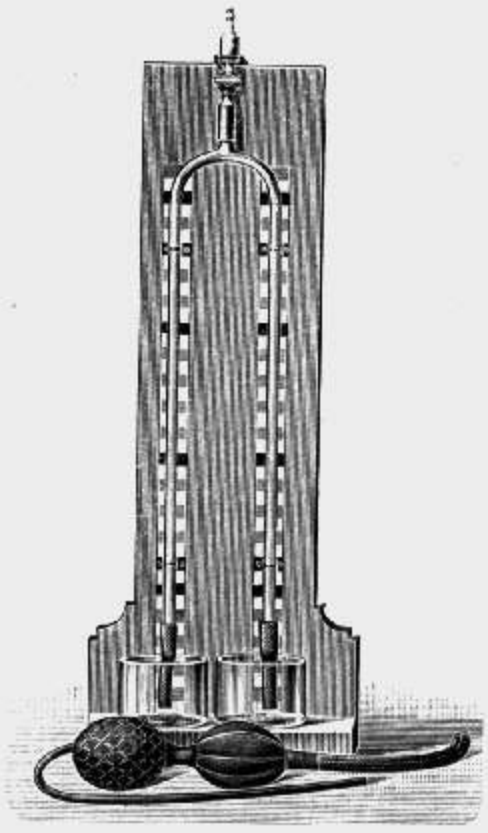
Cl. 766, 767, 2276, 68, 779 ^{1}, 768, 3645.



52 558. 1 : 8.



52 560 B. 1 : 6.



52 562. 1 : 6.



52 560 A. 1 : 4.



52 566. 1 : 4.

52,558. **Differential Hydro-Pycnometer,** after Rebenstorff, Figure, without glass cylinder (Ztschr. f. d. phys. u. chem. U. **17**, 1904, p. 339) . . . . . £ 1. 8. 0

The instrument is used for accurately determining the sp. gr. from 0.5—2.0, requires only a very small quantity of liquid and can be used in the preparatory and laboratory work of the teacher as a precision hydrometer. It gives an opportunity for exercises on the Archimedian Principle as well as for discussing the advantages and disadvantages of the various methods for determining density in the preparatory practical instruction.

52,559. **Glass Cylinder** for Differential Hydro-Pycnometer No. 52,558, 445 mm high, 90 mm wide, all for Hydrometer No. 52,560 . . . . . £ 0. 3. 6

52,560. **Hydrometer with Centigram Spindle,** after Rebenstorff (Ztschr. f. d. phys. u. chem. U. **19**, 1906, p. 10), Figs. A and B, of glass, in elegant case, with 5 weights each for water and air in separate wood box. Price without glass cylinder (see No. 52,559) £ 1. 4. 0

The Centigram Spindle is arranged so as to screw off and is provided with coloured scale. This Hydrometer is specially adapted for instruction in chemistry and mineralogy, it permits of rapid working.

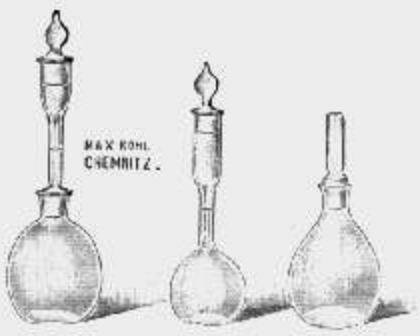
52,561. **Pneumatic Densimeter,** for determining the Specific Gravity of Liquids, after Boyle, 2 tubes with 1 pump, on graduated stand . . . . . £ 1. 8. 0

52,562. — idem, after Mohr (**Alexander Hydrometer**), Figure, instead of being fitted with pump, with rubber ball and valve (M. P. **I**, Fig. 399) . . . . . £ 1. 5. 0

52,563. — idem, after Babinet, without bellows (M. P. **I**, Fig. 364), with 2 U-shaped tubes and graduation for accurately reading differences of height . . . . . £ 1. 0. 0

Cl. 3332, 3329, 781, 3328, 770.

Max Kohl A. G. Chemnitz, Germany.



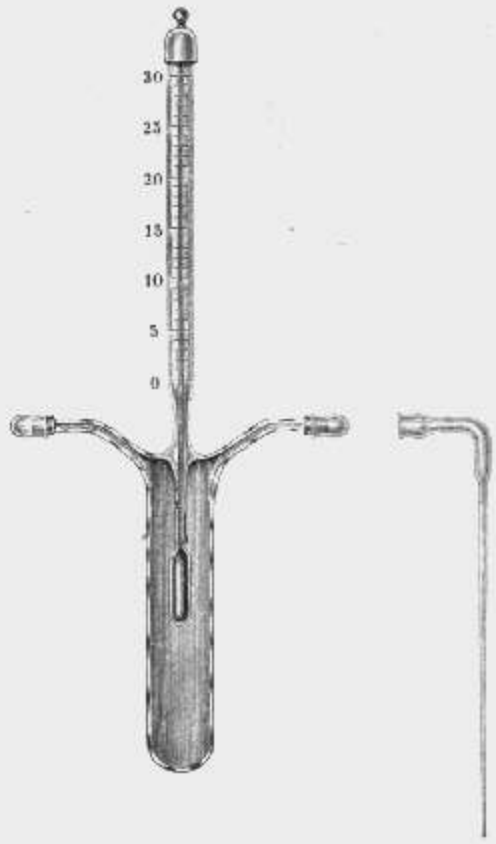
52 567. 1 : 4. 52 568. 1 : 4. 52 569. 1 : 4.



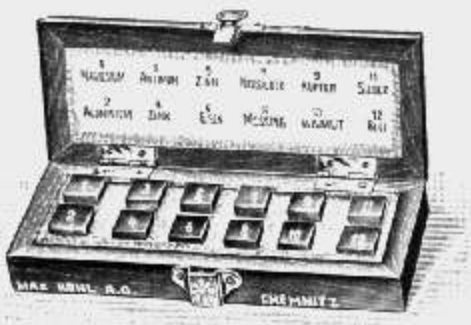
52 571. 1 : 7.



52 570. 1 : 2.



52 572. 1 : 2.



52 574. 2 : 5.

52,564. **2 Immersion Tubes,** after Friedr. C. G. Müller, for light and heavy liquids respectively (M. P., Fig. 63) . . . . . £ s. d. 0. 8. 0

U-shaped Tubes: see p. 343.

51,749. **Pycnometer,** Fig. 51,749, p. 250, for determining the sp. gravity of solids and liquids; comprising small flask with cover plate ground on, spherical pipette and tripod (W. D., Figs. 58 and 59 [53 and 54]), without glass jar 0. 3. 0

52,566. — idem, with thermometer ground in and graduated tube, Figure, for determining the sp. gravity of liquids (W. and E. phys. Prakt., Fig. 38) 0. 5. 0

52,567. **Small Flask,** for determining the specific gravity of solid bodies soluble in water, but insoluble in alcohol, Figure 0. 1. 6

52,568. — idem, for substances insoluble in water, as suggested by Regnault, Figure (Gan.-Man., Fig. 116) 0. 1. 6

52,569. — idem, simple, after Gay-Lussac, for liquids, Figure 0. 1. 0

52,570. — idem, straight pattern, after Regnault, Figure (Gan.-Man., Fig. 117) . . 0. 1. 0

52,571. **Pycnometer,** after Sprengel, for determining the specific gravity of liquids, Figure (W. u. E. phys. Prakt., Figs. 39 and 40) 0. 3. 0

52,572. — idem, Figure, with Thermometer fused in and Glass Cap ground on for accurate measurements (M. P. I, Fig. 391), with filling tube 0. 9. 6

52,573. **1 Cubic Centimetre,** of brass, copper, lead or aluminium. Price, each 0. 3. 0

52,574. **12 Cubic Centimetres** in case, Figure, of magnesium, antimony, tin, German silver, copper, silver, aluminium, zinc, iron, brass, bismuth, lead (Fr. phys. Techn. I, 2, Fig. 2240) 1. 4. 0

52,575. **12 Bars,** all of same weight (10 g) and same section, in case (Fr. phys. Techn. I, 2, Fig. 2241) 1. 6. 0

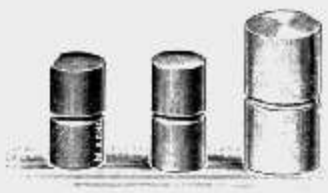
52,576. **4 Metal Strips,** of aluminium, zinc, copper, lead, in case, of equal width, equal thickness and equal weight, the lengths corresponding inversely to the different specific gravity 0. 8. 0

Cl. 771, 772, 773, 777, 5552, 774, 4860.

Max Kohl A. G. Chemnitz, Germany.



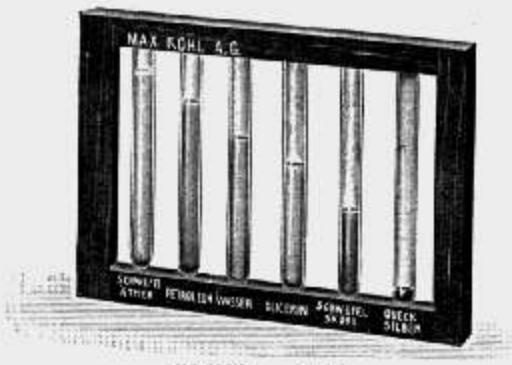
52 577. 1 : 13.



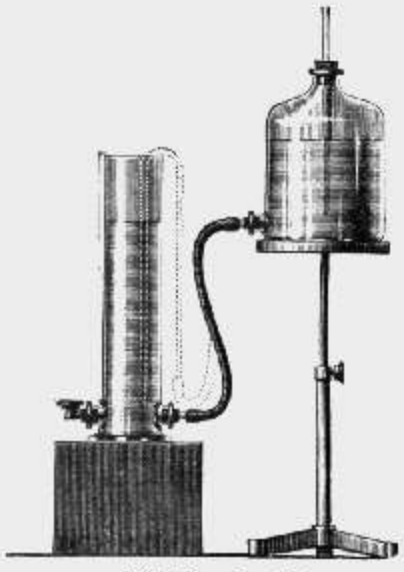
52 578. 1 : 5.



52 579. 1 : 5.



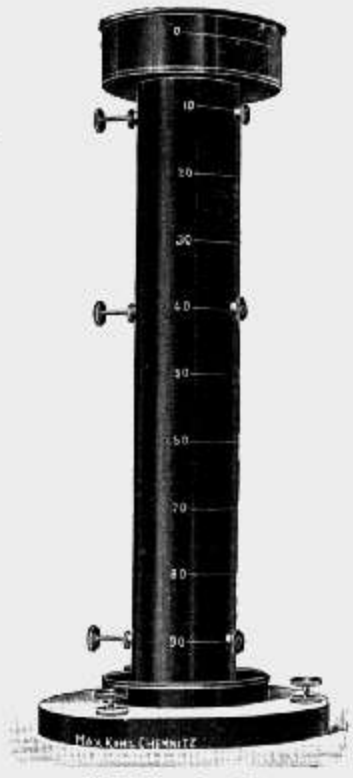
52 580. 1 : 7.



52 581. 1 : 15.



52 582. 1 : 12.



52 583. 1 : 13.

52,577. **14 Metal Strips,** after Arendt, Figure, of platinum, gold, lead, silver, copper, German silver, brass, nickel, steel, iron, tin, zinc, aluminium and magnesium, of same thickness, width and weight; lengths inversely proportional to specific gravity . . . | £ 1. s. d. 16. 0

The construction is very accurate and all metals are genuine.

52,578. **3 Cylindrical Bodies** of the same weight, after Kolbe, Figure, of aluminium, iron and lead . . . . . | 0. 18. 0

52,579. **Cylindrical Glass Vessel** with 4 Liquids of different specific gravity, Figure . . | 0. 5. 0

52,580. **6 Liquids of different specific gravities,** Figure (Mercury, Sulphuric Acid, Glycerine, Water, Petroleum, Sulphuric Ether), in glass tubes of same length and width, in wood frame. The lengths of the liquid columns are in inverse ratio to the specific gravities | 0. 16. 0

Motion of Liquids.

52,581. **Outflow Apparatus,** for experiments on flow out of an orifice in a thin wall, Figure (W. D., Figs. 119, 120 [108, 109]), consisting of Mariotte flask, rubber tubing, glass tube, outflow vessel, 1 mouthpiece and small table . . . . . | 1. 15. 0

52,582. — idem, for experiments on outflow velocities at different pressures, Figure | 1. 0. 0

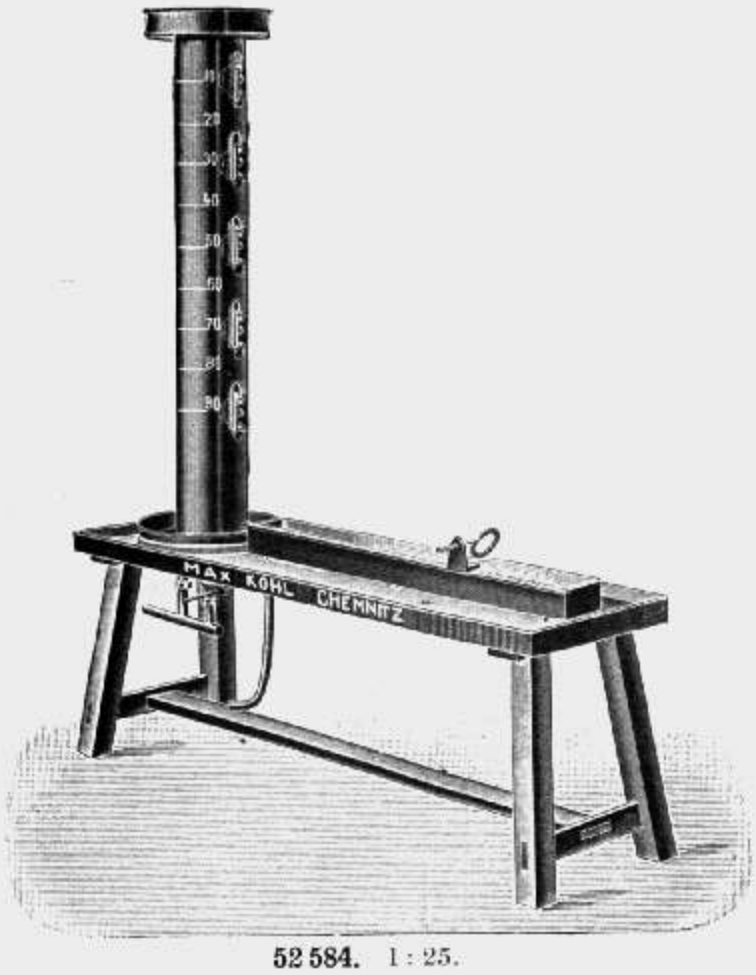
A sheet iron cylinder, 75 cm high, with a wide vessel at the top for more easily maintaining a constant level, and with 3 orifices at distances of ratio 1 : 4 : 9 provided below the level, for showing that the quantities flowing out are proportional to the square roots of the heights of pressure (Torricelli's Theorem).

52,583. — idem, after Weisbach, with vessel 1 m high, Figure, with stuffing boxes (M. P. **I**, Fig. 402 [392]), on plate with levelling screws . . . . . | 2. 12. 0

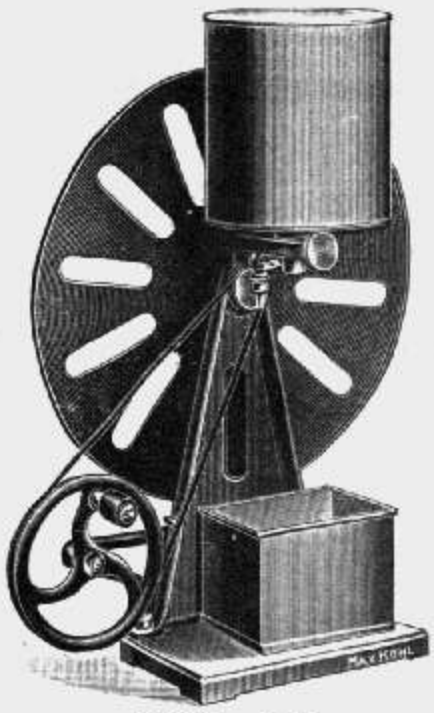
Cl. 779, 5079, 3334, 5775, 783, 784, 785.

Max Kohl A. G. Chemnitz, Germany.

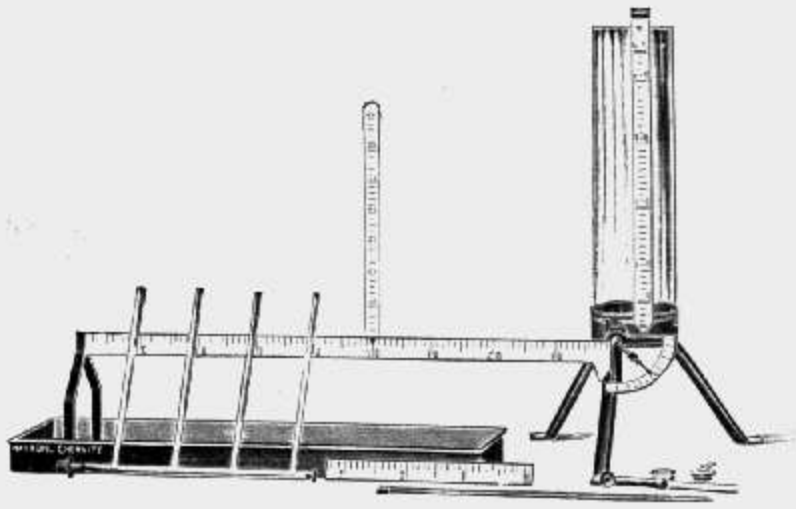
Max Kohl A. G. Chemnitz, Germany.



52 584. 1 : 25.



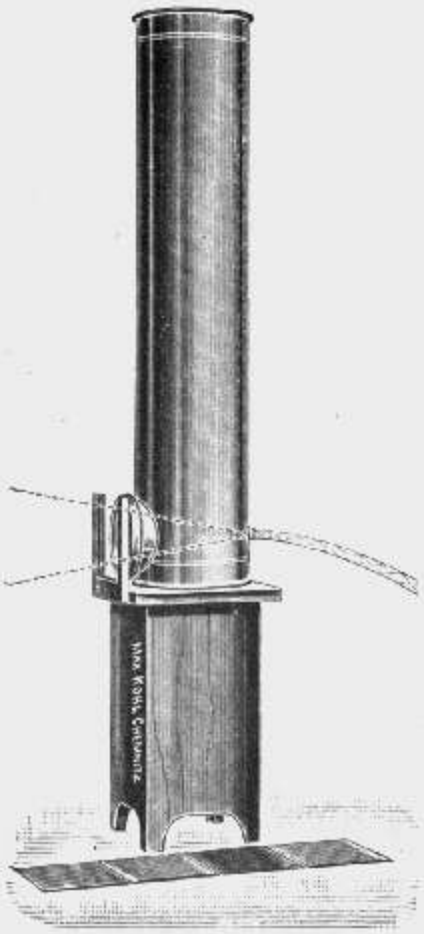
52 588. 1 : 6.



52 586. 1 : 15.

	£ s. d.
52,584. **Outflow Apparatus,** for proving Torricelli's Law on velocity and quantity of outflow at different hydrostatic pressures, Figure, with 5 sliding plugs, constant level overflow pipe, catching trough and table	11. 0. 0
Each outflow support has a manometer and 3 different tubes are provided for each slider for showing the increase in the quantities enanating through annex pipes; the catching trough is graduated and has a sliding diaphragm. The whole rests on a wood table covered with sheet iron.	
52,585. — idem, simpler, annex tubes without manometers	9. 0. 0
52,586. **Hartl's Apparatus** for experiments on velocity and quantity of outflow at different pressures, for showing the diminution of pressure, the reacting pressure of liquids, and for demonstrating the projection parabola, Figure (Fr. phys. Techn., Figs. 3530, 3538)	7. 0. 0
52,587. **Well Spring,** of glass, comprising glass vessel with glass tube and point (Meyer, Naturlehre, Fig. 154; Gan.-Man., Fig. 127)	0. 2. 0
* 52,588. **Apparatus** for showing that a Jet of Water flowing into the air is composed of drops, Figure	1. 6. 0
Suitable for setting up on the projection lantern. A stroboscopic disc is placed in front of the water vessel with outflow aperture; with the aid of this disc it is possible to render visible (when the disc is rapidly rotated) the composition of the water jet of drops.	

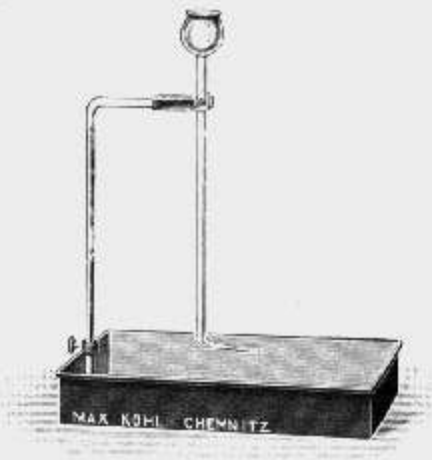
* Can be used with the projection apparatus.



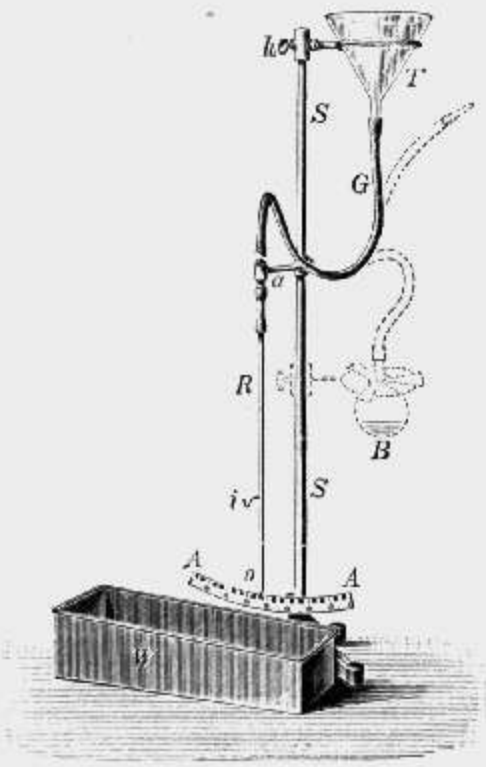
52 590. 1 : 15.



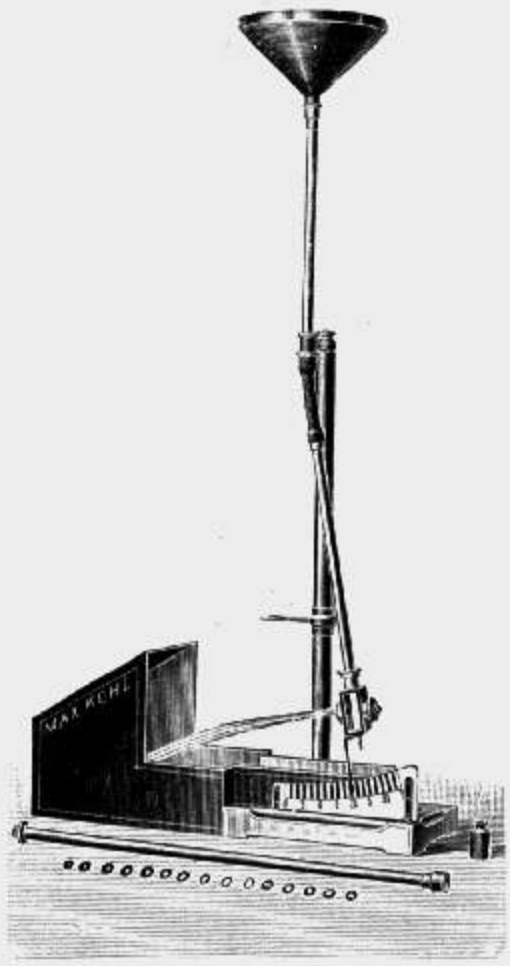
52 591. 1 : 10.



52 592. 1 : 7.



52 593. 1 : 10.



52 595. 1 : 10.

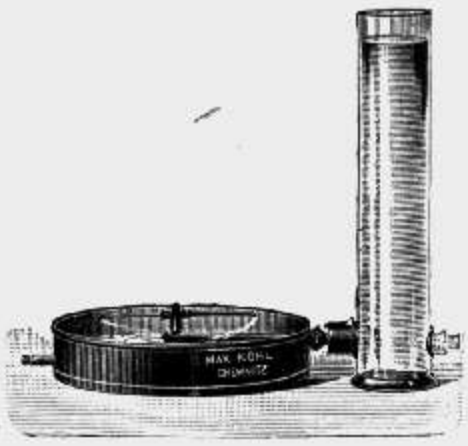
	£ s. d.
* 52,589. **Apparatus** for showing the parabolic form of the outflowing Water Jet; can be used at same time for demonstrating total reflection in a water jet (W. D., Fig. 291 [274])	0. 16. 0
* 52,590. — i d e m, with vessel 1 m high, F i g u r e, on support, with 4 coloured discs for inserting	2. 0. 0
52,591. **Reaction Float,** F i g u r e, for showing the back impact of outflowing liquids, with water vessel (Weber, Lehrb. d. Phys., 10th edn., 1897, Fig. 60)	0. 15. 0
52,592. **Reaction Apparatus,** F i g u r e, for showing hydrodynamic lateral pressure. . . .	0. 14. 0
52,593. — i d e m, after Hartl, F i g u r e, for showing the back impact of outflowing liquids, gases and vapours (Ztschr. f. d. phys. u. chem. U. **10,** 1897, p. 234)	1. 4. 0

The apparatus consists of a stand carrying a metal tube hanging from a rubber tube, the metal tube having two opposite apertures, a gram scale and a trough. The two apertures are in size as 1 : 2 and can be alternately closed. At the upper end of the rubber tubing either a funnel (for experiments with liquids), a mouthpiece (for experiments with gases), or a sheet iron sphere (for experiments with vapours) can be arranged, these three latter being given in with the apparatus.

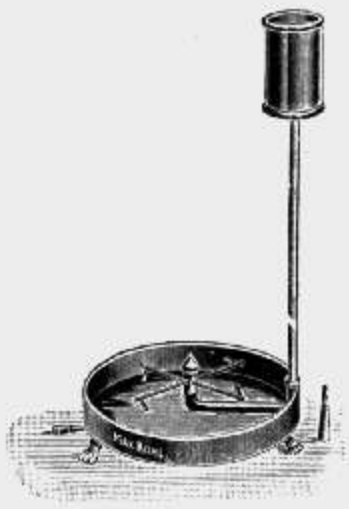
* Can be used with the projection apparatus.

Cl. 342, 5091, 3337, 790. 789.

Max Kohl A. G. Chemnitz, Germany.



52 596. 1 : 13.



52 597. 1 : 8.



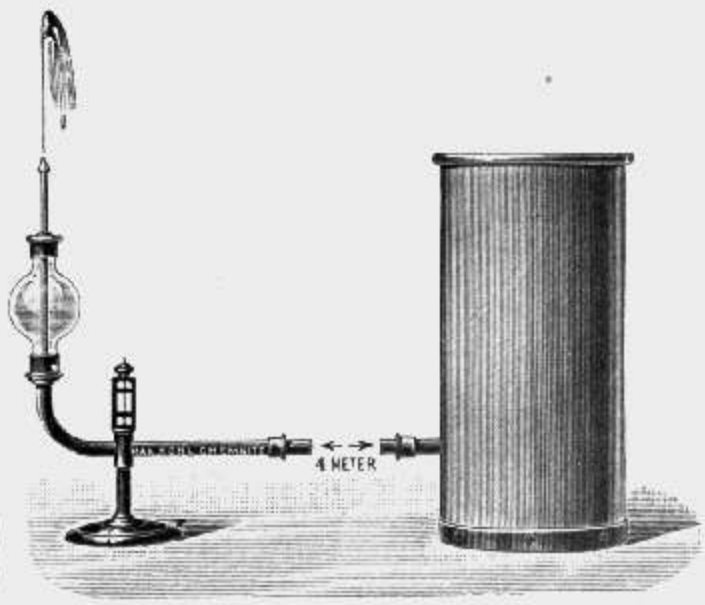
52 598. 1 : 10.



52 600. 1 : 10.



52 602. 1 : 4.



52 603. 1 : 10.

52,594. **Lateral Pressure Apparatus,** after Kleiber, for demonstrating hydrodynamic lateral pressure (Kleiber, Lehrb. d. Phys. f. Gymnas., Fig. 85), consisting of a small water balance with aperture at the end . . . . . £ s. d. 0. 15. 0

52,595. **Apparatus** (Hartl's), Figure, **for experimental measurements on Velocities of Outflow, Quantity of Outflow and Reaction-Pressure** (Ztschr. f. d. phys. u. chem. U. **9**, 1896, p. 234) 4. 4. 0

The outflow orifice can be placed either in the bottom or the side wall. Five different plates permit of varying the form and size of the same, while the pressure is varied by small inset tubes 25 and 50 cm long. A sheet iron rule, on which the water jet gives its velocity direct, is used for determining the velocity of outflow. The reaction-pressure is given automatically on the pressure scale which is divided in grams. The apparatus works with thorough accuracy without large quantities of water being necessary.

52,596. **Barker's Mill (Reaction Wheel),** with water tank, Figure 1. 0. 0

52,597. — idem, entirely of metal, Figure; can also be used as a **well-spring** . . . 1. 0. 0

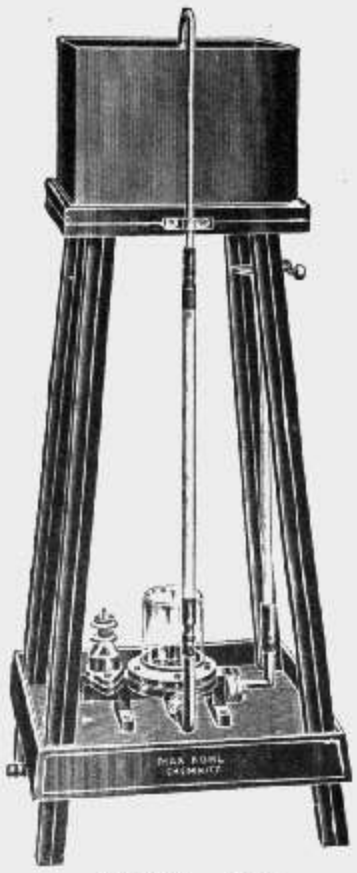
52,598. **Barker's Mill,** Figure, of metal, with rotating vessel 0. 16. 0

52,599. — idem, **smaller,** with glass water vessel 0. 12. 0

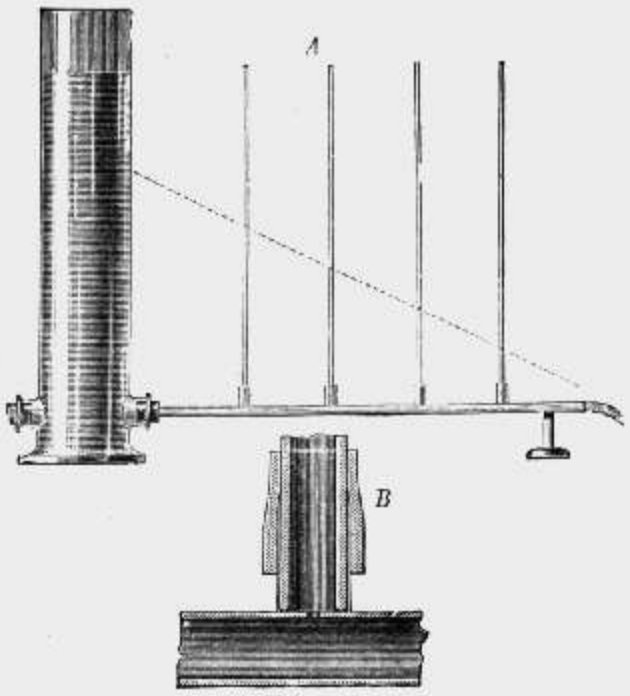
52,600. — idem, Figure, **of glass and metal,** with polished wood stand 2. 5. 0

52,602. **Hydraulic Ram,** after Montgolfier, of glass, Figure (W. D., Fig. 126 [114 B]) . 0. 8. 0

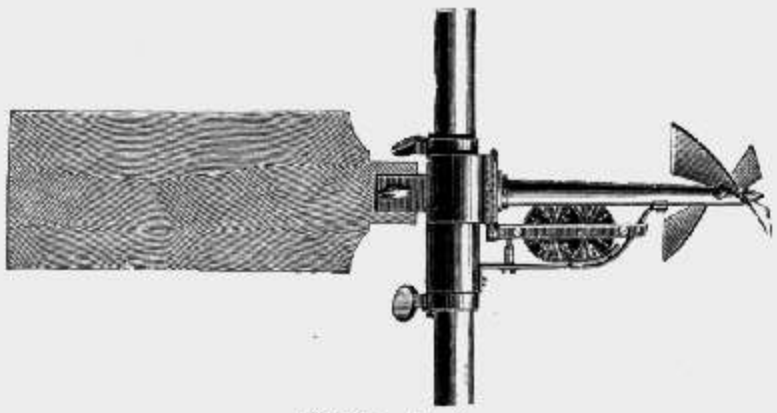
52,603. — idem, **of metal and glass,** Figure (W. D., Fig. 125 [114 A]), with pipe line 4 m long; can be easily taken apart; excellent in action; with sheet iron vessel for placing underneath for the water running out of the impact valve 3. 12. 0



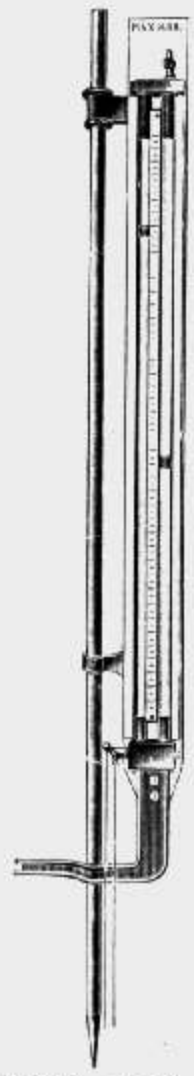
52 604. 1 : 8.



52 611. 1 : 1.



52 616. 1 : 6.



52 615. 1 : 13.

	£ s. d.
52,604. **Hydraulic Ram,** Figure, with water tank and vessel for setting underneath, on one stand	3. 15. 0
51,601. **Plate and Hollow Hemisphere** for measuring the Impact Pressure of Liquids (M. T., pp. 108 and 109)	0. 3. 0
52,606. **Water-Lead Mouthpiece,** for experiments on Impact and Reaction-pressure (M. T., Figs. 74 and 75)	0. 2. 0
52,607. **Indifferent Immersion Body,** for impact pressure experiments (M. T., Fig. 76)	0. 2. 0
52,608. **Model of a Dressing Machine** (M. T., Fig. 77)	0. 3. 0
52,609. **Glass Vessel for Whirlpool** (Höfler, Physik, Fig. 177)	0. 2. 0
52,610. **Diminution of Pressure Apparatus,** after Friedr. C. G. Müller (M. T., Fig. 73)	0. 10. 0
52,611. **Apparatus for showing Diminution of Pressure in Cylindrical Tubes,** Figure (W. D., Fig. 121 [110])	1. 0. 0
52,612. **Attachment** for above, for outflow experiments on an orifice in a thin wall (W. D., Fig. 120 [109])	0. 4. 0
52,613. **Two Glass Tubes,** for showing pressure-change in bent or constricted tubes (W. D., Figs. 122 and 123 [111 and 112]), for attaching to Apparatus No. 52,611 or directly to the water-lead	0. 4. 0
52,614. **Glass Tube,** for showing the sucking action of flowing water (W. D., Fig. 124 [113])	0. 1. 0
52,615. **Pitot Tube,** modified by Darcy and Reichenbach, Figure, for measuring velocity of flow	6. 0. 0

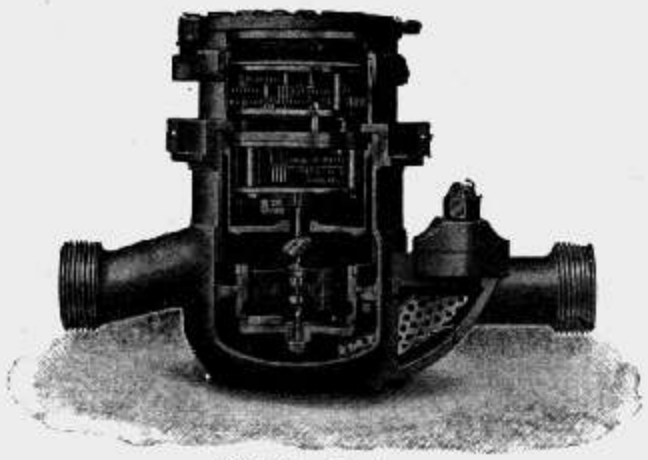
This apparatus is independent of a time observation. It has two upright tubes alongside each other, which are horizontally bent underneath. One is for taking up the impact of flowing water, while the other shows the hydrostatic pressure of the surface of the water.

Both tubes have a suction tube connected to them at their upper ends; this suction tube can be closed by a cock. By this arrangement it is possible to raise or lower the water columns, as required, for convenience in reading, for carrying out the comparison in height.

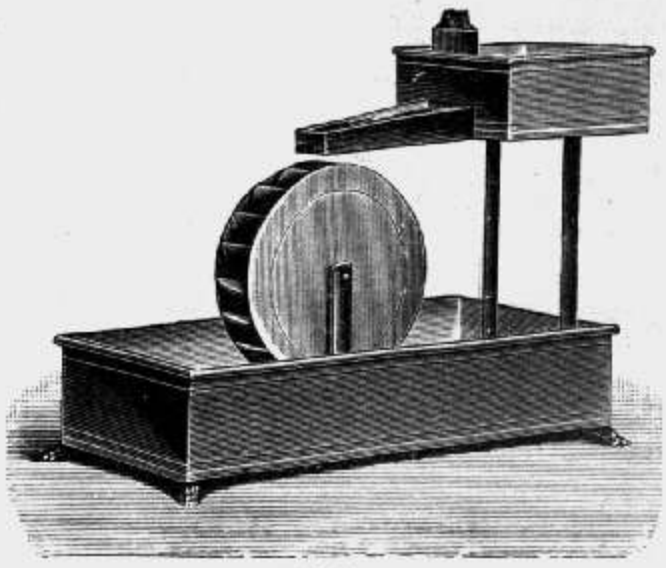
The lower cock which cuts off the water columns from the tubes can be closed and opened by two cords.

Cl. 796, 799, 800, 801.

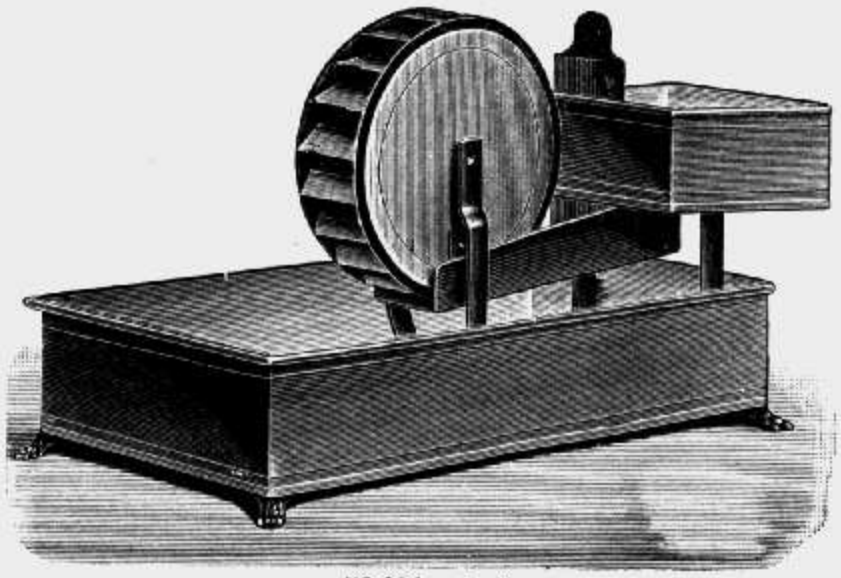
Max Kohl A. G. Chemnitz, Germany.



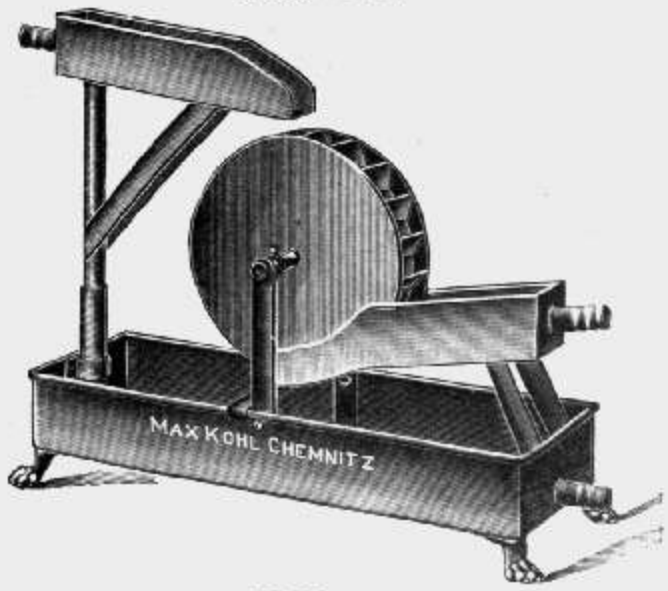
52 619. 1 : 4.



52 622. 1 : 6.

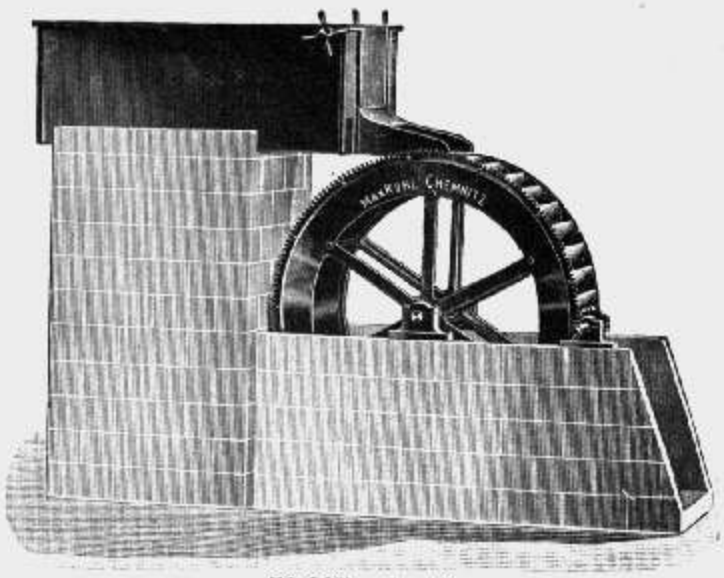


52 624. 1 : 5.

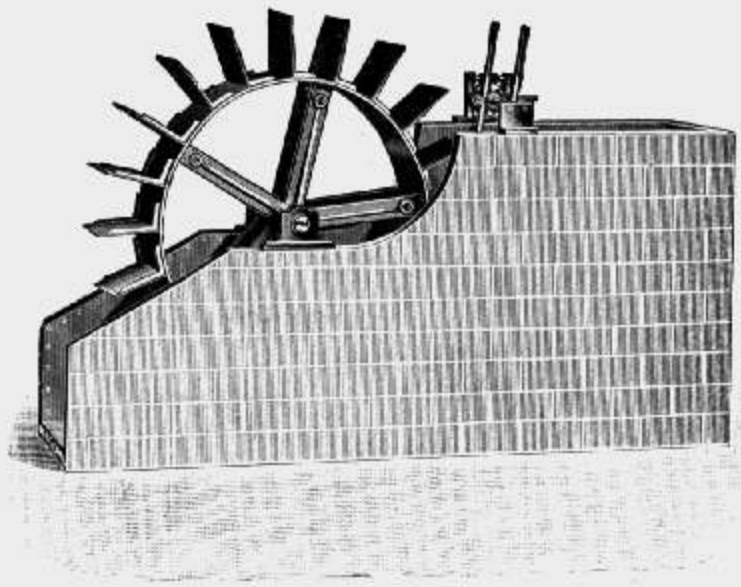


52 626. 1 : 6.

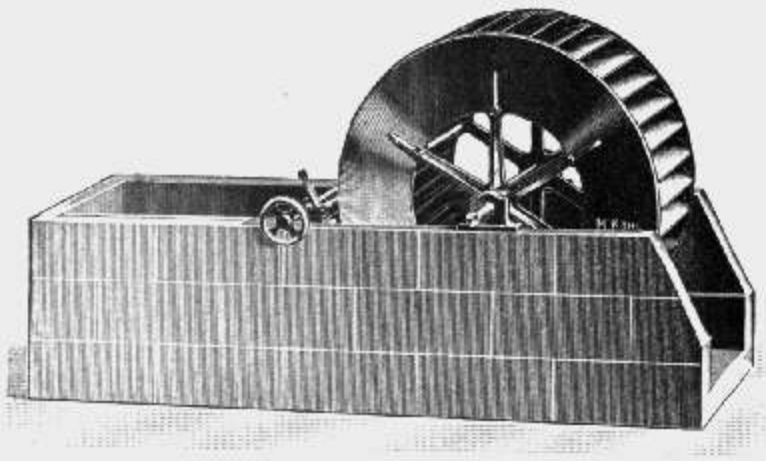
	£ s. d.
52,616. **Woltman's Mill,** Figure, for measuring velocities of flow, improved pattern, with counting mechanism for 1000 revolutions; axes running in agate and ball bearings; blades 12.5 cm diameter and about 25 mm pitch	7.10.0
If desired, the apparatus can be calibrated in Berlin or Munich. The fee is about £ 2.12.0, exclusive of cost of carriage both ways.	
52,617. **Rod** for above, of glass tubing, 4 m long, can be folded in 2 parts, with point and detachable base-disc and decimetre graduation	1. 5.0
52,618. **Releasing Device,** for fixing on the Rod, for use with small depths and velocities .	0.18.0
Hydrometrical Mills, large or small Patterns, for high Velocities, with Electrical Contact, Self-recording Gauge Indicator quoted for on application.	
52,619. **Sectional Model of a Vane Water Meter,** Figure	4. 0.0
After passing the sack-shape sieve the water passes through the sloping channels distributed over the area of the measuring space proper (a bottom beaker) and meets the blade wheel in jets with tangential contact. The revolutions of the blade wheel are transmitted to the counting and indicating mechanism.	
52,620. — idem, of a **Disc Water Meter**	7. 0.0
52,621. — idem, of a **Woltman Water Meter,** for the passage of large quantities . . .	15.15.0
52,622. **Model of an Overshot Water Wheel,** Figure, of lacquered sheet zinc, with water tank and collecting vessel	1. 4.0
52,623. — idem, larger	1.16.0
52,624. **Model of an Undershot Water Wheel,** Figure, of lacquered sheet zinc, with water tank and collecting vessel	1. 4.0
52,625. — idem, larger	1.16.0
52,626. **Overshot and Undershot Water Wheel,** combined to form one model, Figure, of lacquered sheet zinc, with hose for connecting to the water wheel. The lower gutter can be detached	2. 0.0



52 627. 1 : 13.



52 628. 1 : 12.



52 630. 1 : 10.



52 632. 1 : 5.



52 634. 1 : 5.



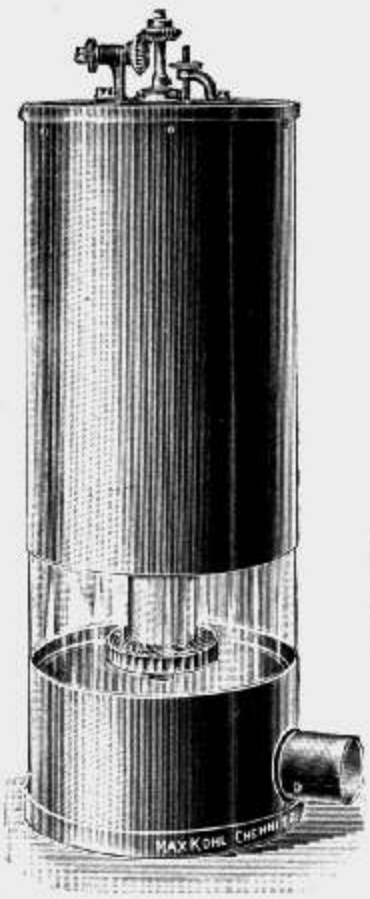
52 633. 1 : 5.

	£ s. d.
† 52,627. **Model of Overshot Water Wheel,** Figure, large pattern	16. 10. 0
† 52,628. **Model of an Undershot Water Wheel,** with sliding sluice, Figure, large pattern	16. 10. 0
† 52,629. **Model of a Middle-shot Water Wheel,** with weir	16. 10. 0
† 52,630. **Model of a Poncelet Wheel,** Figure	20. 0. 0
† 52,631. **Model of a Tangential Wheel,** inward flow partial turbine after Fourneyron . . .	34. 0. 0
52,632. **Model of a Turbine,** Figure, for connecting to the water-lead	1. 16. 0
52,633. — idem, simple, after Weinhold, Figure (W. V. d. E., Fig. 146)	1. 0. 0
52,634. **Model of a Jonval Turbine (downward flow),** Figure, for connecting to the water supply	6. 0. 0
† 52,635. **Large Model of a Jonval Turbine**	15. 0. 0

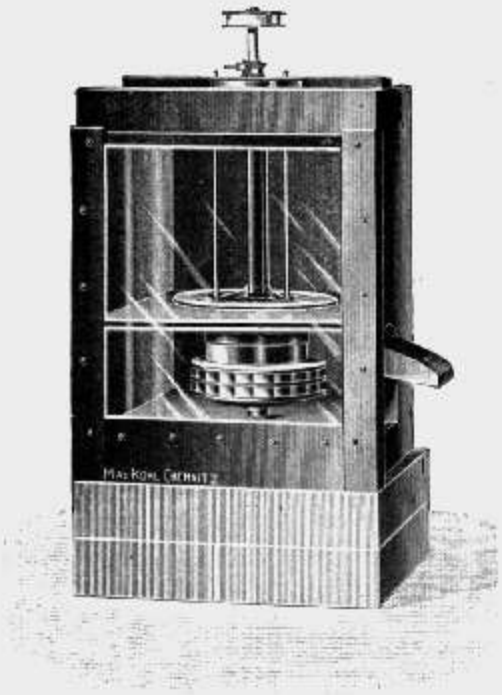
The items marked † are carefully constructed models for Universities and Colleges.

Cl. 804, 805, 806, 808, 807, 3340

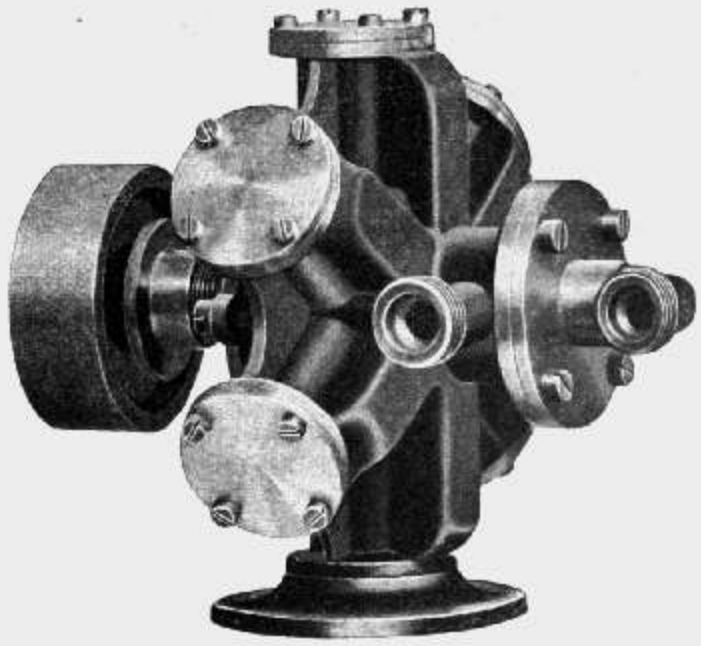
Max Kohl A. G. Chemnitz, Germany.



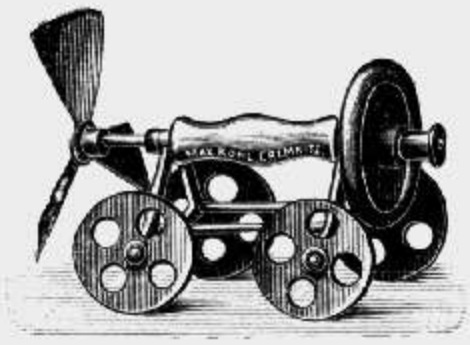
52 636. 1 : 8.



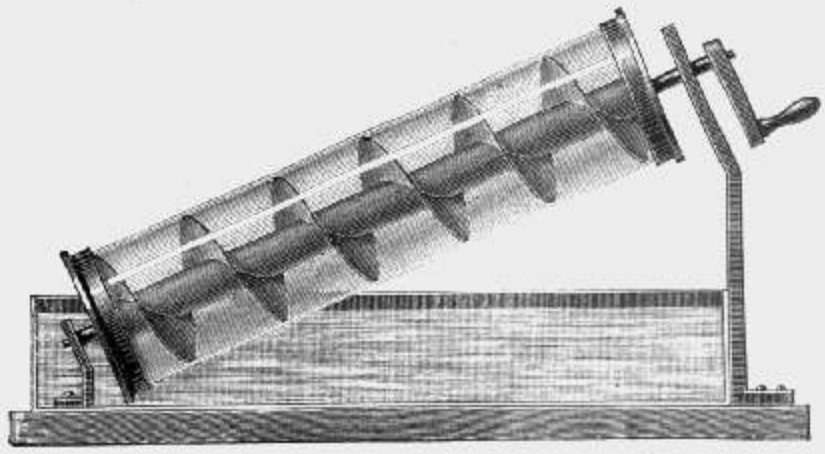
52 637. 1 : 9.



52 638. 1 : 4.



52 639. 1 : 5.



52 641. 1 : 3.

52,636. **Model of a Fourneyron Turbine,** Figure (outward flow **Radial Turbine**), with visible guide blades which are covered by glass; the jacketting is glazed underneath. Model is 85 cm high and 30 cm diameter . . . . . £ 9. 0. 0

† 52,637. **Model of a Fourneyron Turbine** (outward flow **Radial Turbine**), Figure 15. 0. 0

52,638. **Water Motor,** Figure, suitable as a model of a piston water motor, also for working easy running machines; with wide degree of speed regulation; capacity $^1/_{10}$th HP at 4 atm. water pressure; with 2 lubricators 5. 0. 0

52,638 a. — idem, **larger,** output $^1/_5$th HP at 4 atm. water pressure 7. 5. 0
This and the following size differ somewhat from construction shown in illustration.

52,638 b. — idem, **larger still,** output $^1/_3$rd HP at 4 atm. water-pressure 9. 10. 0

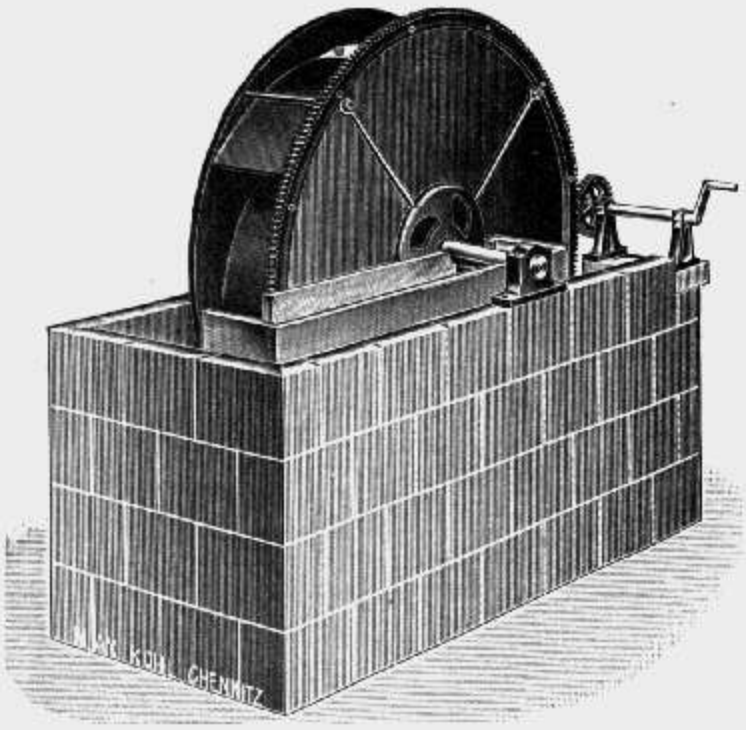
52,639. **Model of the Ship's Screw,** Figure, and of the **Airship Propeller** 1. 4. 0
The screw is fitted on a small carriage and can be rapidly rotated by pulling a cord, and the carriage moved backwards or forwards.

† 52,640. **Model of a Wheel with movable Paddles,** for steamers 13. 0. 0

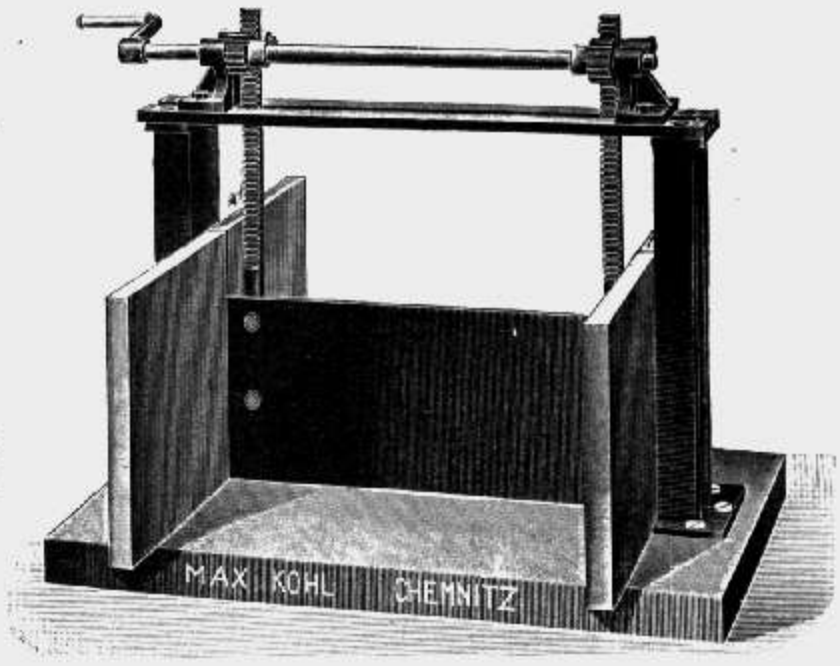
52,641. **Model of an Archimedian Water Screw,** Figure (Fr. phys. Techn. **I**, 2, Fig. 2313 [I, Fig. 553]) 1. 0. 0

52,642. **Model of a Discharging Water-drawing Wheel** 30. 0. 0

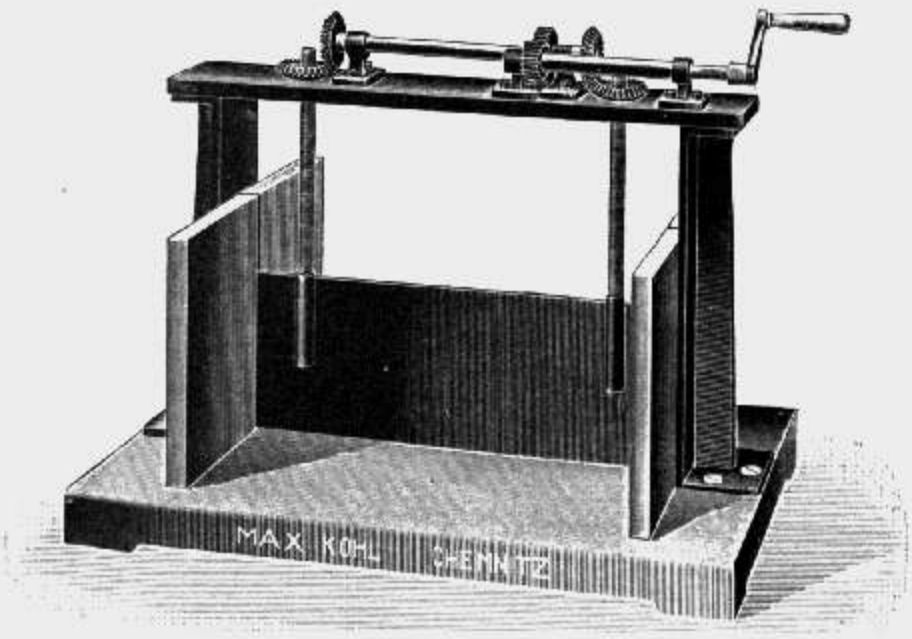
The items marked † are carefully constructed models for Universities and Colleges. Cl. 3647, 810, 5161, 812, 811.



52 643. 1 : 6.



52 644. 1 : 5.



52 645. 1 : 5.

	£ s. d.
† 52,643. **Model of a medium-high Discharging Water-drawing Wheel,** Figure	15. 0. 0
52,644. **Model of an Apparatus for raising the Sluices,** with rack and pinion, Figure . .	5. 0. 0
52,645. — idem, **with Screw and Spur Wheels,** Figure	6. 10. 0
52,646. — idem, **with Switch-gear and with Chain-pull**	7. 10. 0

Molecular Effects of Liquids.

52,647. **Piezometer,** after Weinhold, Figure (W. D., Fig. 127 [115]), suitable for the Projection Lantern, for showing the small degree of compressibility of liquids	2. 5. 0
52,648. — idem, after Grimsehl (Grimsehl, Lehrb. d. Phys., 1909, Fig. 214; Ztschr. f. d. phys. u. chem. U. **20**, 1907, p. 7). The compression vessel with the liquids to be tested is kept at the same pressure inside and outside by mercury. Price without mercury	1. 18. 0
52,649. **Piezometer,** after Oersted, Figure, with Pressure Screw, with massive glass cylinder for 10 atm., with insets (pressure vessel, thermometer, air manometer)	4. 10. 0

The items marked † are carefully constructed models for Universities and Colleges.

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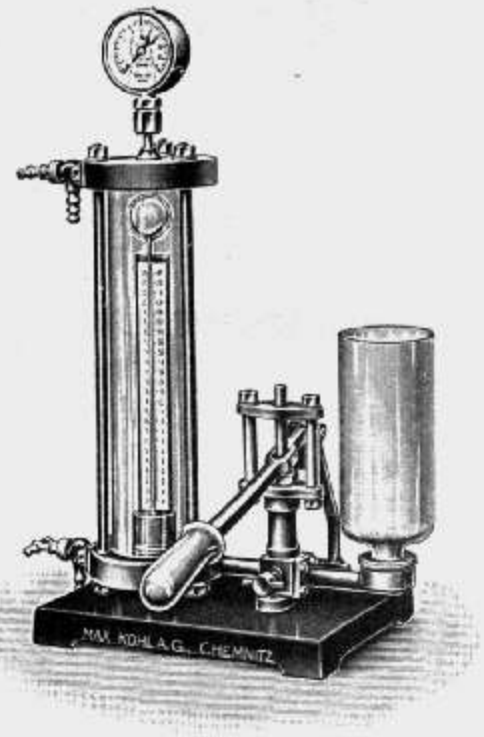
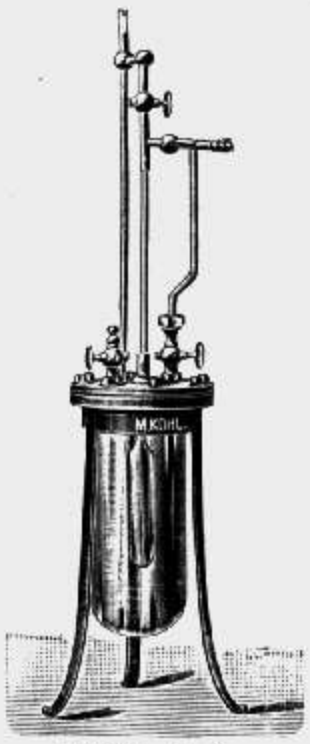
52 647. 1 : 5.



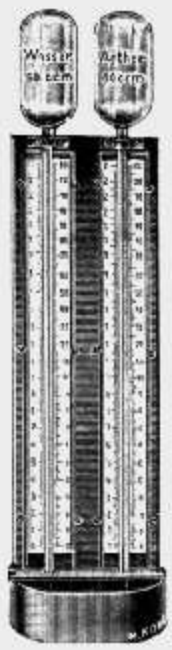
52 649. 1 : 8.



52 650. 1 : 8.



52 657. 1 : 8.



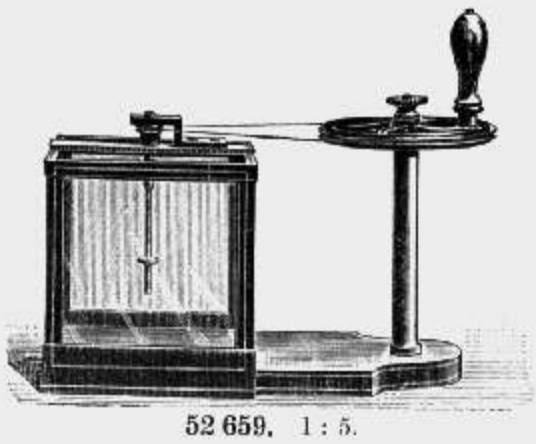
52 654. 1 : 5.



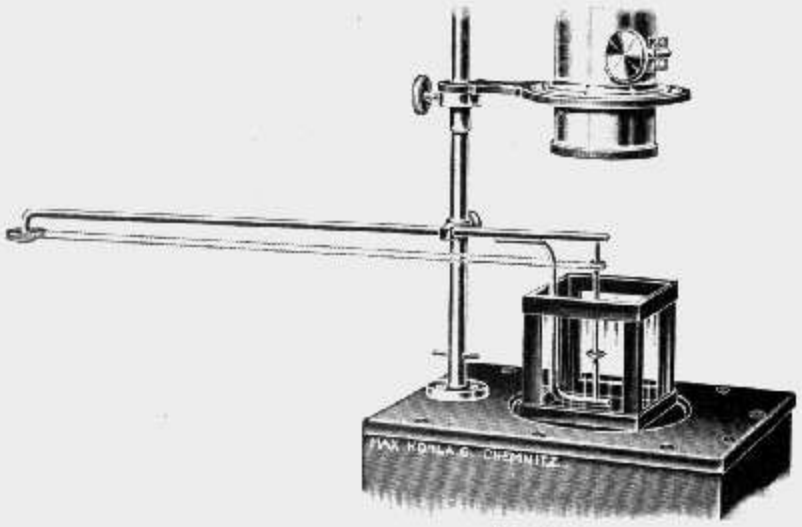
52 656. 1 : 5.

	£ s. d.
52,650. **Piezometer,** after Oersted, F i g u r e, with pressure pump and spring pressure gauge, tested to 10 atm.; easy and convenient to manipulate and fill; with discharge cock, 1 pressure vessel, graduated, and mercury vessel (Fr. phys. Techn. **I**, 2, Fig. 2524) .	8. 0. 0
52,651. — i d e m, **with Safety Valve**	8. 10. 0
52,652. **Attachment with Pressure Vessel, Thermometer and Air Manometer** for Piezometers Nos. 52,650 and 52,651, cf. Fig. 52,649	1. 0. 0
52,653. **Attachment with two Gas Pressure Tubes,** after Despretz, for comparing the differing compressibility of gases (Chwolson, Lehrb. I, Fig. 227)	1. 0. 0
52,654. **Attachment with 1 Ether Vessel and 1 Water Vessel,** for the Oersted Piezometer, F i g u r e, for comparative experiments	1. 10. 0
52,655. **Attachment,** consisting of Lead Plate and Ether Thermometer in protecting tube, and Manometer, for demonstrating the lowering of the melting point of water by pressure, after Thomson (M. P., **III**, Fig. 327 [II, 2, Fig. 95]), for the Oersted Piezometer	2. 5. 0
52,656. **Attachment with Four Tubes,** after Magnus, F i g u r e, for liquifying gases by pressure (M. P., **III**, Fig. 306 [II, 2, Fig. 163]) . . . . . Four short barometer tubes are contained in one common vessel and can be fed with mercury and with different gases which are present above them.	1. 10. 0
52,657. **Piezometer,** after Regnault, F i g u r e (M. P., **III**, Fig. 152 [I, Fig. 412]), with glass vessel and nickelled metal parts	6. 10. 0

Cl. 5768, 819, 5404, 822, 821, 3341.



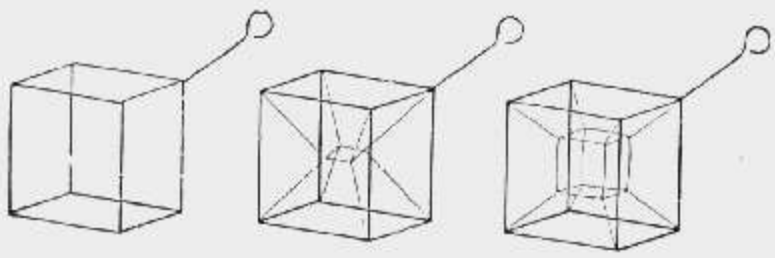
52 659. 1 : 5.



52 660. 1 : 6.



52 661. 1 : 4.



52 663. 1 : 3.

	£	s.	d.
52,659. **Plateau's Apparatus,** for showing the flattening of a Sphere of Oil rotating in an alcoholic solution, with rectangular glass box, Figure (Fr. phys. Techn. **I**, 2, Fig. 3522)	1.	8.	0
* 52,660. — idem (Weinhold's) (W. D., Fig. 85 [78]), Figure, for use with the Projection Apparatus by employing one of the apparatus for projecting horizontal objects, Nos. 51,032 to 51,039	1.	0.	0
52,661. **4 Cohesion Plates,** Figure, for suspending on the balance, 40 mm diameter, of ground glass, polished ebonite, brass and iron (W. D., p. 167 [144]), for showing the **cohesion** of wetting liquids and the **adhesion** of non-wetting liquids on solids	0.	6.	0
52,662. **4 Hollow Spheres, of glass, 2 of these coated with paraffin,** for demonstrating capillary attraction and repulsion (M. P., **III**, Figs. 191—193 [**I**, Figs. 448—450])	0.	4.	0
52,663. **Plateau's Equal-weight Figures,** for soap solution, set of 4, Figure, circle with feet, circle with handle, triangle and cube (cf. Fr. phys. Techn. **I**, 2, Figs. 2446—2450)	0.	6.	0
52,664. **Vacuum Syphon,** after Weinhold-Steinbrinck, Figure, **Cohesion Syphon** filled with water, approx. 1 m long (Jahrbücher für wissenschaftl. Botanik, Vol. 42, part 4, pp. 585 et seq.), working by the **cohesion** of the liquid particles	0.	16.	0

* Can be used with Projection Apparatus.

Cl. 816, 5863, 823, 825.

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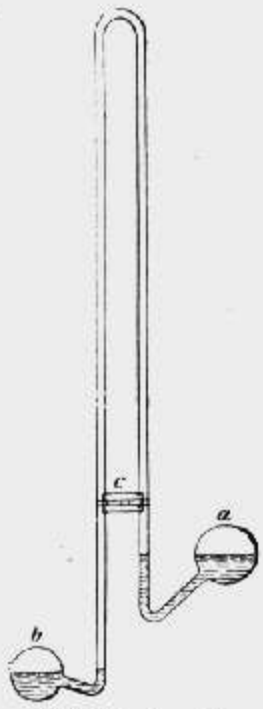
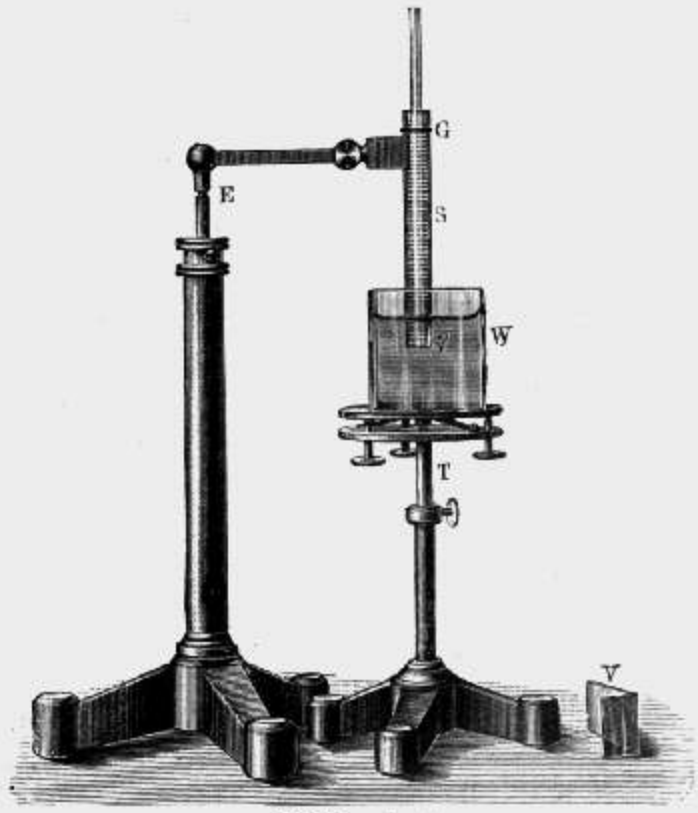
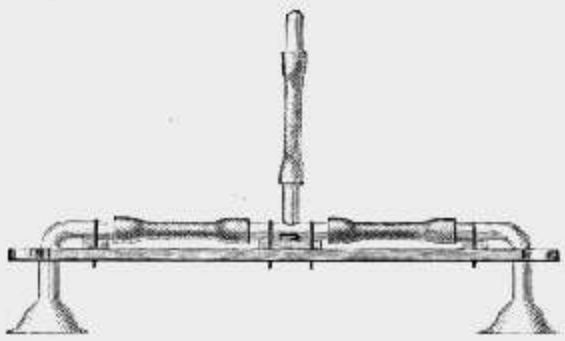
52 664. 1 : 12.



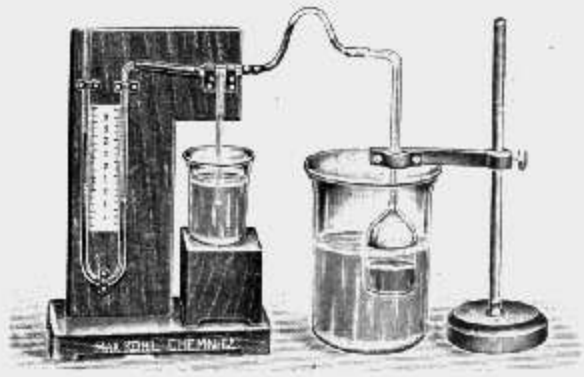
52 666. 1 : 10.



52 672. 1 : 4.



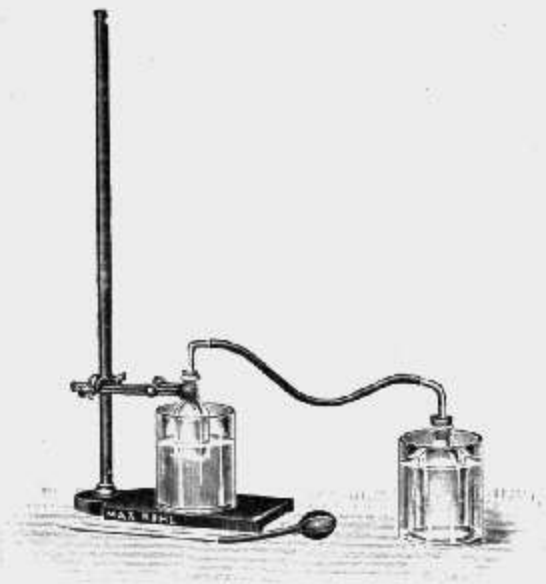
52 668. 1 : 3.



52 673. 1 : 8.

	£	s.	d.
52,665. **Vacuum Syphon** as No. 52,664, with Mercury and Water Filling	1.	1.	0
52,666. — i d e m, simple, after Weinhold, F i g u r e (W. D., Fig. 171; Ztschr. f. d. phys. u. chem. U. **17**, 1904, p. 152)	0.	6.	0
52,667. **Cohesion and Adhesion Tube,** after Leduc and Sacerdote (Gan.-Man., Figs. 26 and 27), for showing the cohesion and adhesion of liquids, for connecting up to the Vacuum Pump	0.	12.	0
52,668. **Apparatus for showing that Liquids endeavour to Contract,** F i g u r e, but with glass cock (W. D., Fig. 130 [118])	0.	6.	0
52,670. — i d e m, simple (W. D., Fig. 128 [116])	0.	1.	0
* 52,671. **Apparatus for demonstrating Surface Tension** (W. D., Fig. 131 [119]), U-shaped glass tube with unequal limbs, with stand	0.	4.	0
52,672. **Apparatus for showing and measuring Surface Tension,** F i g u r e (W. u. E. phys. Prakt., Fig. 74)	3.	0.	0
The measurement is carried out by observing the degree of ascension in capillary tubes which are fastened on a glass scale by means of a rubber ring. The cubical trough containing the liquid consists of plate glass sheets of 5 cm side.			
52,673. **Apparatus** after Rebenstorff, for measuring Surface Tension, capillary ascension, F i g u r e (Ztschr. f. d. phys. u. chem. U. **19**, 1906, p. 26, Fig. 2)	1.	0.	0
The apparatus consists of a manometer for coloured water, a number of capillary tubes together with stand and glasses, and a pressure tube extending in width downwards, with beaker and 2 hose pieces each of 15 cm length.			

* Can be used with the Projection Apparatus.



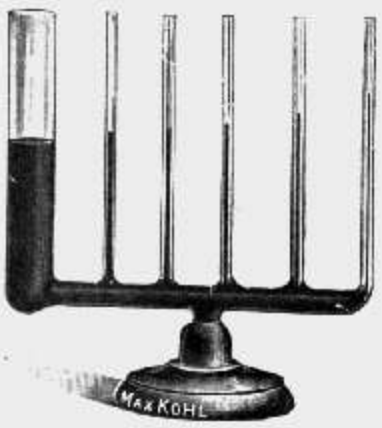
52 674. 1 : 10.



52 676 A.
1 : 4.



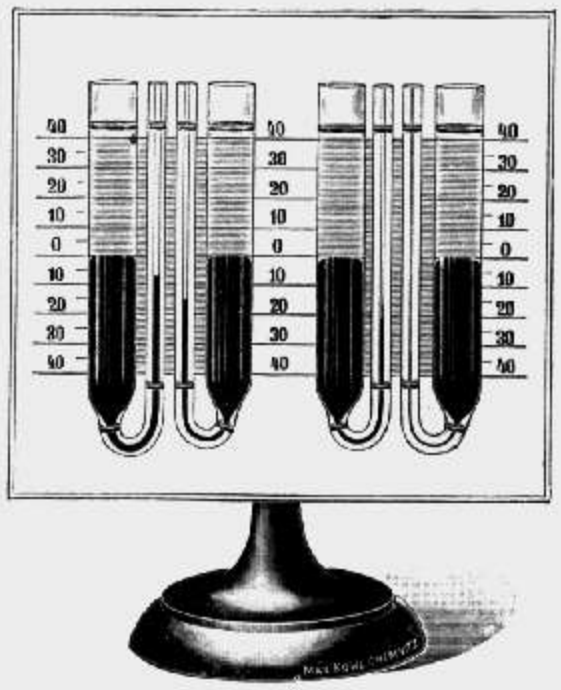
52 679. 1 : 5.



52 680. 1 : 5.



52 676 B.
1 : 1.



52 682. 1 : 2.

52,674. **Apparatus** after Rebenstorff, for reducing the Surface Tension of Water by Ether, Figure (Ztschr. f. d. phys. u. chem. U. **19**, 1906, p. 27, Fig. 3) . . . . . £ 0. 13. 0

The apparatus consists of a glass bell with nozzle seal, a glass dish, a stand for holding the bell, a weighted compression bell in a glass cylinder, a pipette for ether and a 30 cm length of rubber tubing.

* 52,675. **Dropping Apparatus,** after Friedr. C. G. Müller, for showing Surface Tension (M. T., Fig. 78), suitable for the Projection Lantern 0. 6. 0

The liquid used for dropping is coloured colza oil in a mixture of water and alcohol, of such density that the drops fall slowly.

52,676. **Dropping Pipette, for determining the Constant of Capillarity,** Figures A and B (W. u. E. phys. Prakt., Figs. 78 and 79) 0. 2. 6

Fig. B shows the lower smoothly polished end of the pipette with drop of liquid hanging on the end.

* 52,677. **Wide Tube and Capillary Tube,** for capillary depression of non-wetting liquids (W. D., Fig. 132 [120]) 0. 4. 0

* 52,678. — idem, **with short Capillary Limb,** for demonstrating Surface Tension (M. T., Fig. 79) 0. 3. 0

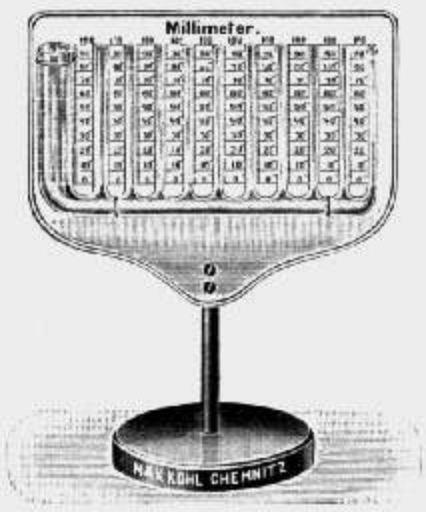
* 52,679. **2 Wide Tubes with Capillary Tubes,** for projection, Figure, on stand, for demonstrating **Capillary Ascension** of wetting and the **Capillary Depression** of non-wetting liquids, e. g. coloured water and mercury 0. 8. 0

* 52,680. **Wide Tube with 5 Communicating Capillary Tubes,** Figure, for the objective demonstration of the capillary ascension of wetting liquids or the capillary depression of non-wetting liquids 0. 6. 0

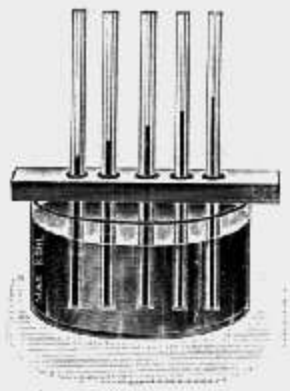
* Can be used with the Projection Apparatus.

Cl. 4984, 828, 3650, 3796, 829, 830.

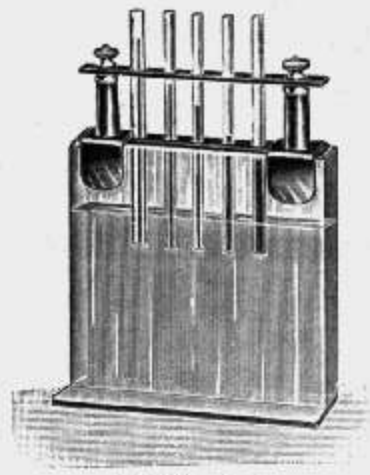
Max Kohl A. G. Chemnitz, Germany.



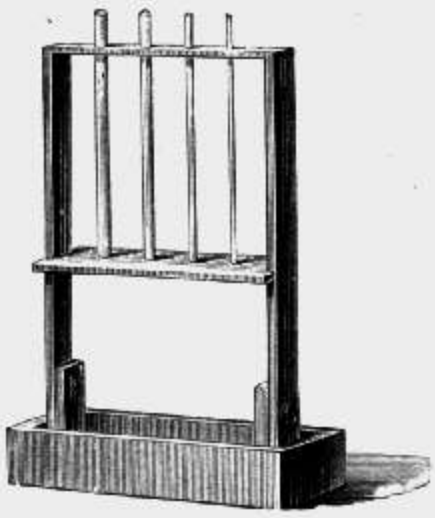
52 683. 1 : 6.



52 684. 1 : 4.



52 685. 1 : 2.



52 686. 1 : 2.



52 589. 1 : 4.



52 691. 1 : 4.

52,681. **Apparatus for Capillary Depression and Ascension of Liquids,** with 3 capillaries of different widths, on graduated wood stand (Fr. phys. Techn. **I,** 2, Fig. 2451) . . . . £ 0. 8. 0

52,682. — i d e m, with 4 capillaries of different widths, on graduated wood stand, F i g u r e 0. 12. 0

52,683. **Stand with 10 Communicating Capillary Tubes,** F i g u r e, graduated 0. 12. 0

* 52,684. **5 different Capillary Tubes,** with holder and glass vessel, F i g u r e (Fr. phys. Techn. **I,** 2, Fig. 2452) 0. 2. 0

* 52,685. — i d e m, with plane parallel glass vessel, F i g u r e 0. 12. 0

* 52,686. **5 Capillary Tubes** of different widths, with stand, F i g u r e (W. D., Fig. 133 A [121 A]) 0. 8. 0

* 52,687. **Capillary Tubes alone** (Gan.-Man., Figs. 208—211) 0. 1. 0

* 52,688. **5 Capillary Tubes of different shapes,** for showing that the capillary ascension at the same temperature is independent of the shape of the tube (Gan.-Man., Fig. 218) . . 0. 3. 0

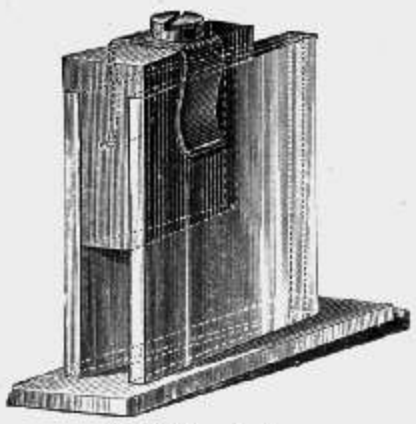
* 52,689. **Apparatus** for showing the behaviour of wetting and non-wetting liquids in a conical tube, F i g u r e (W. D., Fig. 134 [122]), on stand 0. 2. 0

* 52,690. **1 Set Capillary Tubes** for demonstrating capillary ascension and depression, the propagation of a drop in a conical tube, the independence of the capillary effect on the form of tube, and the migration of a drop of mercury by inequality of the surface tension produced electrolytically 0. 4. 0

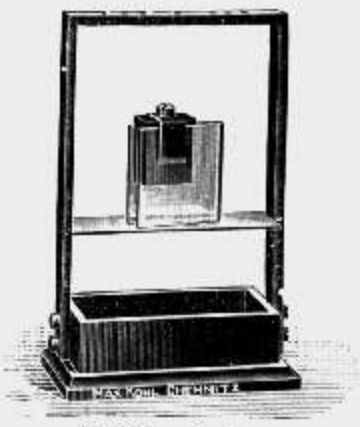
* 52,691. **Apparatus for demonstrating Migration of a Mercury Drop by the electrolytically-produced inequality of surface tension,** F i g u r e, suitable for objective observation . 0. 8. 0

* Can be used with the Projection Apparatus.

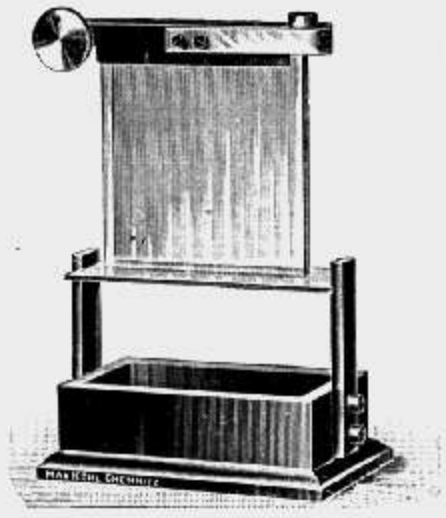
Cl. 3342, 329, 5790, 5846, 330, 3533.



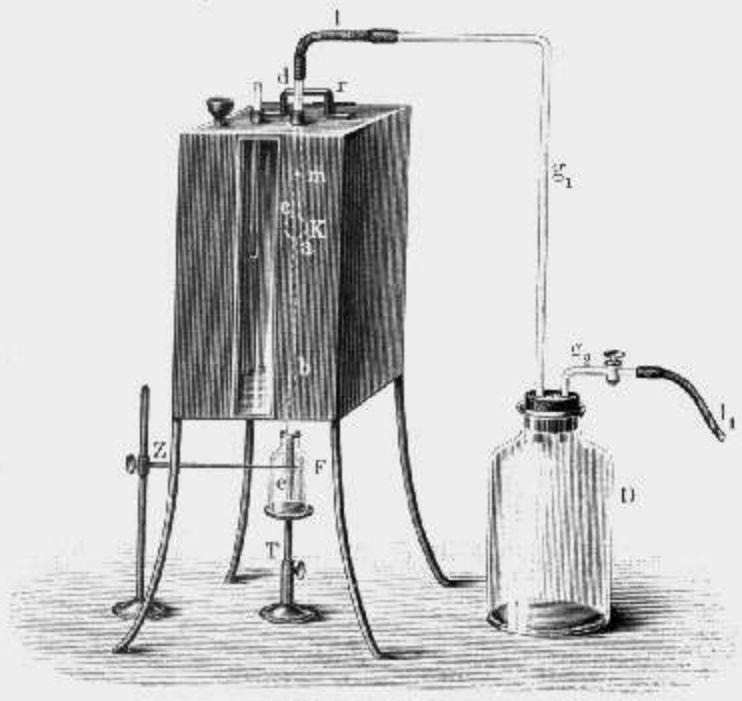
52 692. 1 : 1.



52 693. 2 : 5.



52 694. 1 : 2.



52 695. 1 : 10.



52 697. 1 : 7.



52 698. 3 : 10.



52 699. 1 : 8.

* 52,692. **Capillary Plates,** maintained in correct position by a brass wedge and spring, Figure (W. D., Fig. 133 B [121 B]), without stand . . . . . £ 0. 3. 0

* 52,693. — idem, with stand, Figure 0. 10. 0

* 52,694. — idem, larger, with adjustable angle and with stand, Figure 0. 16. 0

52,695. **Apparatus** after Arrhenius, **for determining the internal friction of Liquids,** Figure (W. u. E. phys. Prakt., Fig. 67) 3. 0. 0

In a brass box, let in at the front and back with windows, is a capillary tube with ball and two marks. The specific coefficient of friction is determined by observing the times of outflow of definite quantities of liquid.

With regard to Viscosimeters and Apparatus for testing Oils and Fats for their lubricating quality, kindly ask for quotations.

52,696. **Apparatus** after Jamin, for demonstrating the absorption of liquids through porous bodies (Chwolson, Lehrb. d. Phys., **I**, Fig. 328) 0. 10. 0

A cube of chalk contains a cavity for taking a manometer, the cube being immersed in water.

52,697. **Striation Apparatus,** after Heumann, Figure, for demonstrating the dissolving tension of salts (Fr. phys. Techn. **I**, 2, Fig. 2466) 0. 3. 0

52,697a. **Tube with supersaturated Sodium Sulphate Solution;** the solution crystallises when tube is opened (Chwolson, Physik, Vol. I, p. 620) 0. 1. 0

52,698. **Apparatus** after Uppenborn, **for the Diffusion of Liquids,** Figure (W. D., Fig. 135 [123]) 0. 1. 6

52,699. **Endosmometer,** after Dutrochet, Figure, with graduation on wood (M. P., **III**, Fig. 223 [**I**, Fig. 465]) 0. 5. 0

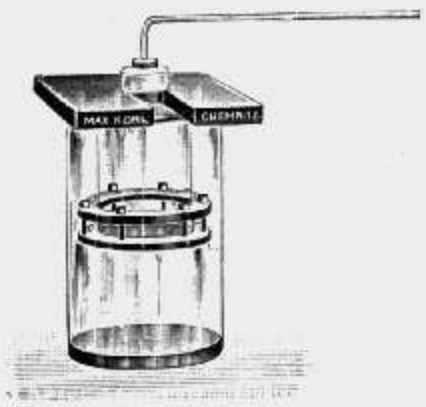
52,700. — idem, Figure, with horizontal ascension tube (W. D., Fig. 136 [124]) . . 0. 10. 0

* Can be used with the Projection Apparatus.

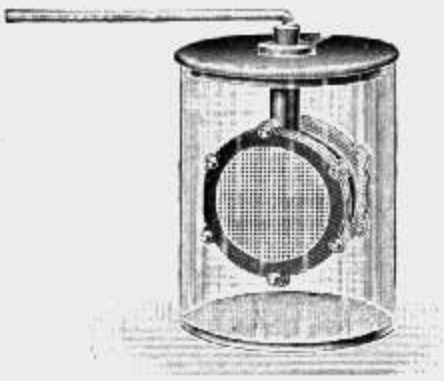
Cl. 332, 333, 334, 837, 5360, 838, 839.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



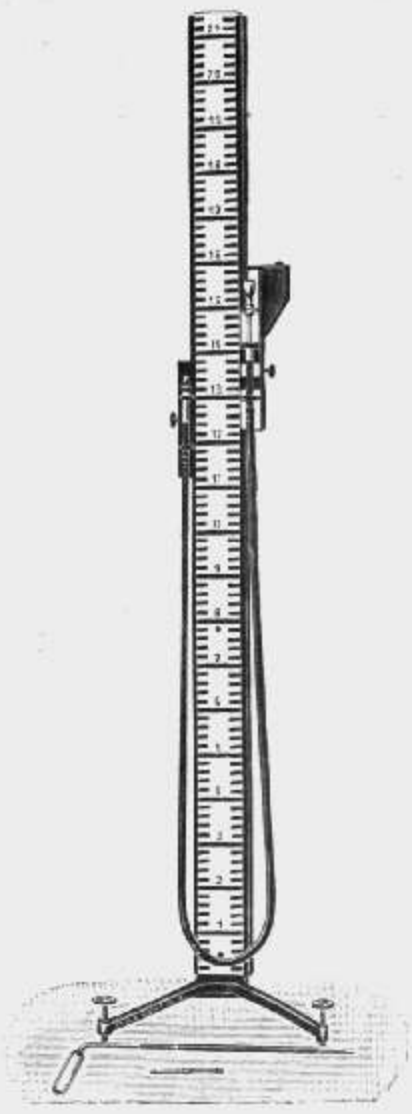
52700. 1 : 6.



52701. 1 : 6.



52705. 1 : 30.



52706. 1 : 19.

	£	s.	d.
52,701. **Endosmometer,** after Niemöller, with vertical membranes, Figure	2.	0.	0
52,702. **Endosmometer,** after Pfeffer, with manometer (Lüpke-Bose, Grundzüge der Elektrochemie, 5th edn., Fig. 27).	0.	8.	0
52,703. **Osmose Apparatus,** after Friedr. C. G. Müller (M. T., Fig. 81)	0.	10.	0
52,704. **Vessel for Dialysis,** after Weinhold (W. D., p. 175 [153])	0.	5.	0

Two ebonite rings of 80 mm diameter fitting in each other with a sheet of parchment stretched between for receiving the white of an egg.

Equilibrium, Motion and Molecular Effects of Gases.

Equilibrium of Gases.

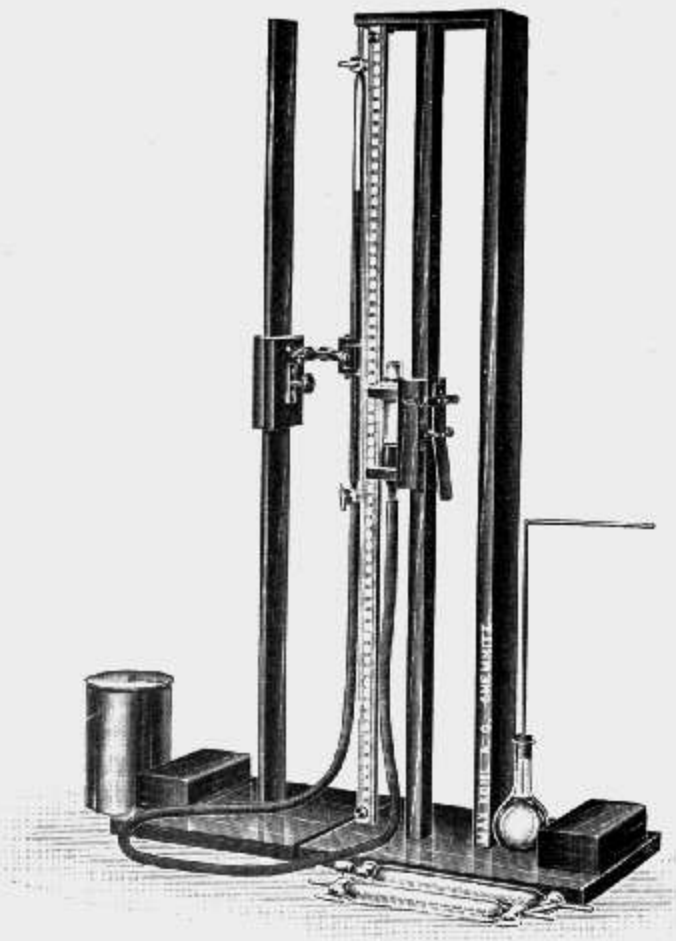
	£	s.	d.
52,705. **Apparatus** after Schaffers, **for Experiments with Gases and Vapours,** Figure, suitable for proving Boyle's (Mariotte's) Law for Pressures which are greater or smaller than 1 atm. and for experiments on the Tensive Force of saturated and non-saturated vapours in vacuo and in air (Ztschr. f. d. phys. u. chem. U. **18**, 1905, p. 217) . . .	6.	0.	0

The apparatus is a combination of the Feilitzsch-Weinhold Apparatus for proving Mariotte's Law with the 3-tube apparatus as used for the laws relative to the tensive force of gases and vapours.

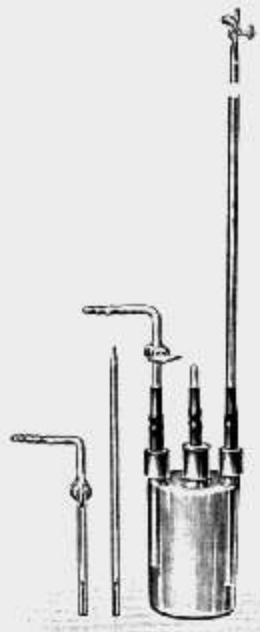
52,706. **Apparatus for Demonstrating the Properties of Gases,** after Lermantoff, Figure, for demonstrating the Barometer, Mariotte's Law, the Geissler Mercury Air Pump, the Expansion of Air with constant volume and constant pressure respectively (Air Thermometer), the Volumnometer, the Tension of saturated and non-saturated vapours . .	5.	0.	0

For observing according to O. Lehmann's method the growth of solid and liquid crystals which are apparently alive, kindly refer to the Projection Microscopes and Accessories Nos. 51,057—51,061, pp. 183 and 184.

Cl. 840, 4180, 5528, 5844.



52 707. 1 : 12.



52 709. 1 : 10.



52 710. 1 : 7.

52,707. **Apparatus for Experiments with Gases,** after Schneider, Figure, suitable for a large number of experiments on the theory of the equilibrium of gases and on the theory of heat; can also be used as a Gas Measuring Apparatus; suitable for school use . . — £ s. d. 3. 12. 0

The apparatus consists of 2 separate stands provided with weights, with 3 burette tubes each having two stopcocks and graduation; 1 rule with 2-coloured centimetre graduation on one side and millimetre graduation on the other; 1 round flask with rubber stopper and angle tube.

The apparatus is intended for demonstration work in teaching and for students' exercises. It is suitable for the following demonstration experiments, among others: Demonstrating the Syphon Barometer (also with variable vacuum); the Testing of Barometers; the Mercury Air Pump; for producing a Vacuum Tube with the Torricellian vacuum; demonstrating boiling and re-boiling on cooling in vacuo; demonstrating the MacLeod Vacuum Gauge; for experiments on the Vapour Pressure of Ether in vacuo and in air; for the suction, conduction and measurement of quantities of gas; demonstrating the Pressure Gauge; Gay-Lussac's Law on the Expansion of Gases at constant pressure; on the increase of Pressure of Gases when heating in constant volumes; on the variation in Volume of Gases with variation of pressure and temperature; Solubility of Gases in liquids; measuring the Vapour Pressure of water, etc. etc.

52,708. — idem, with **iron stand** 4. 10. 0

52,709. **Pressure Flask,** after Schneider, Figure, for measuring the **Pressure in Water Leads,** the **Air Pressure** produced by the water lead; for demonstrating **Heron's Ball** and the **Air Chamber** 0. 18. 0

52,710. **Diving Bell,** Figure, of glass, with light-holder, suspended in stand, for showing that air occupies a space 1. 5. 0

52,711. — idem, with rubber bellows 1. 12. 0

52,712. **Indiarubber Balloon in wood box,** Figure, with loosely fitting lid and 6 iron weighting plates, for showing the **elasticity of air** 0. 9. 0

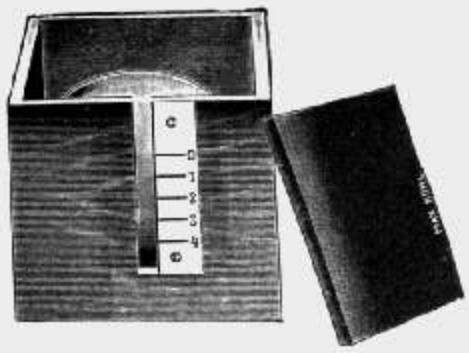
If the lid, and consequently the balloon, is weighted with the iron plates, this depresses the balloon more or less.

52,713. **Apparatus for showing the Elasticity of Air,** Figs. A and B 1. 0. 0

A piston fitted with a handle and hook, moves in vacuo in a metal tube, Fig. A, provided with a bottom piece and a hook; the tube communicates with the outer atmosphere by a stopcock. If the cock is closed and the piston pushed in, the piston tends to spring back when an attempt is made to pull it out. A tripod and a loading plate are supplied with the apparatus; the tripod being detachable (Fig. B), in order to show also the Compressibility and Elasticity of the compressed air.

Double Sphere for showing the Expansion of Gases: see Nos. 51,751 and 51,752, p. 250.

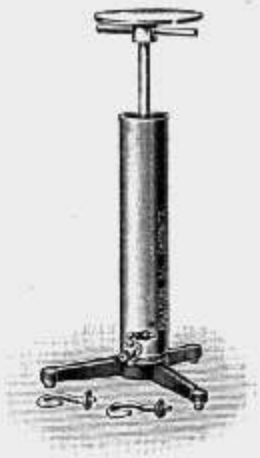
Glass Sphere for weighing Air: see Auxiliary Apparatus for the Air Pump.



52 712. 1 : 4.



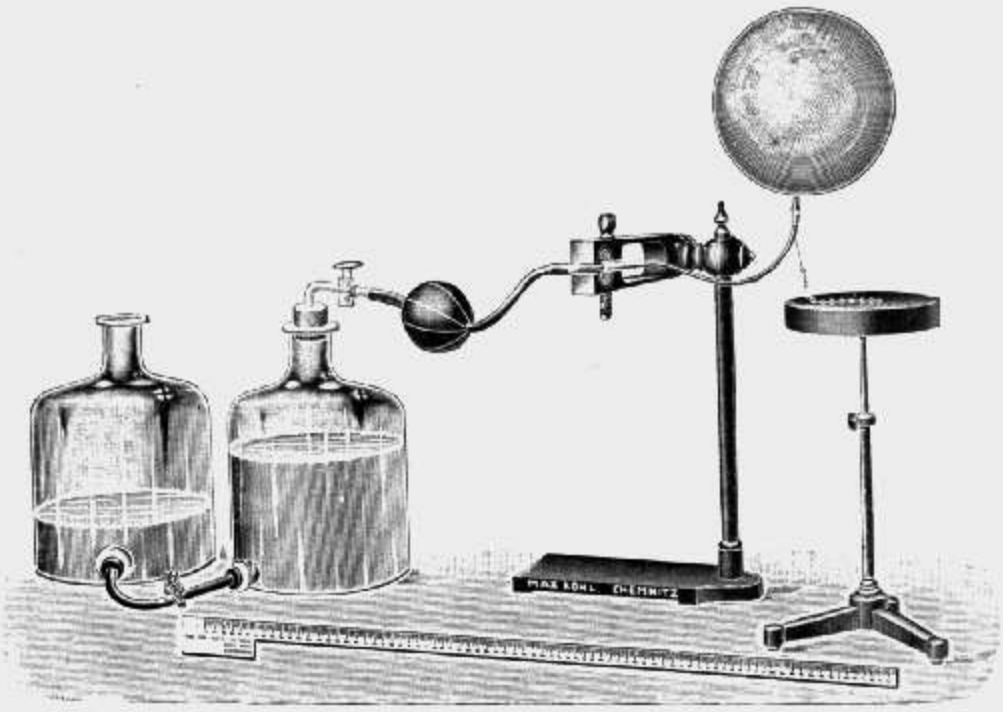
52 713 A. 1 : 5.



52 713 B. 1 : 7.



52 717. 1 : 5.



52 718, 52 719 — 52 721. 1 : 10.

52,715. **Glass Tube,** for determining the **Specific Gravity of Gases,** after Friedr. C. G. Müller (M. T., Fig. 83), for use in conjunction with pressure level No. 52,731 . . . . . £ s. d. 0. 6. 0

52,716. — i d e m, for the Grimsehl **Gas Balance,** with 3-way cock (Ztschr. f. d. phys. u. chem. U. **18,** 1905, p. 200), for use with the Spirit Level Pressure Gauge No. 52,732 0. 3. 0

52,717. **Baroscope** after Schoentjes, F i g u r e, **for showing the Buoyancy of Air,** with counterpoise (Fr. phys. Techn. **I,** 2, Figs. 2708 and 2708 a; Ztschr. f. d. phys. u. chem. U. **14,** 1901, p. 166) 1. 5. 0

By increasing the hermetically closed hollow body it is shown that this appears lighter when it displaces more air. If air is allowed to force its way inside, the body then appears heavier.

52,718. **Apparatus for Experimental Measurements with Air Balloons,** F i g u r e, after Rebenstorff (Ztschr. f. d. phys. u. chem. U. **19,** 1906, p. 98), complete, without clamping stand 2. 0. 0

For experimental measurements on the buoyancy of balloons filled with hydrogen or house gas.

The apparatus consists of 2 tubulated glass flasks with rubber connecting tubing; 1 clamp for tubing; 1 perforated rubber stopper; 1 glass tube with stopcock; 1 rubber bellows; 1 glass tube in stopper; 1 piece thin walled tubing; 4 rubber balloons; 2 pieces chain; 1 adjustable small table; 2 small glass stoppers; 2 distance pieces; 1 rule and 1 sheet iron case with projecting lid and moistening flask.

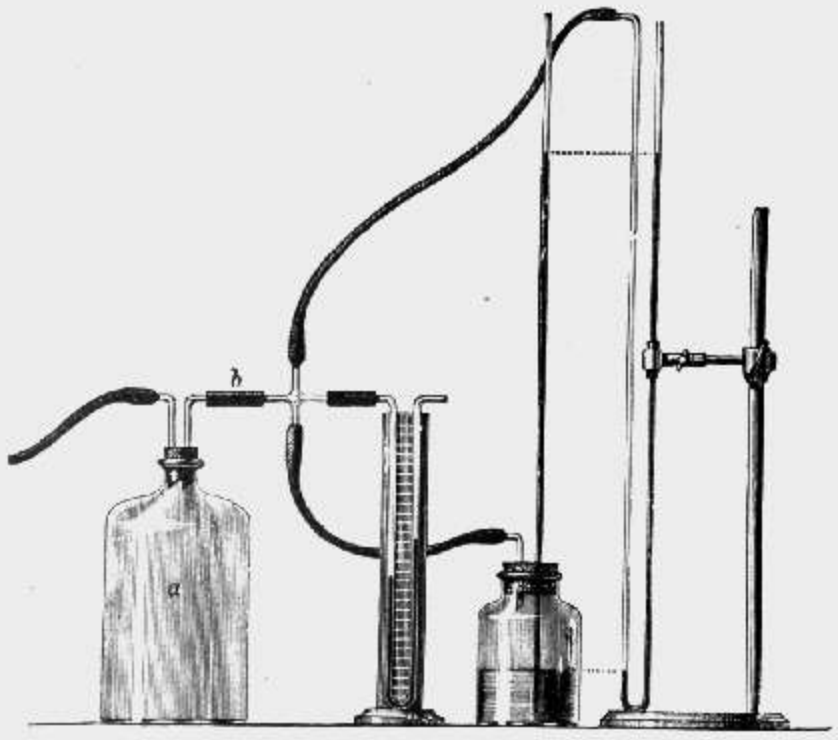
52,719. **Single Constituents** of preceding Apparatus, see Fig. 52,718, without clamping stand 1. 8. 0

2 tubulated glass flasks with rubber tubing; 1 rubber stopper; 1 glass tube with stopcock; 1 small adjustable table and 1 sheet iron case with overlapping lid and with moistening flask.

Cl. 842, 843, 5534, 844, 3651.



52 730. 1 : 6.



52 733. 1 : 10.



52 734. 1 : 8.



52 735. 1 : 6.

	£ s. d.
52,720. **Further Constituents** of Apparatus for Experimental Measurements with Air Balloons, see Fig. 52,718	0. 9. 0
4 rubber balloons; 1 piece thin walled rubber tubing; 1 rubber ball; 1 glass tube in stopper; 2 glass stoppers; 2 distance pieces; 2 pieces chain and 1 rule.	
52,721. **Clamping Stand,** of wood, with iron base (**Retort Holder**), see No. 51,110.	0. 5. 0

Collodion Balloons.

List No.	52,722	52,723	52,724	52,725	52,726
Diameter cm	5	11	18	22	35
Each £	**0. 0. 9**	**0. 1. 0**	**0. 1. 7**	**0. 2. 0**	**0. 3. 0**

Hydrogen Generating Apparatus: see under Nos. 51,278—51,284, p. 213.

52,737. **Hollow Cylinder,** of pasteboard, **for Air Balloon Experiments,** after Friedr. C. G. Müller (M. T., Fig. 105a)	0. 2. 0
52,452. **Apparatus for showing the uniform Propagation of Pressure of Gases:** see Figure 52,452, p. 335	1. 0. 0
52,453. — i d e m, **on stand and with stopcock:** see Fig. 52,453, p. 335	1. 16. 0
52,730. **Pressure Level,** after Töpler, F i g u r e, for measuring small pressure-differences (W. D., Fig. 141 [187])	0. 5. 0
52,731. — i d e m, after Friedr. C. G. Müller (M. T., Fig. 67), with U-shaped horizontal tube, with 2-colour centimetre graduation	0. 18. 0
52,732. — i d e m, after Grimsehl, with air bubble in horizontal tube (Ztschr. f. d. phys. u. chem. U. **18**, 1905, p. 199, Fig. 2)	0. 18. 0
52,733. **Pressure Gauge Apparatus,** F i g u r e (W. D., Fig. 138 [126]), for comparing the mercury syphon pressure gauge with the water vessel pressure gauge and with the water syphon pressure gauge, with stand	1. 1. 0
52,734. **Pressure Gauge,** for measuring the gas pressure, F i g u r e, giving pressure direct in millimetres, with stopcock	0. 5. 0
52,735. **Pressure Gauge with 3-way stopcock,** F i g u r e, on stand, measuring to 120 mm	0. 8. 0
Pressure and Vacuum Gauge, after Landolt: see Fig. 50,164 a, p. 26	0. 18. 0

Cl. 1043, 850, 845, 5536.

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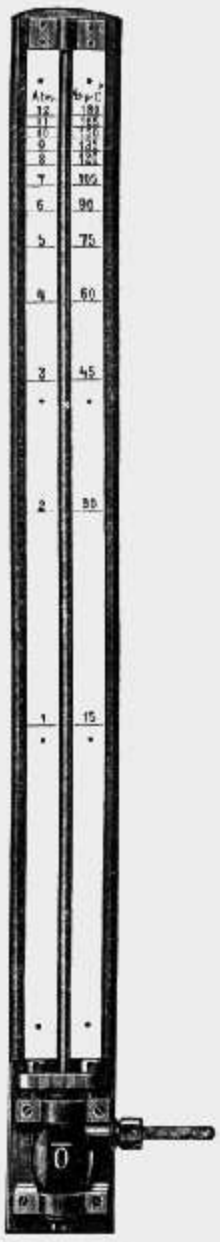
52 739. 1 : 18.



52 742. 1 : 8.



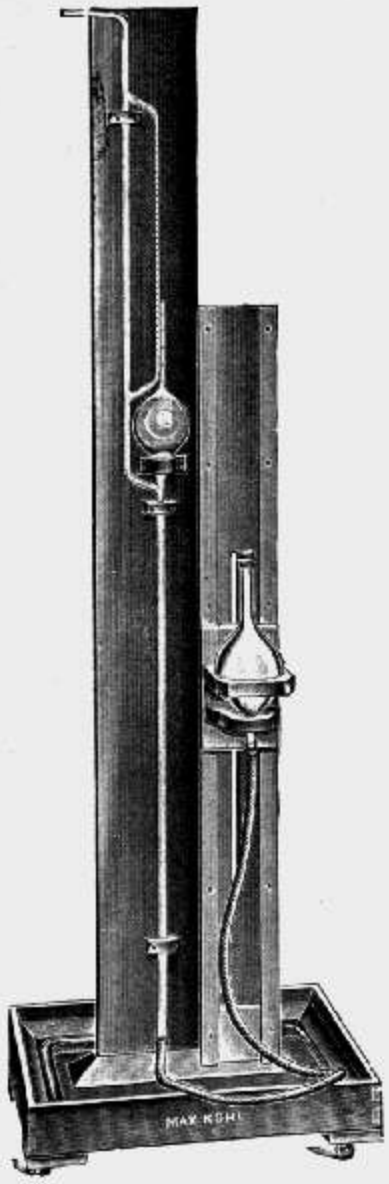
52 743. 1 : 8.



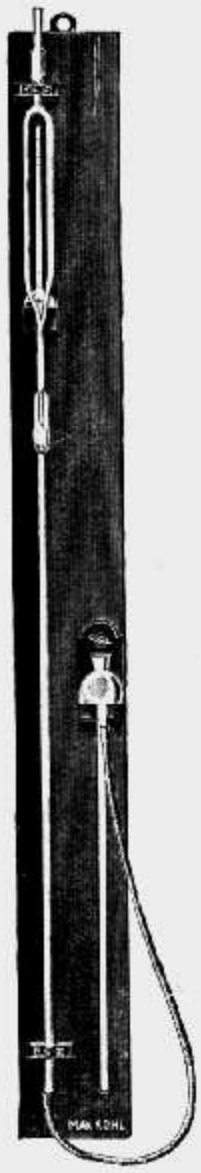
52 744. 1 : 6.

		£ s. d.
52,737.	**Sensitive Syphon Pressure Gauge,** after Grimsehl, based on the difference in the specific gravity of two liquids (Ztschr. f. d. phys. u. chem. U. **18**, 1905, p. 199, Fig. 1)	0. 18. 0
25,738.	**Duplex Pressure Gauge,** after Friedr. C. G. Müller (M. T., Fig. 66), a syphon pressure gauge for two liquids, for different ranges; **can be used aerostatically and hydrostatically**	0. 16. 0
52,739.	**Open Mercurial Pressure Gauge** for 2 atm., Figure, on board with graduation.	1. 0. 0
52,740.	— idem, for 3 atm.	2. 0. 0
52,741.	**Closed Mercurial Pressure Gauge,** cf. Fig. 52,742, to 12 atm., with silvered graduation, with lateral tube supports with cock	2. 6. 0
52,742.	— idem, Figure, without cock	2. 0. 0
52,743.	**Mercurial Vacuum Gauge,** Figure, with 3-way cock, on polished board, with silvered metal scale	2. 2. 0
52,744.	**Recording Pressure Gauge,** Figure, for indicating and recording from 0—20 kg per sq. cm	12. 0. 0
	When ordering please state whether the records are required to be made with hygroscopic ink or with lead pencil and whether the cylinder has to make a revolution once in 24 or once in 12 hours.	
52745.	**400 Pieces Paper Strip** for above	0. 18. 0

Prices for Micromanometers quoted on application.



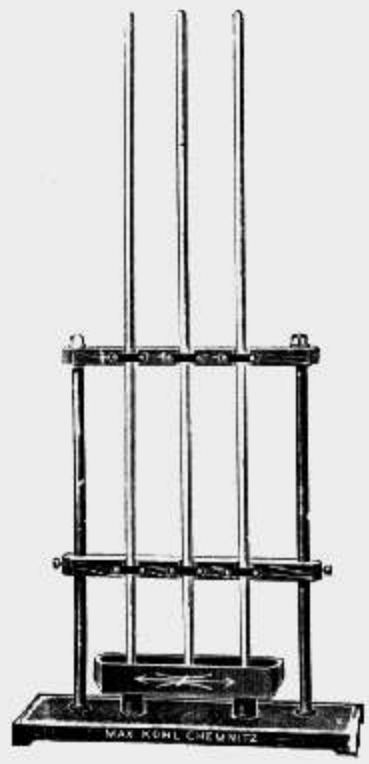
52 746. 1 : 14.



52 747. 1 : 10.

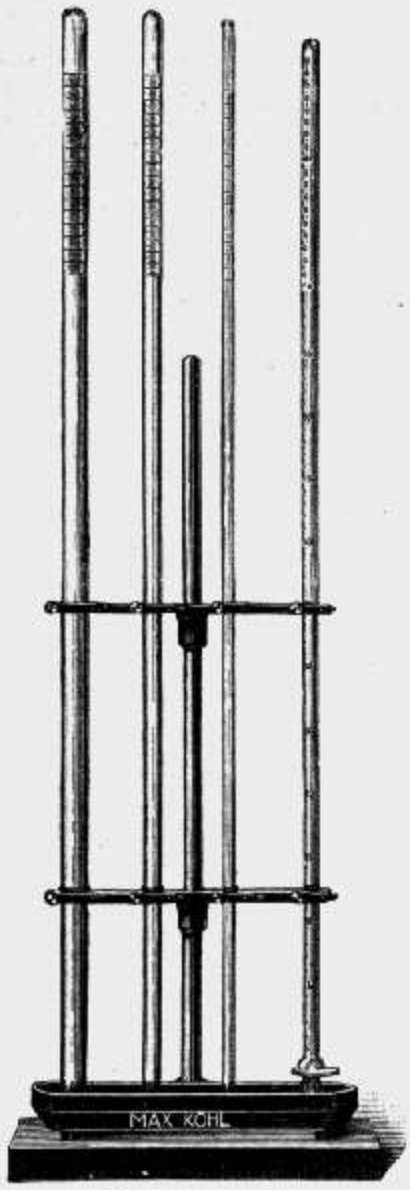


52 749. 1 : 9.



52 752. 1 : 12.

	£ s. d.
52,746. **Vacuum Gauge,** after MacLeod, Figure (Ztschr. f. Instrumentenkunde, **15,** 1895, p. 191), for measuring **high vacua.** Price without mercury	3. 15. 0
This instrument is absolutely necessary when exhausting **Geissler** and **Röntgen Tubes.** The **Oil Vacuum Pumps** and **Mercury Vacuum Pumps** supplied by us are tested exclusively with this instrument. The **Vacuum Gauge** has a measuring bulb of 500 ccm capacity and it permits of measuring high vacua up to $^{1}/_{250\,000}$th mm with accuracy. About 7 kg mercury is necessary for filling.	
52,747. **Vacuum Gauge,** after MacLeod, smaller and simpler, on wall board, Figure, without mercury	1. 16. 0
About 2 kg mercury is necessary for filling.	
52,748. **Barometrical Pressure Gauge (Differential Barometer),** after Regnault-Leduc, consisting of a mercury barometer and a pressure gauge having common vessel, suitable for readings with the cathetometer (Gan.-Man., Fig. 158)	8. 0. 0
52,749. **Barometer Tube, without graduation,** with cast iron mercury cup, for **Torricelli's experiment,** Figure (M. T., p. 116). Without mercury	0. 3. 0
52,750. — idem, **with etched graduation,** glass stopcock at lower end and iron cistern .	0. 8. 0
52,751. **Barometer Tube, piece of Rubber Tubing and short piece Tubing** (Meyer, Naturlehre, Fig. 166)	0. 2. 6
52,752. **3 Barometer Tubes** in mercury trough, Figure, with stand (M. P., **III,** Fig. 236 [II, 2, Fig. 108]), for showing the difference between gases and vapours	1. 10. 0
52,753. — idem, tubes having etched graduation, **with funnel-shaped opening and half-perforated stopcocks** on the upper end, for conveniently introducing the liquids to be evaporated	2. 0. 0



52 754. 1 : 7.



52 756. 1 : 10.



52 758. 1 : 10.



52 762. 1 : 15.

	£ s. d.
52,754. **4 Barometer Tubes,** of 15, 12, 8 and 6 mm width, Figure, for showing that the height of the barometer is independent of the width of the tubes, but that the meniscus influences the reading to a greater extent in the case of narrow tubes than in the case of wide; **with etched graduation** (in millimetres at the upper end) and one iron trough, iron stand with ribs for removing the tubes laterally . . . . . One of the tubes is provided underneath with a stopcock for securing ease of manipulation in the general experiments on the Torricellian vacuum.	2. 2. 0
52,755. — idem, **without graduation**	1. 12. 0
52,756. **Demonstration Barometer Tube,** after Kolbe, Figure (Ztschr. f. d. phys. u. chem. U. **6**, 1893, p. 31), of glass, with two stopcocks and glass vessel	0. 15. 0
52,757. — idem, with one platinum electrode in the upper part	0. 18. 0
52,758. **Barometer Tube,** with 80 cm long iron tube vessel, Figure	0. 14. 0
52,759. — idem, the glass tube, however, being fitted above **with stopcock and etched graduation**	1. 0. 0
52,760. **Tripod Stand,** of wood, for barometer tubes Nos. 52,758 and 52,759	0. 8. 0
52,761. **Barometer Tube,** with iron tripod stand (cf. M. P., **I**, Fig. 472 [513]), cf. Fig. 52,762; the tube graduated, without tube holder and index, and without cock	1. 10. 0
52,762. — idem, **with Tube Holder and Index,** Figure	1. 16. 0
52,763. **Duplex Barometer,** suitable for explaining the **Syphon** (Fr. phys. Techn. **I**, 2, Fig. 2558), with **one** vessel	0. 8. 0
52,764. — idem, **with two vessels,** for two liquids (Fr. phys. Techn. **I**, 2, Fig. 2559, see also Ztschr. f. d. phys. u. chem. U. **14**, 1901, p. 347)	1. 10. 0



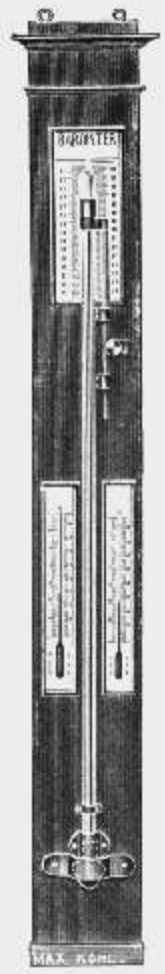
52 766.
1 : 14.



52 767.
1 : 12.



52 772.
1 : 8.



52 774.
1 : 10.



52 776.
1 : 10.



52 777.
1 : 10.

52,765. **Duplex Barometer,** after Kleiber, with two tubes connected under the mercury level (Fr. phys. Techn. **I,** 2, Fig. 2560; Ztschr. f. d. phys. u. chem. U. **14,** 1901, p. 247, Fig. 2) . . . . . £ s. d. 0.12.0

52,766. **Apparatus for the Torricellian Experiment,** after Dechant, Figure, can also be used as an open or a closed **Manometer** 1. 2.0

The U-tube is filled with a sufficient quantity of mercury, and for demonstrating the barometer, the apparatus, with stopcock open, is inclined to the right until mercury flows out of the cock; the cock is then closed and the apparatus placed upright.

52,767. **Demonstration Barometer,** after Schulze, Figure, with 3 glass stopcocks . . . 1.10.0

Suitable for showing air-pressure and **Mariotte's Law.**

52,768. **Experimental Barometer,** after Friedr. C. G. Müller (M. T., Fig. 84), can also be used as a **Vacuum Gauge,** with plain millimetre and centimetre graduation 1.10.0

52,769. **Simple School Model of Barometer, with Fortin Vessel** (Kleiber, Lehrb. f. Gymnasien, Fig. 114), without mercury 0.18.0

52,770. — idem, of **Syphon Barometer,** with U-tube (Kleiber, Lehrb. f. Gymn., Fig. 115 a), without mercury 0.12.0

52,771. **Barometer,** simple, on board with milk glass scale 0.12.0

52,772. **Barometer, English form,** Figure, ivory scale with vernier 2. 0.0

52,773. **Standard Barometer,** after Regnault (Gan.-Man., Fig. 141), for reading with the cathetometer, with tube 2.5 cm wide and iron cistern 8. 0.0

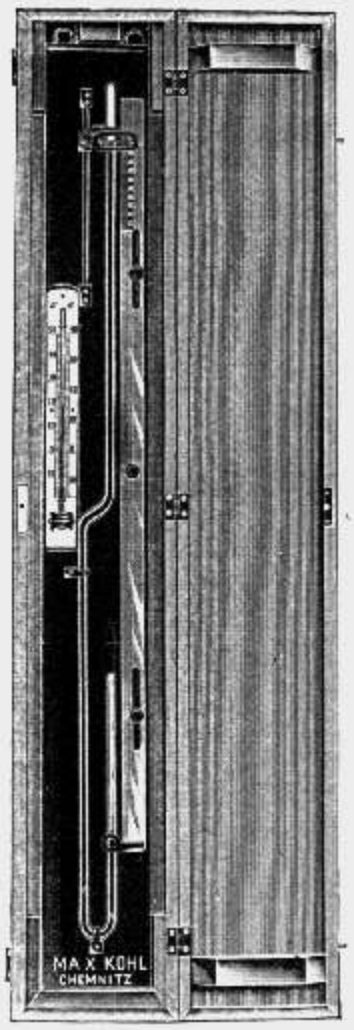
52,774. **Barometer,** on finely polished board, Figure, the sight vane adjusted by rack and pinion, with 2 thermometers 2. 0.0

52,775. — idem, sight-vane without rack motion 1.10.0

Max Kohl A. G. Chemnitz, Germany.



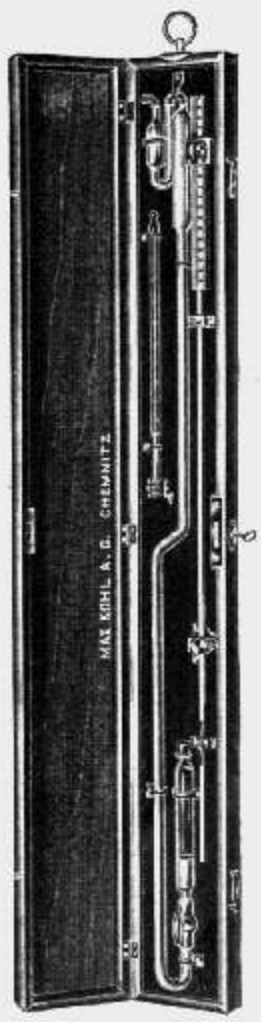
52 778.
1 : 8.



52 779.
1 : 10.



52 782.
1 : 9.



52 783.
1 : 9.



52 785.
1 : 10.

52,776. **Syphon Barometer,** after Brunn, Figure, can be used for accurate readings with the cathetometer (Fr. phys. Techn. **I,** 2, Fig. 2552) . . . . . £ s. d. 1.14.0

The upper part of the tube is exhausted with the vacuum pump, the cock being then closed and the apparatus tilted until the mercury has ascended into the upper vessel. When the instrument is again placed upright the mercury divides and an absolute vacuum is formed in the main tube. If air should collect in this later it can be shifted into the upper vessel quite easily by tilting.

52,777. **Syphon Barometer with Glass Verniers** and graduations on glass, Figure, the graduations being insensitive to the action of moisture 10. 0.0

52,778. **Syphon Barometer with sliding wood rule,** Figure, on black, polished board, with ebonite seal and two sighting vanes 1.12.0

52,779. — idem, **in case, portable,** Figure, for measurements in mines, etc.; on black, polished board, with adjustable wood rule, ebonite seal, sight-vanes and **with thermometer** with Centigrade graduation 2. 6.0

52,780. **Syphon Barometer,** with sliding metal rule, otherwise as No. 52,778 . . . . . 2. 0.0

52,781. **Syphon Barometer,** with etched graduations on the limbs, with 2 adjustable sight vanes 1.10.0

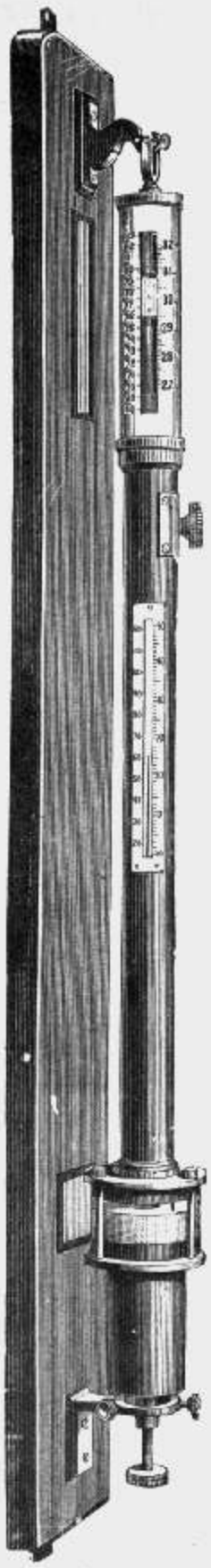
52,782. **Station Barometer,** Figure, Rule adjustable by rack and pinion, verniers read with magnifying glasses 8. 0.0

52,783. **Syphon Barometer,** after Krajevitch, Figure, with adjustable metal scale, with rackwork and vernier, with cock on the short limb, plummet and thermometer graduated in $^1/_5{}^0$ C., in case 5. 0.0

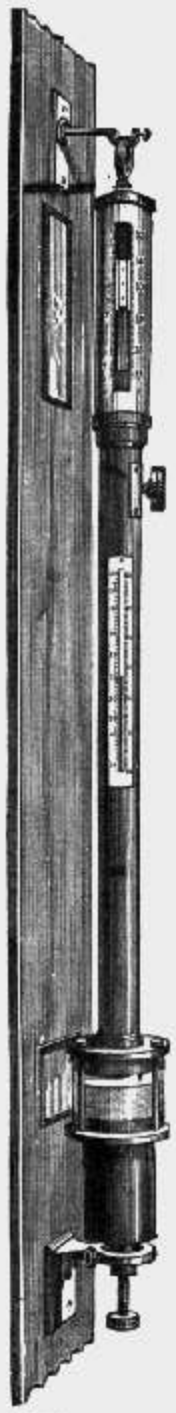
Air bubbles can easily be forced into the extension of the long limb by tilting.

52,784. — idem, **simpler,** scale adjustment without rack 4. 0.0

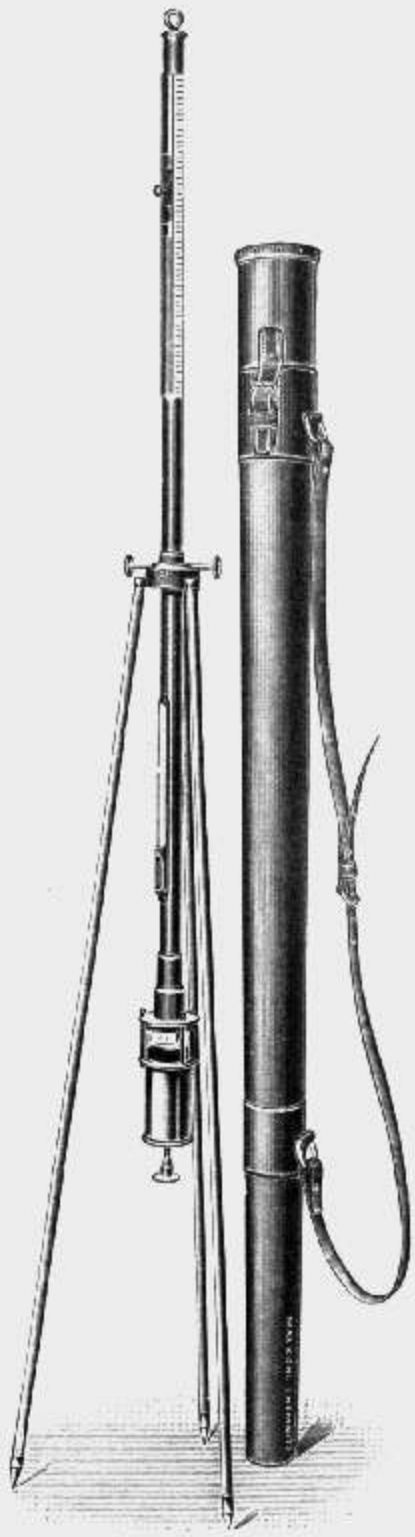
52,785. **Syphon Barometer, with adjustable Barometer Tube,** Figure, with metal scale, vernier and thermometer, the scales being silvered 3.10.0



52 786. 1 : 7.



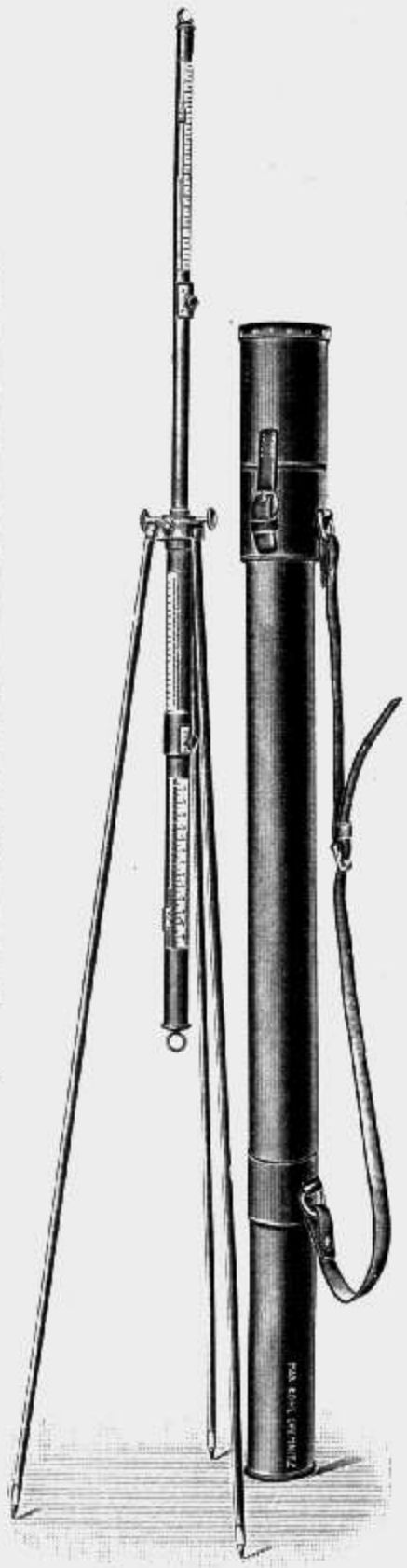
52 787. 1 : 9.



52 788. 1 : 7.



52 789.
1 : 10.



52 790. 1 : 7.

Max Kohl A. G. Chemnitz, Germany.

52,786. **Fortin Station Barometer,** F i g u r e, in metal case, **tube 19 mm internal width,** vernier reading to $^1/_{10}{}^{th}$ mm and movable with rack; reading of vernier and level facilitated by mirror illumination. The thermometer is in direct contact with the barometer tube and can be read from the outside. The instrument is suspended on a hook and can be centred at the lower end . . . . . £ 18. 10. 0

52,787. — i d e m, **with tube 12.5 mm wide,** F i g u r e 10. 0. 0

52,788. **Travelling and Altitudinal Barometer,** after Fortin, F i g u r e, with tube 10 mm width, vernier giving $^1/_{10}{}^{th}$ mm, with thermometer, **Stand** and **Universal Suspension,** also **leather case** 7. 10. 0

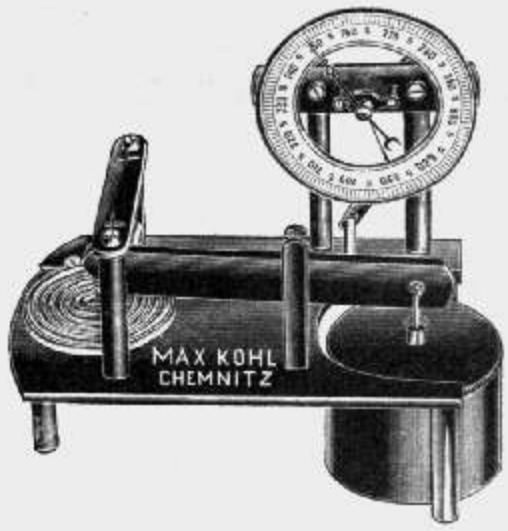
52,789. — i d e m, **as Station Barometer,** on wood board, F i g u r e 6. 0. 0



52 791. 1 : 3.



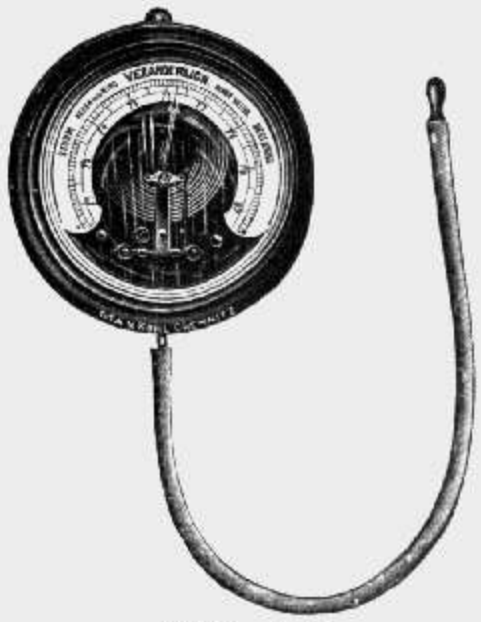
52 792. 1 : 4.



52 794. 1 : 4.



52 795. 1 : 5.

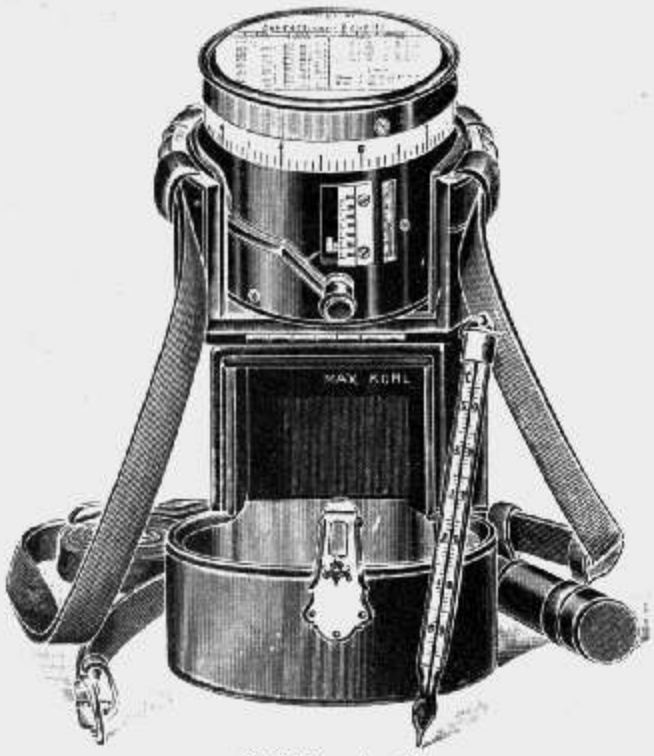


52 796. 1 : 5.

	£ s. d.
52,790. **Travelling and Altitudinal Barometer** after Gay-Lussac, Figure, syphon barometer, with two verniers, giving $^1/_{10}{}^{th}$ mm, with thermometer, stand, and universal suspension and with leather case	7.10.0
52,791. **Bourdon's Tube,** on stand, Figure, with pointer and scale, for placing on the vacuum pump, for explaining the principle of the **Aneroid Barometer**	1. 2.0
52,792. **Aneroid Barometer** (Holosterical Barometer after Vidi), Figure, excellent mechanism, mounted open, 100 mm scale diameter, with glass plate, glass bell and rubber tubing with mouthpiece	2. 4.0
If the air under the glass globe is compressed or rarified by blowing through or applying suction to the mouthpiece, the barometer gives these variations.	
52,793. — idem, scale 130 mm	2.10.0
52,794. **Demonstration Aneroid Barometer for the Vacuum Pump,** Figure	2.10.0
52,795. **Demonstration Aneroid Barometer,** after Weiler, Figure	2.10.0
52,796. **Demonstration Aneroid Barometer,** Figure, for suction, with rubber tubing and mouthpiece, covered by glass bell, can be used horizontally and vertically	1.10.0
The instrument works very well and can be recommended.	

Cathetometers for accurately reading Barometers: see Nos. 51,463—51,466, p. 224.

Cl. 870, 872, 3345, 4699, 873.



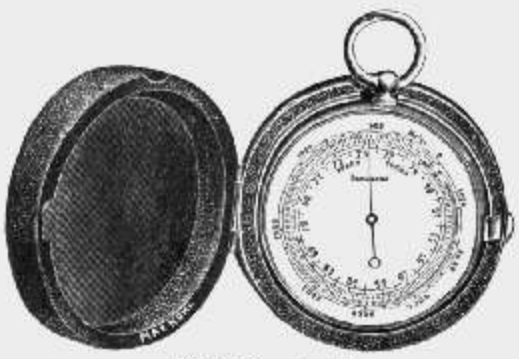
52 797. 1 : 3.



52 799. 1 : 1.



52 806. 1 : 3.



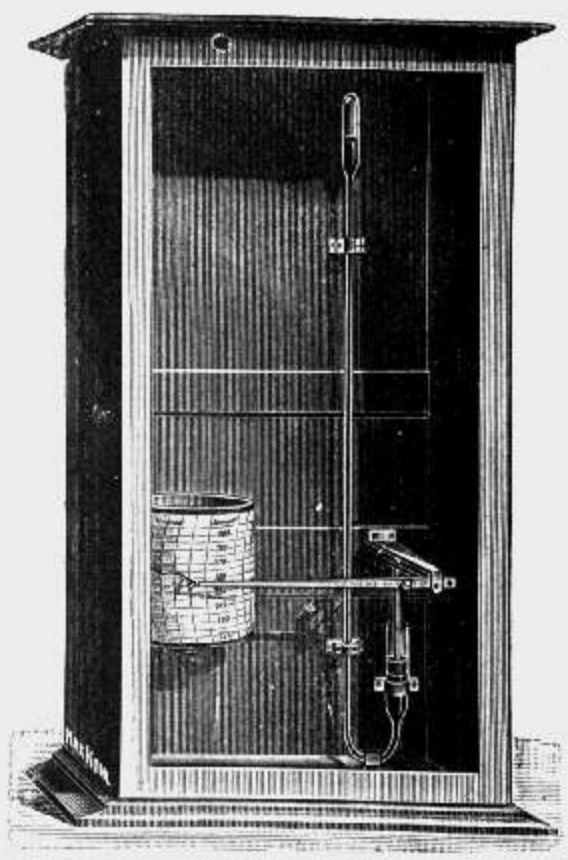
52 800. 1 : 2.



52 802. 1 : 3.



52 804. 1 : 2.



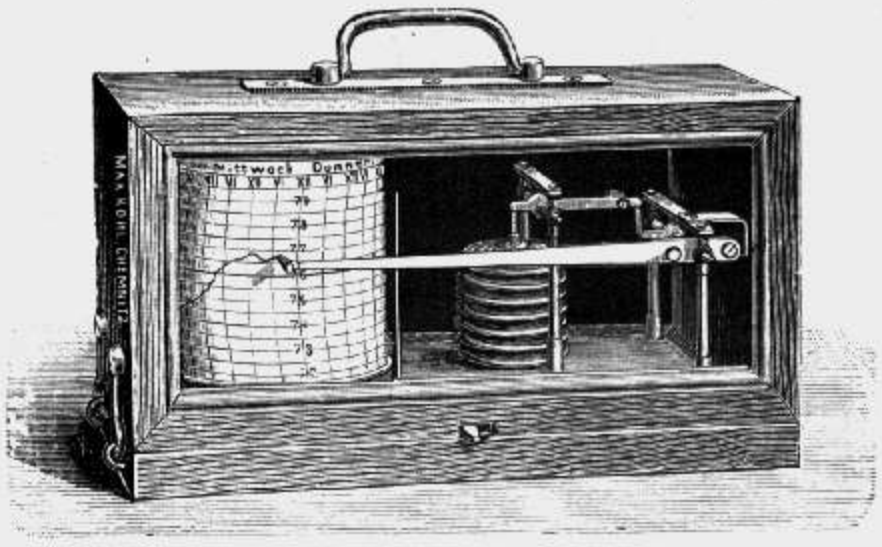
52 810. 1 : 12.

		£ s. d.
52,797.	**Levelling Barometer,** after Goldschmidt, Figure, for altitudes to 5000 m, accurate to approximately 2 m, with comparison table and thermometer, in case with carrying straps	5. 0. 0
52,798.	— idem, accurate to approx. 1 m	7.10. 0
52,799.	**Altitudinal Barometer,** Figure, with rotary scale, for altitudes from 0 to 2500 m	1.10. 0
52,800.	— idem, finest construction, compensated and gilt, Figure, in case, to 5000 m	2.15. 0
52,801.	— idem, with compass on back	3.16. 0
52,802.	**Altitudinal Barometer, Compass** and **Thermometer,** in case, Figure	2.10. 0
52,803.	— idem, smaller, watch-pocket form and finest construction.	4. 0. 0
52,804.	**Aneroid Barometer,** Figure, simple, in metal case, with open mechanism of 9 cm scale diameter	0.10. 0
52,805.	**Good Round Pattern Barometers,** in metal case or in wood frame. Price according to to construction . . . . . **£ 0.15. 0**	1.15. 0

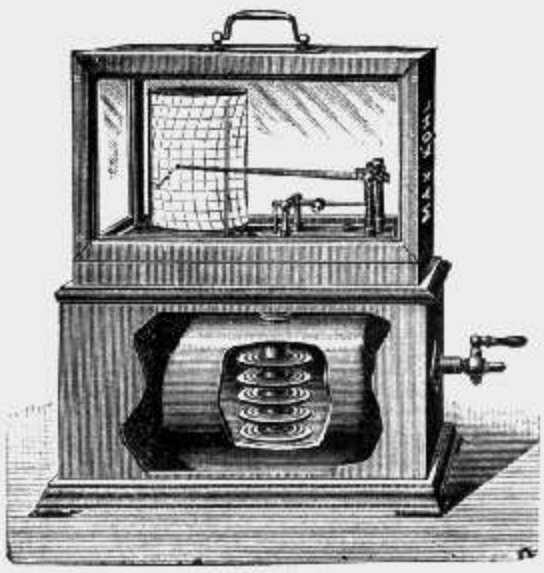
When ordering kindly state price.

Cl. 874, 875, 879, 876, 877, 878, 884.

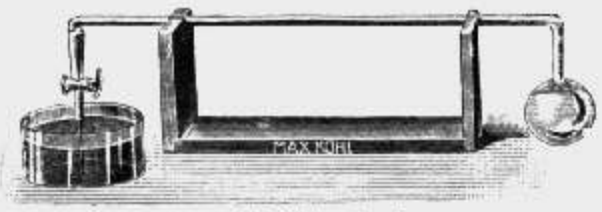
Max Kohl A. G. Chemnitz, Germany.



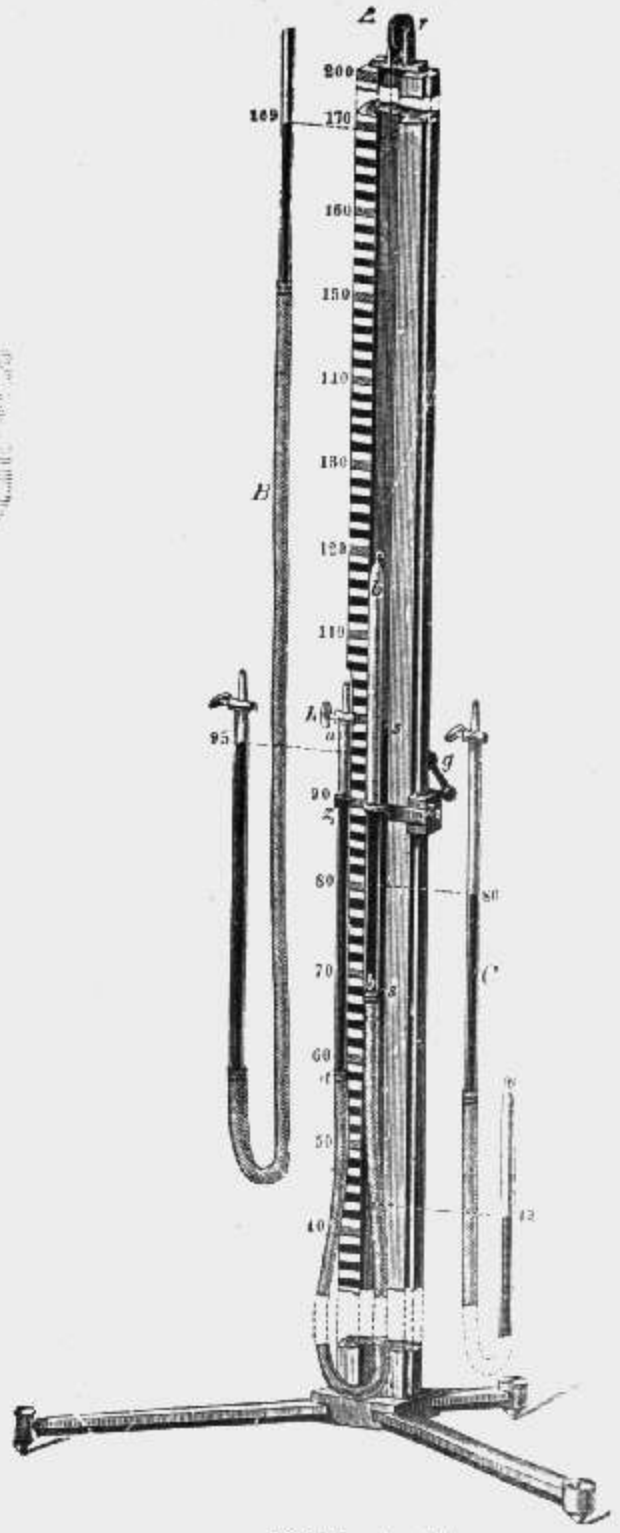
52 808. 1 : 3.



52 809. 1 : 7.



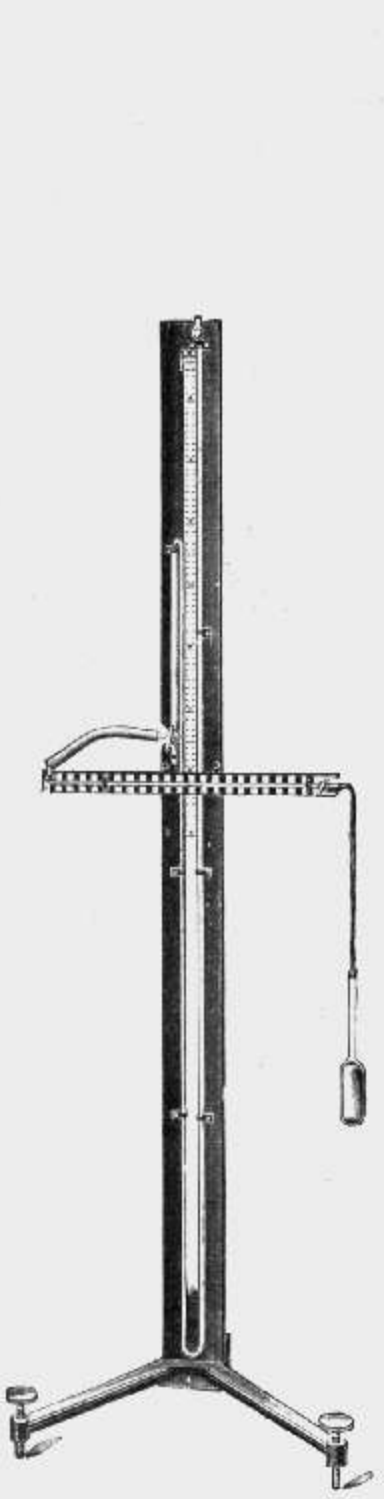
52 812. 1 : 7.



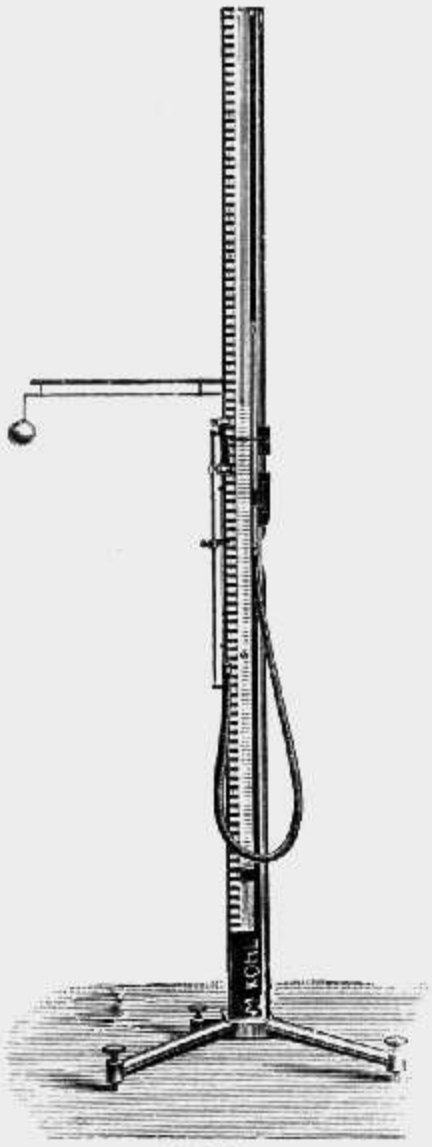
52 811. 1 : 10.

	£ s. d.
52,806. **Metal Barometer with Bourdon Tube,** Figure, 130 mm diameter, very sensitive	1. 10. 0
52,807. — idem, with scale 200 mm in diameter	2. 0. 0
52,808. **Aneroid Barograph,** Figure, with 8 boxes, 8-day mechanism	6. 0. 0
52,809. — idem, Figure, **highly sensitive,** with large deflection combined with high accuracy	17. 10. 0
This instrument is employed for investigating sudden fluctuations of pressure attendant on the occurrence of storms, cyclones and meteorological phenomena generally. As an amplitude of 10 or 25 mm is recorded for 1 mm pressure-difference, an estimation to 0.01 mm can be made.	
52,810. **Recording Mercurial Barometer,** Figure, a very accurately indicating instrument	15. 0. 0
Deflection on the drum amounting to 3 mm for every 1 mm of the mercury column.	
52,811. **Boyle's Law Apparatus,** Figure, after Feilitzsch, as altered by Weinhold (W. D., Fig. 139 [127]), 2.2 m high.	2. 14. 0
52,812. — idem, **with the addition of a Glass Vessel,** Figure (W. D., Fig. 344 [324]), to enable the apparatus to be used for determining the **coefficient of expansion of gases** at constant volume or as an **Air Thermometer**	3. 6. 0

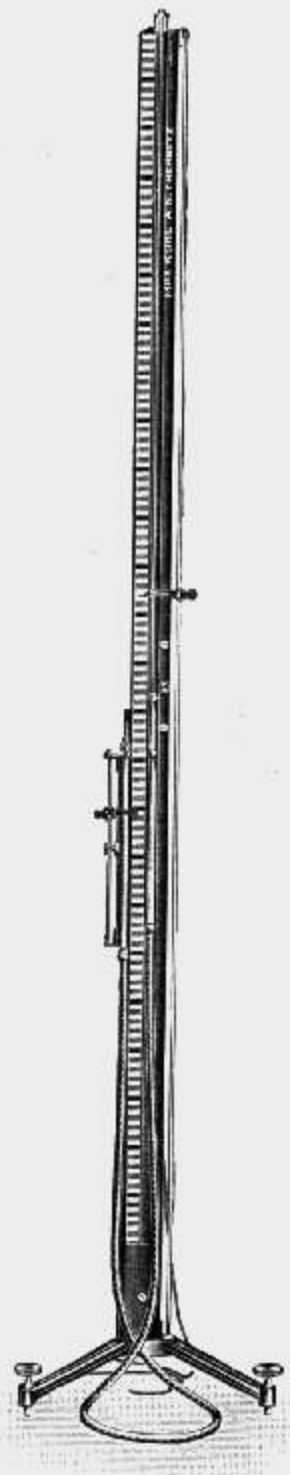
Cl. 880, 881, 886, 885.



52 813. 1 : 14.



52 814. 1 : 18.



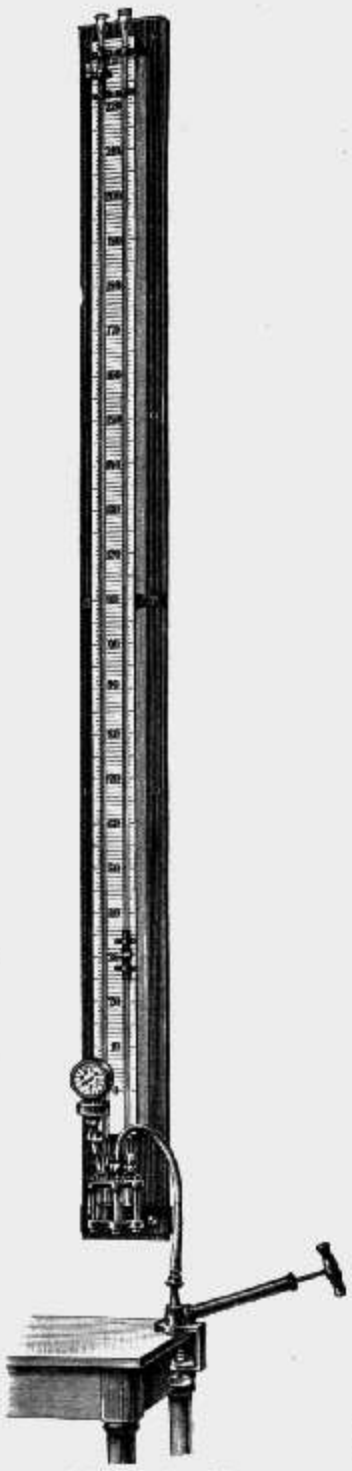
52 815 A. 1 : 14.



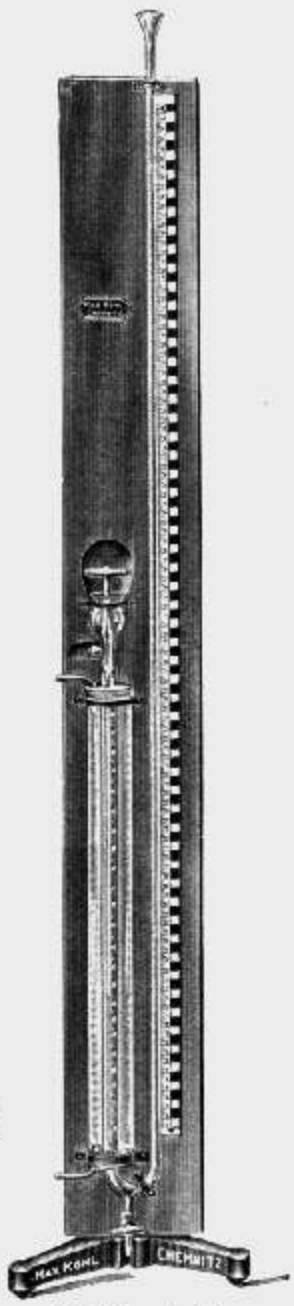
52 815 B. 1 : 15

Max Kohl A. G. Chemnitz, Germany.

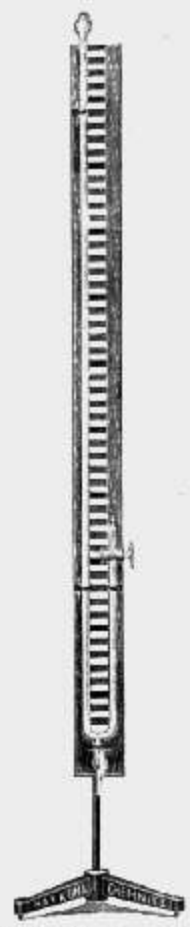
	£ s. d.
52,813. **Boyle's (Mariotte's) Law Apparatus,** after Friedr. C. G. Müller, Figure (Ztschr. f. d. phys. u. chem. U. **16**, 1903, p. 18; M. T., Fig. 85), can also be used as an **Air Thermometer**	4. 0. 0
The apparatus is for use in conjunction with a vacuum pump. It is possible by this arrangement to generate over-pressures to 2 atm., while still keeping the construction of the apparatus of a short form. In addition there is the advantage that the pressure gauge tube can be made entirely of glass without the use of rubber connections and that valves can be omitted. The horizontally arranged measuring tube is connected by a thick-walled rubber tube with the manometer tube by means of a 3-way cock, which also admits of connecting up to the vacuum pump by a separate attaching tube.	
52,814. — idem, after Pfaundler, Figure, 2.2 m high, with coloured centimeter graduation and with adjustable glass rule, 1 m long, resting in the centre of the rail, the glass rule having etched millimetre graduation. Apparatus can also be used as an **Air Thermometer**	6. 0. 0
52,815. **Boyle's (Mariotte's) Law Apparatus, large pattern,** 2.8 m high, Figure A, with glass vessel and accessories, Figure B, the use of the latter enabling the apparatus to be used as an **Air Thermometer**	7. 0. 0
52,816. **Boyle's (Mariotte's) Law Apparatus,** after Szekely, Figure, with spring pressure gauge and small force pump	14. 0. 0
The tubes are suitable for high pressure, being constructed of Jena glass and provided with steel	



52 816. 1 : 20.



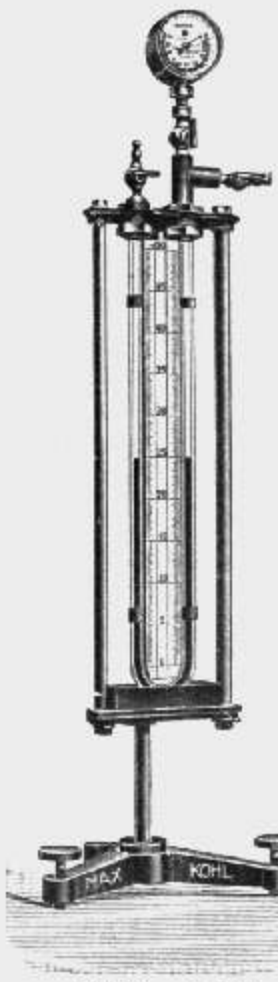
52 817. 1 : 9.



52 818. 1 : 12.



52 820. 1 : 12.



52 821. 1 : 10.

stopcocks. The scale is visible at a considerable distance. With both limbs the apparatus can be used to 2.5 atm. | £ s. d.

52,817. **Boyle's (Mariotte's) Law Apparatus,** after Huber, Figure, on iron stand and wood board, with two-coloured scale; can be used as an **Air Thermometer** 2. 0. 0

The pressure tube has a scale 1.10 m long with millimetre graduation and with black and white centimetre graduation visible at a considerable distance. The short arm has a graduation on glass, contains a thermometer closed by the upper aperture which must be pocked with mercury, and is enclosed in a cylinder of large diameter so that a uniform temperature of the gas to be investigated is maintained by a current of air or the like.

52,818. **Boyle's (Mariotte's) Law Apparatus,** Figure, **small pattern,** with fixed glass tube, 1 stopcock on the lower end, 1 stopcock on the short limb; scale with coloured graduation which is easily visible; on iron stand 1.1 m long 1. 4. 0

52,819. — idem, with fixed glass tube, with stopcock on the short limb 1. 0. 0

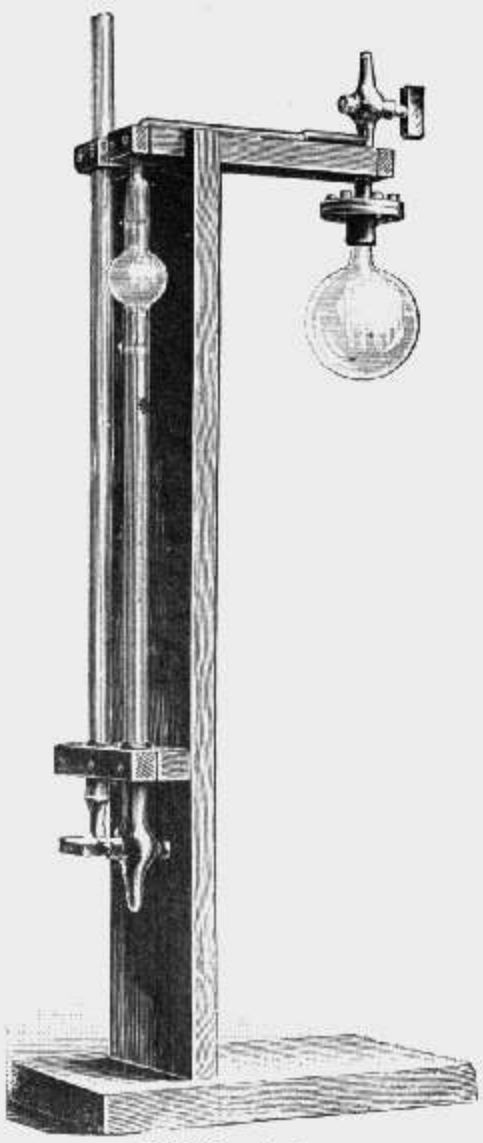
52,820. — idem, on polished board, with figured graduation, Figure, without glass stopcock (Gan.-Man., Fig. 151, 152) 1. 10. 0

52,821. — idem, after Hugh M. Browne, Figure, for pressures to 10 atm., with spring manometer and easily visible scale 4. 0. 0

The apparatus is easy to manipulate, is very substantially built and possesses steel stopcocks. The pressure is generated by leading in compressed air.

See also the Apparatus after Schaffers, Schneider and Lermantoff, on pp. 365 and 366, **also Barometer Tubles** Nos. 52,758—52,762, p. 371.

Cl. 894, 3346, 4776, 892, 893.



52 823. 1 : 7.



52 824. 1 : 10.



52 825.
1 : 8.



52 829.
1 : 5.



52 831. 1 : 6.



52 832. 1 : 7.



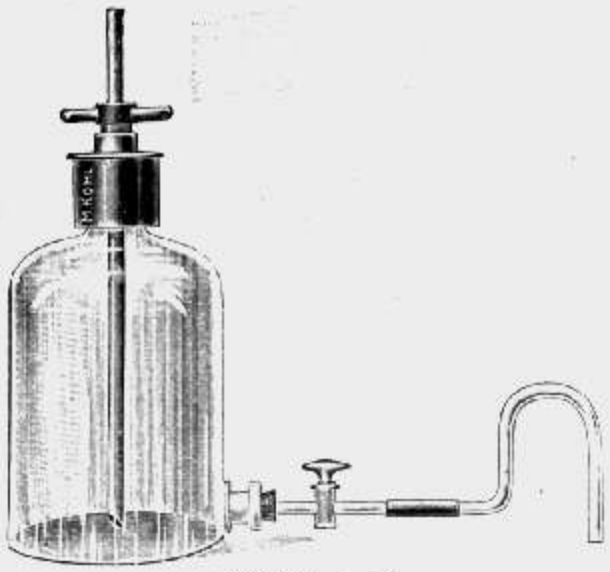
52 834. 1 : 6.

Max Kohl A. G. Chemnitz, Germany.

		£ s. d.
52,822.	**Air Thermometer,** for proving Mariotte's Law (Kleiber, Lehrb. f. Gymn., p. 107) .	0. 1. 0
52,823.	**Volumnometer,** after Regnault, Figure, for volume determinations on pulverulent and porous bodies; all stopcocks of steel (M. P., **I,** Figs. 488—492 [529—533]) . . .	3. 10. 0
52,824.	— idem, after Paalzow, Figure, with vessel which can be closed by a ground glass lid (Fr. phys. Techn. **I,** 2, Fig. 2764 [I, Fig. 291]; W. u. E. phys. Prakt., Fig. 51)	5. 0. 0
52,825.	**Stereometer,** after Say, Figure, for determining the volume and density of pulverulent bodies (M. P., **I,** Fig. 486 [527])	0. 6. 0
52,826.	**Bathometer,** of glass (W. D., Fig. 157 [144])	0. 5. 0
52,827.	**Vestal Sieve.**	0. 5. 0
52,828.	**Magic Jug**	0. 4. 0
52,829.	**Tantalus Cup,** Figure (Gan.-Man., Fig. 204)	0. 1. 6
52,830.	**Magic Pitcher**	0. 9. 0
52,831.	**Magic Tun,** Figure	1. 4. 0
52,832.	**Magic Funnel,** Figure	0. 4. 0
52,833.	**Inverted Float,** after Weinhold (W. D., Fig. 144 [131])	0. 3. 0
52,834.	**Mariotte's Bottle,** Figure, with 3 emission apertures	0. 10. 0
52,835.	— idem, after Friedr. C. G. Müller (M. T., Fig. 72)	0. 6. 0
52,836.	**Mariotte's Bottle,** with metal fittings, Figure (Gan.-Man., Fig. 190)	0. 15. 0
52,837.	**Large Mariotte Bottle,** 1 m high, Figure, with graduation and regulating discharge cock	3. 10. 0
52,838.	**Syphon,** of glass, Figure, 500 mm	0. 0. 6

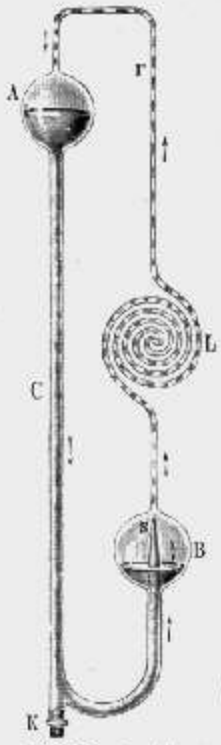
Cl. 3333, 897, 898, 895, 5389, 3955, 3349.

Max Kohl A. G. Chemnitz, Germany.



52 836. 1 : 6.





52849. 1 : 6.



52 852. 1 : 5.



52 853.
1 : 4.

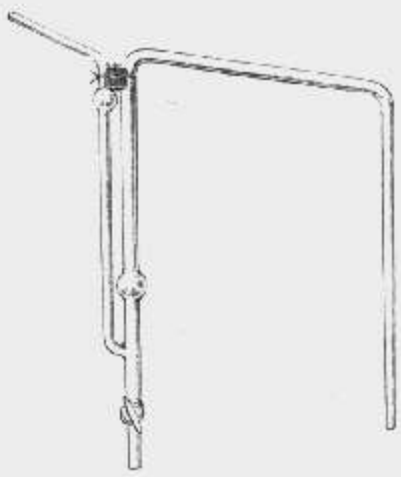


52 838. 1 : 6.



52 840. 1 : 6.

52 837. 1 : 8.

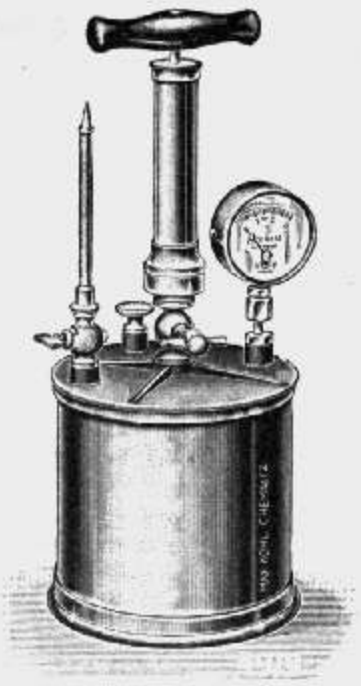


52 842. 1 : 8.

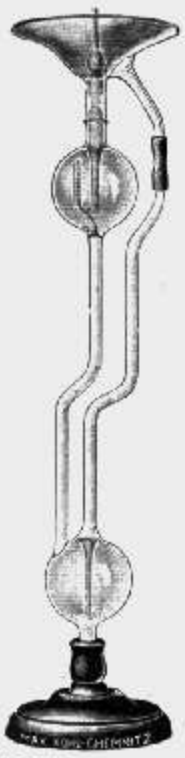


52 856. 1 : 4.

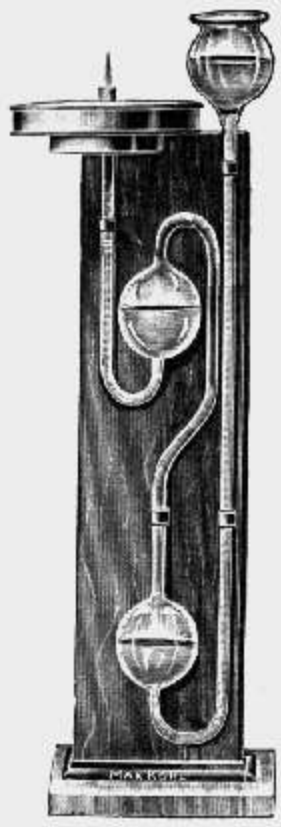
		£	s.	d.
52,839.	**Connecting Syphon** (M. T., Fig. 88)	0.	2.	0
52,840.	**Plunging Syphon,** of glass, Figure	0.	0.	6
52,841.	**Pipette** (Luhme's), with gutta-percha slab	0.	0.	9
52,842.	**Syphon for poisons,** of glass, with stopcock, Figure	0.	3.	0
52,843.	— idem, without stopcock	0.	2.	0
52,844.	**Poison Syphon for easily flowing liquids,** for use by blowing (W. D., Fig. 149)	0.	3.	0
52,845.	**Equal-limb Syphon** (W. D., Fig. 151 [138])	0.	3.	0
52,846.	**Syphon (Weinhold's)** (W. D., Fig. 152 [139]), with constricted tube	0.	2.	0
52,847.	**Discontinous Syphon** (W. D., Fig. 164)	0.	5.	0
52,848.	**Syphon Apparatus,** after Schulze (Fr. phys. Techn. **I**, 2, Fig. 2561)	2.	0.	0
52,849.	**Circulating Syphon,** Figure (M. P., **I**, Fig. 530)	0.	9.	0
52,850.	**Apparatus for showing the circulation of the blood,** 35 cm	0.	10.	0
52,851.	— idem, larger, 75 cm	1.	5.	0
52,852.	**Heron's Ball,** simple, with glass cock, Figure	0.	3.	0
52,853.	**Small Heron's Ball,** with brass cock, Figure	0.	5.	0
52,854.	**Heron's Ball,** screwed, with stopcock	0.	12.	0
52,855.	— idem, with rubber bellows	0.	16.	0
52,856.	**Heron's Ball with Force Pump,** Figure, constructed entirely of brass and glass; height: 30 cm	2.	0.	0



52 857. 1 : 7.



52 858. 1 : 8.



52 859. 1 : 8.



52 866. 1 : 8.



52 869.
1 : 9.



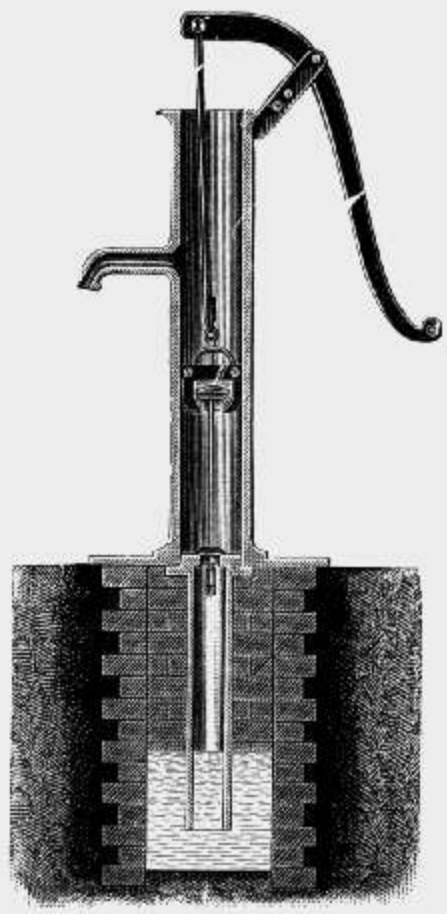
52 860. 1 : 10.



52 861.
1 : 8.



52 863. 1 : 10.



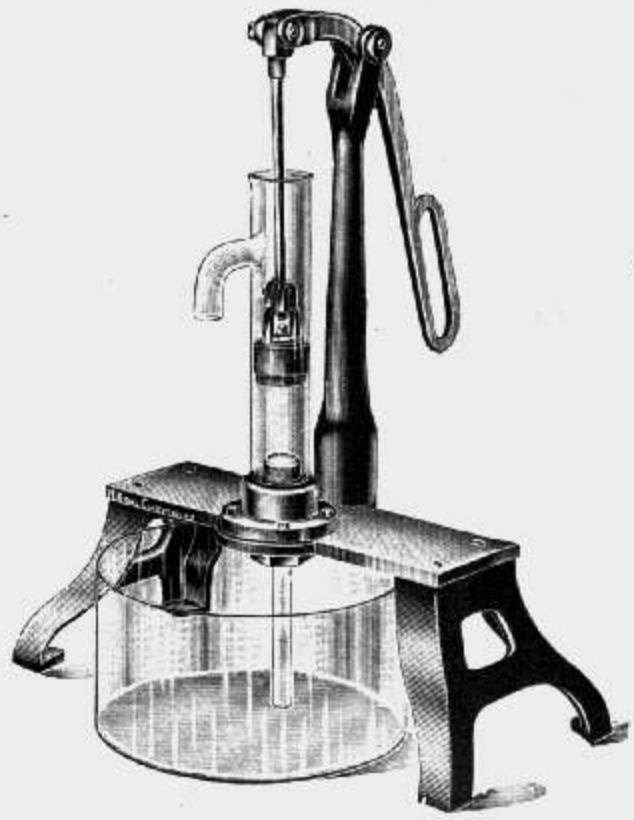
52 868. 1 : 5.

		£ s. d.
52,857.	**Heron's Ball with Force Pump, entirely of metal,** with spring pressure gauge, Figure	4. 10. 0
52,858.	**Heron's Fountain,** of glass, with base, Figure	0. 8. 0
52,859.	**Heron's Fountain,** with wood stand, Figure	0. 18. 0
52,860.	**Heron's Fountain, large,** Figure, with metal mounting, durably constructed, can be taken to pieces (Gan.-Man., Fig. 200)	2. 10. 0
52,861.	**Intermittent Fountain,** of glass, Figure (W. D., Fig. 155 [142])	0. 3. 6
52,862.	— idem, with iron stand	0. 6. 0
52,863.	— idem, large pattern, with metal mounts and metal basin, Figure	1. 14. 0
52,864.	**Cartesian Diver,** in cylindrical glass vessel with rubber bung	0. 2. 6
52,865.	— idem, after Weinhold (W. D., Fig. 156 [143]), with glass cylinder	0. 4. 0
52,866.	**Cartesian Diver,** Figure, in glass cylinder with metal screwed union and force pump	0. 12. 0

Cl. 4979, 906, 907, 911, 913, 908, 5835, 910, 912.



52 870. 1 : 5.



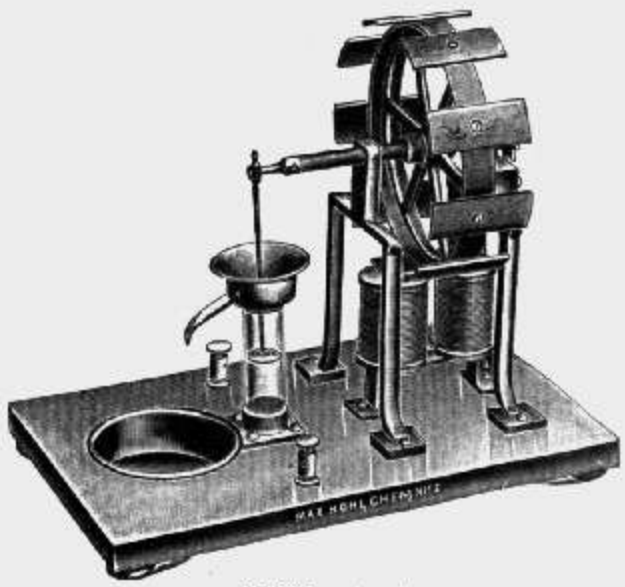
52 871. 1 : 5.



52 872. 1 : 6.



52 873. 1 : 6.



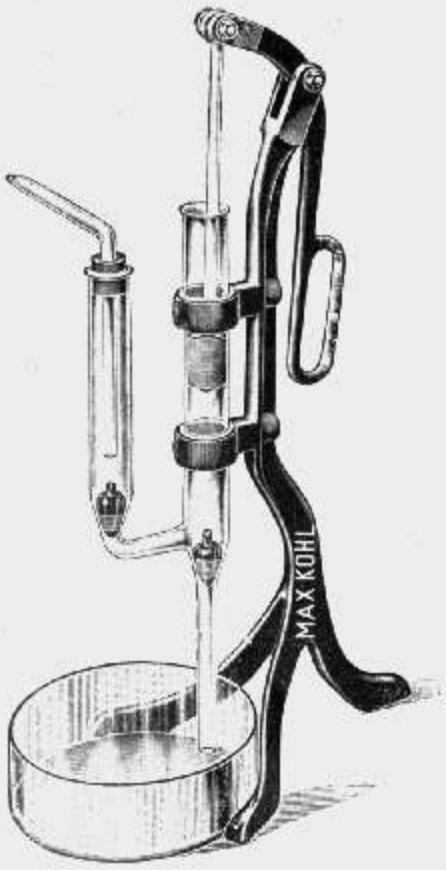
52 874. 1 : 4.



52 875. 1 : 9.

		£	s.	d.
52,867.	**6 Glass Tubes,** for setting up as a Cartesian Diver (M. T., Fig. 69)	0.	1.	0
52,868.	**Model of a Suction Pump,** Figure, with movable piston and movable valves .	1.	4.	0
52,869.	**Model of a Suction Pump,** of glass, Figure	0.	3.	0
52,870.	— idem, with metal stand, Figure	0.	12.	0
52,871.	— idem, of glass and metal, Figure	1.	8.	0
52,872.	**Model of a Suction Pump,** large and massive pattern, Figure, with brass valves visible at a distance, with iron stand; total height: 67 cm; diameter of cylinder: 57 mm	3.	4.	0
52,873.	**Model of a Suction Pump,** French form, Figure, finely constructed	3.	12.	0
52,874.	**Suction Pump,** with electric motor drive, Figure . . . . . For 4-volt D. C. current consumption = 1 ampere.	2.	0.	0
52,875.	**Model of a Force Pump,** of glass, Figure	0.	3.	6

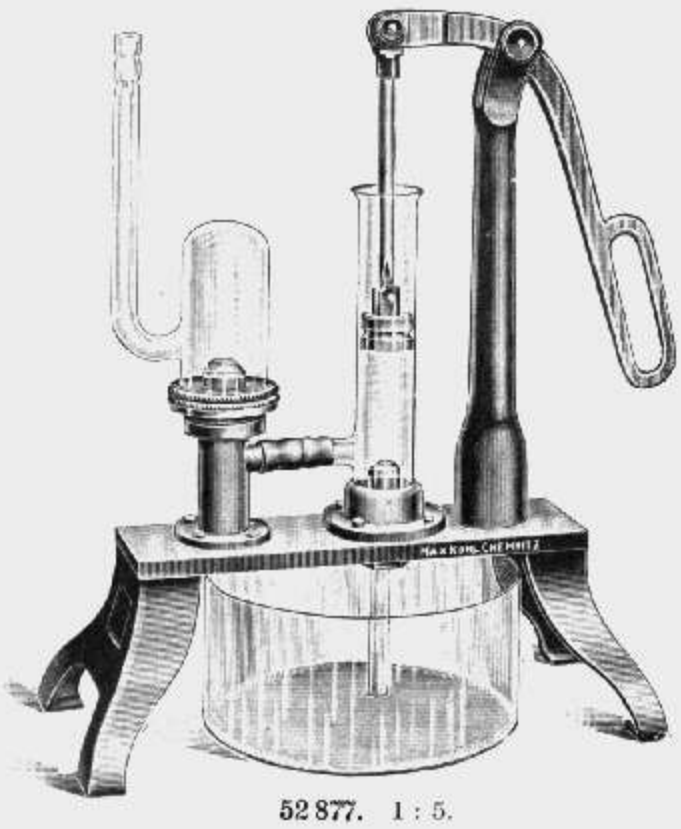
Cl. 914, 915, 916, 917, 923, 5884.



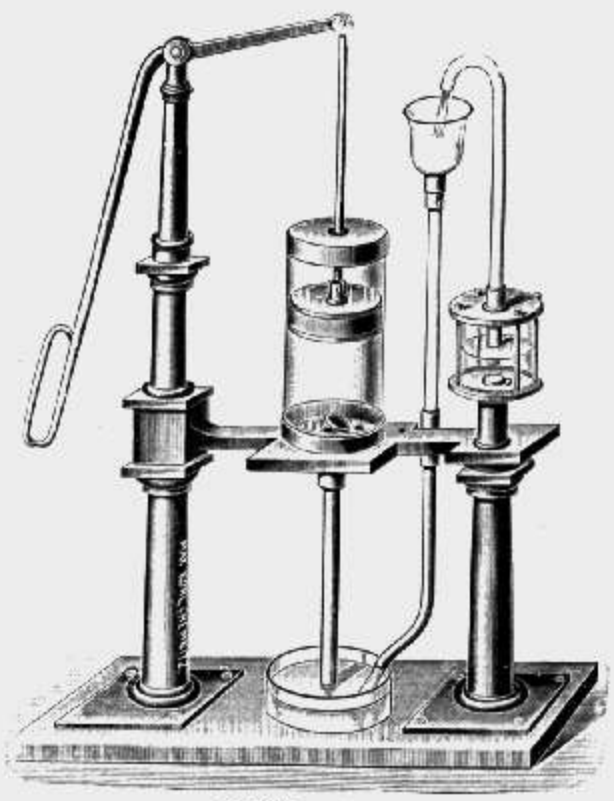
52 876. 1 : 5.



52 878. 1 : 5.



52 877. 1 : 5.

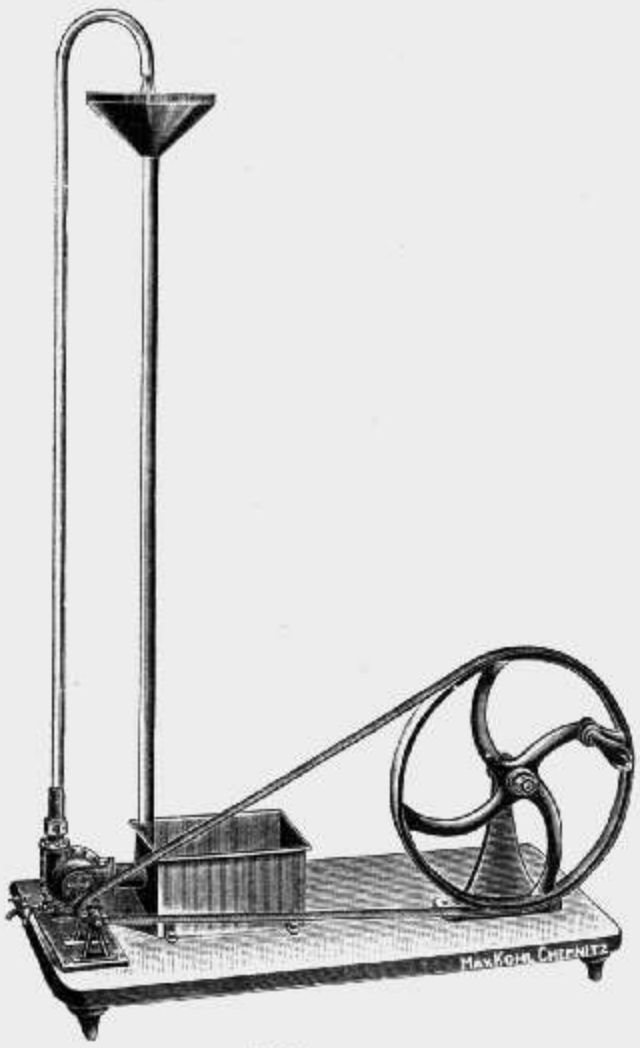


52 879. 1 : 6.

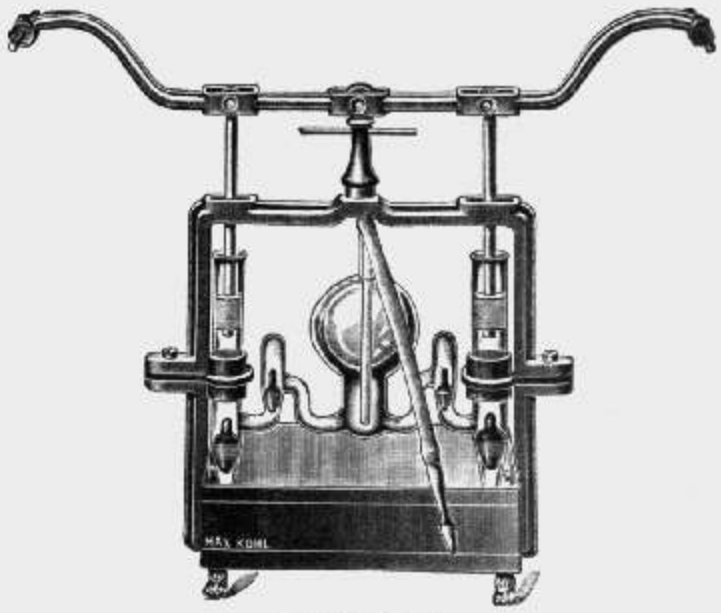
	£ s. d.
52,876. **Model of a Force Pump,** of glass, with metal stand, Figure	0.12.0
52,877. — idem, of glass and metal, larger and stouter construction, Figure	1.16.0
52,878. — idem, larger and stouter construction, Figure, with brass valves visible at a distance, with iron stand; total height: 67 cm; diameter of cylinder: 57 mm .	3.12.0

Cl. 919, 921, 920, 922.

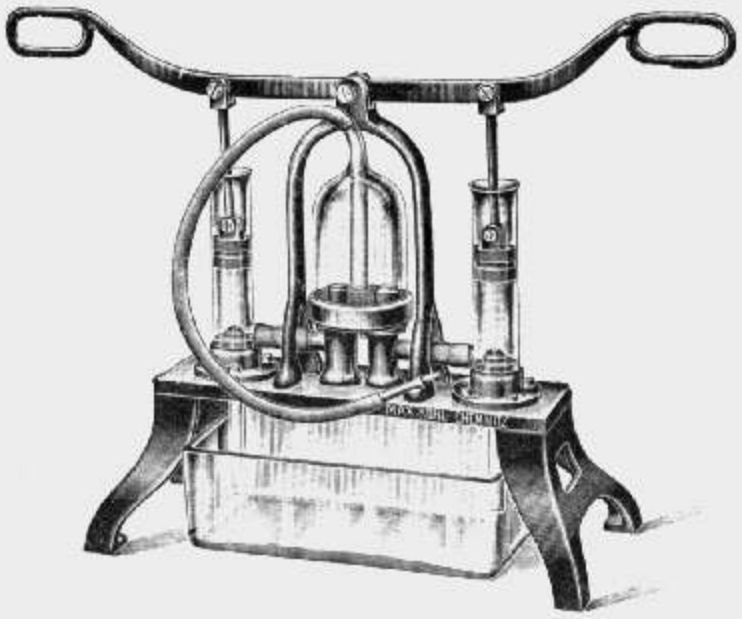
Max Kohl A. G. Chemnitz, Germany.



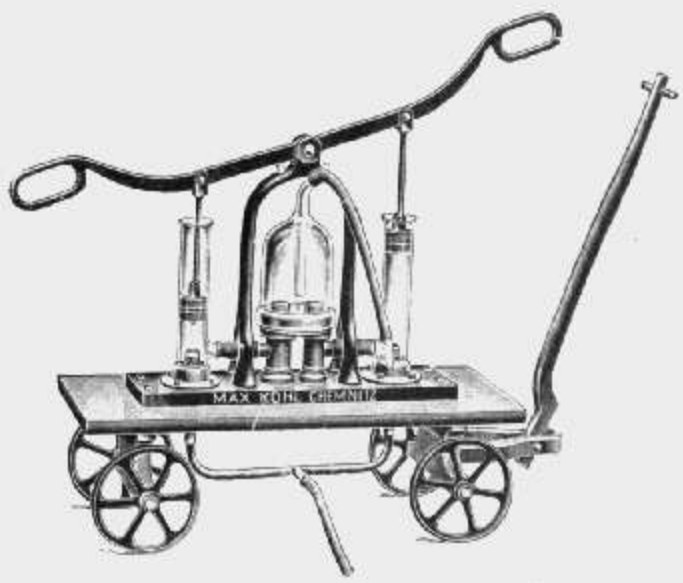
52 880. 1 : 10.



52 881. 1 : 5.

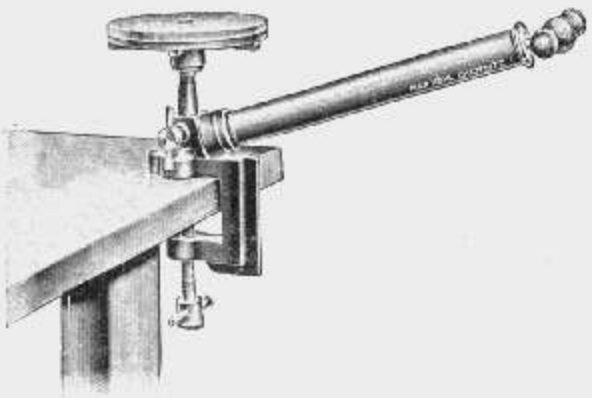


52 882. 1 : 6.



52 883. 1 : 8.

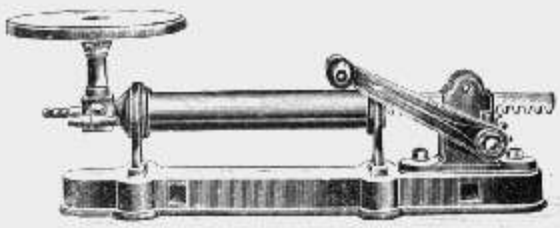
	£ s. d.
52,879. **Model of a Force Pump,** French form, Figure, of glass and metal, finely constructed	4. 4. 0
52,880. **Model of a Centrifugal Pump** with glass ascension pipe, of metal, Figure, mounted with drive on wood board	5. 0. 0
52,005. **Model of the Centrifugal Pump,** with visible mechanism, for the whirling table, after Hartl, see No. 52,005 on page 282	2. 15. 0
52,881. **Model of a Fire Engine,** of glass, in metal stand, Figure	1. 2. 0
52,882. — idem, of metal and glass, Figure	2. 14. 0
52,883. **Model of a Fire Engine on Carriage,** Figure	3. 12. 0



52 885. 1 : 8.



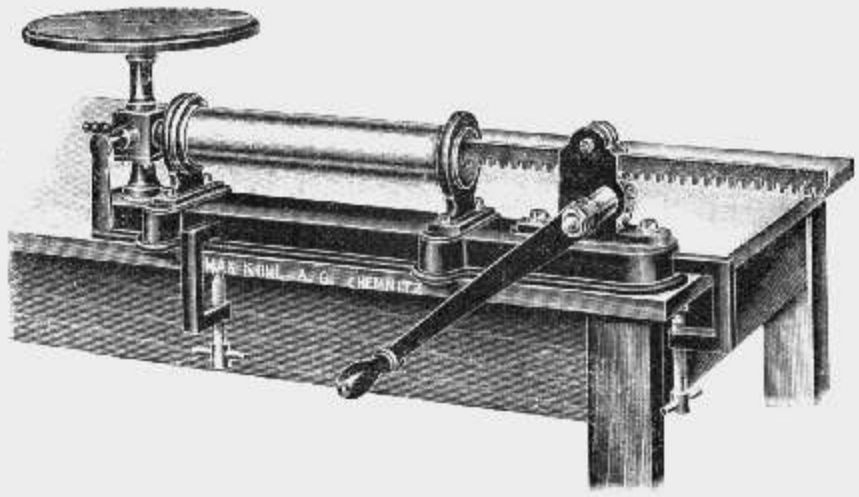
52 886 B. 1 : 5.



52 887. 1 : 10.



52 886 A. 1 : 8.



52 888. 1 : 10.

Motion of Gaseous Bodies.

Piston Vacuum Pumps of various Systems.

£ s. d.

52,884. **Small Stopcock Vacuum Pump,** on iron base, with obliquely inclined cylinder 28 mm internal diameter and 230 mm length, glass plate 140 mm diameter, piston for hand motion, without receiver 2. 0. 0

Largest **Receiver** for use with above: No. 53 009 . . . . . 0. 2. 0

52,885. — i d e m, mounted on massive iron screw clamp, F i g u r e, barrel 30 mm internal diameter, 300 mm long, piston for hand motion, glass plate 140 mm diameter (M. T. p. 121) 2. 0. 0

52,886. — i d e m, larger, Fig. 52,886 A, on massive Iron Base, with barrel 32 mm internal diameter and 280 mm length, glass plate 180 mm diameter, with one iron Screw Clamp, Fig. 52,886 B, for firmly clamping to the table, without receiver 3. 0. 0

Largest **Receiver** for use with above: No. 53,011 . . . . . 0. 3. 0

52,887. **Vacuum Pump,** F i g u r e, on heavy iron base, piston movable by rack and pinion, cylinder 40 mm diameter, 290 mm long, glass plate 200 mm diameter, steel cock, with large jack, to enable it to be turned even when the tallow is hard, **with 2 iron Screw Clamps,** see Fig. 52 886 B, without receiver 6. 0. 0

The freezing experiment with water and sulphuric acid can be carried out with this Vacuum Pump; a vacuum up to 4 mm mercury column is attained in a receiver containing up to 2 litres. — Largest receiver for use with above: No. 53,012 . . . . . 0. 4. 0

52,888. **Vacuum Pump,** F i g u r e, with cylinder 60 mm internal diameter and 350 mm length, glass plate 250 mm diameter (W. D. Fig. 165 [152]), **with 2 iron Screw Clamps,** see Fig. 52,886 B, without receiver 8. 0. 0

Largest **Receiver** for use with above: Nr. 53,014 . . . . . 0. 5. 6

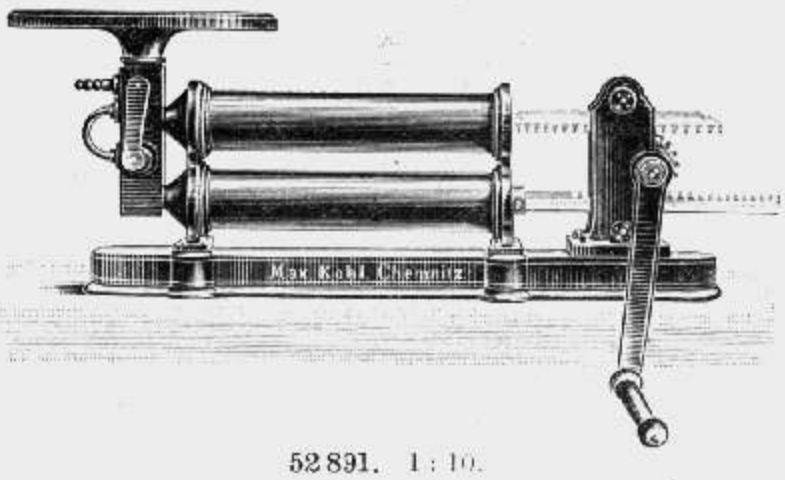
It is, however, advisable to select the next smallest, No. 53,013 . . . . . 0. 4. 9

52,889. — i d e m, with **Barometer Gauge** attached, **with two iron Screw Clamps,** see Fig. 52 886 B 9. 0. 0

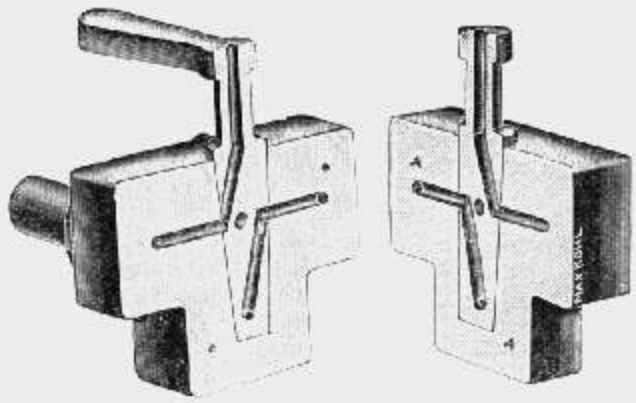
Water Air Pumps: see pp. 22—27.

Cl. 3885, 932, 931, 929, 5392.

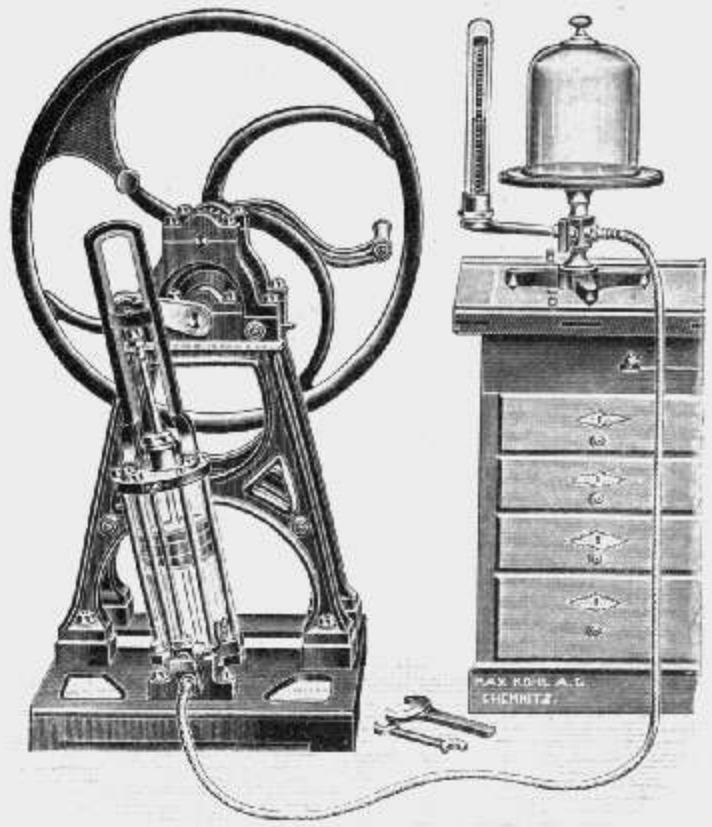
Max Kohl A. G. Chemnitz, Germany.



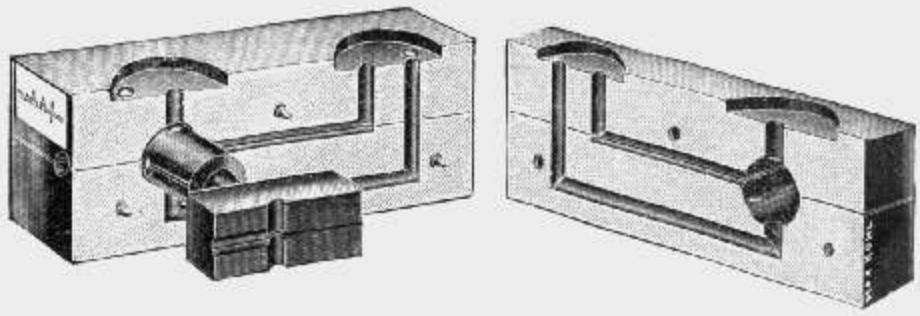
52 891. 1 : 10.



52 893. 1 : 4

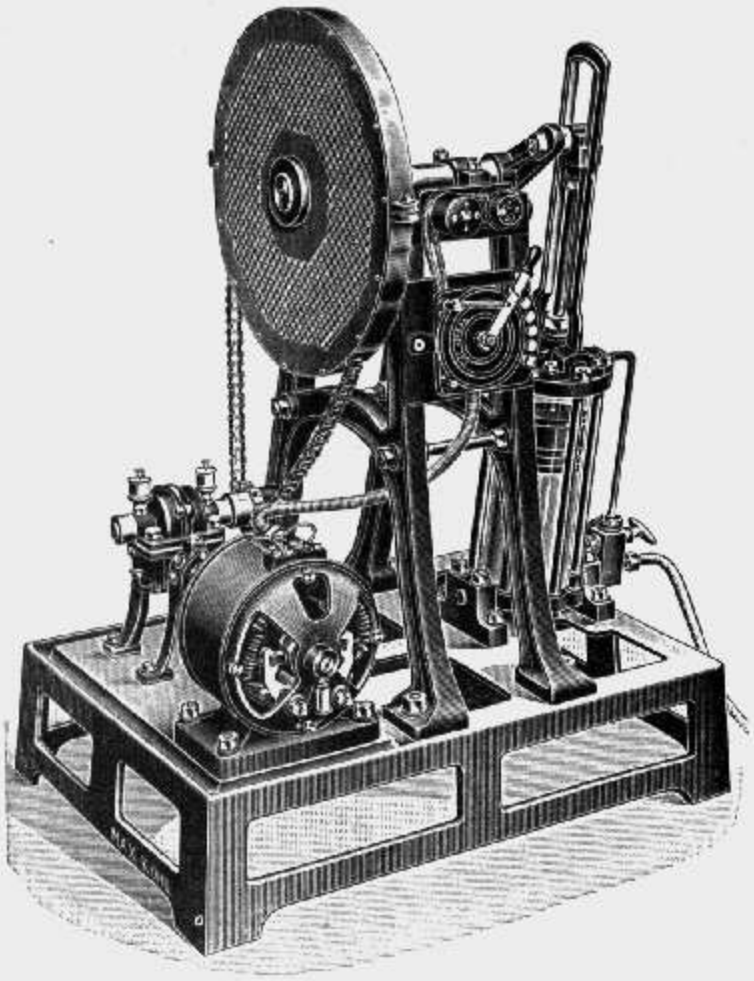


52 894. 1 : 5.

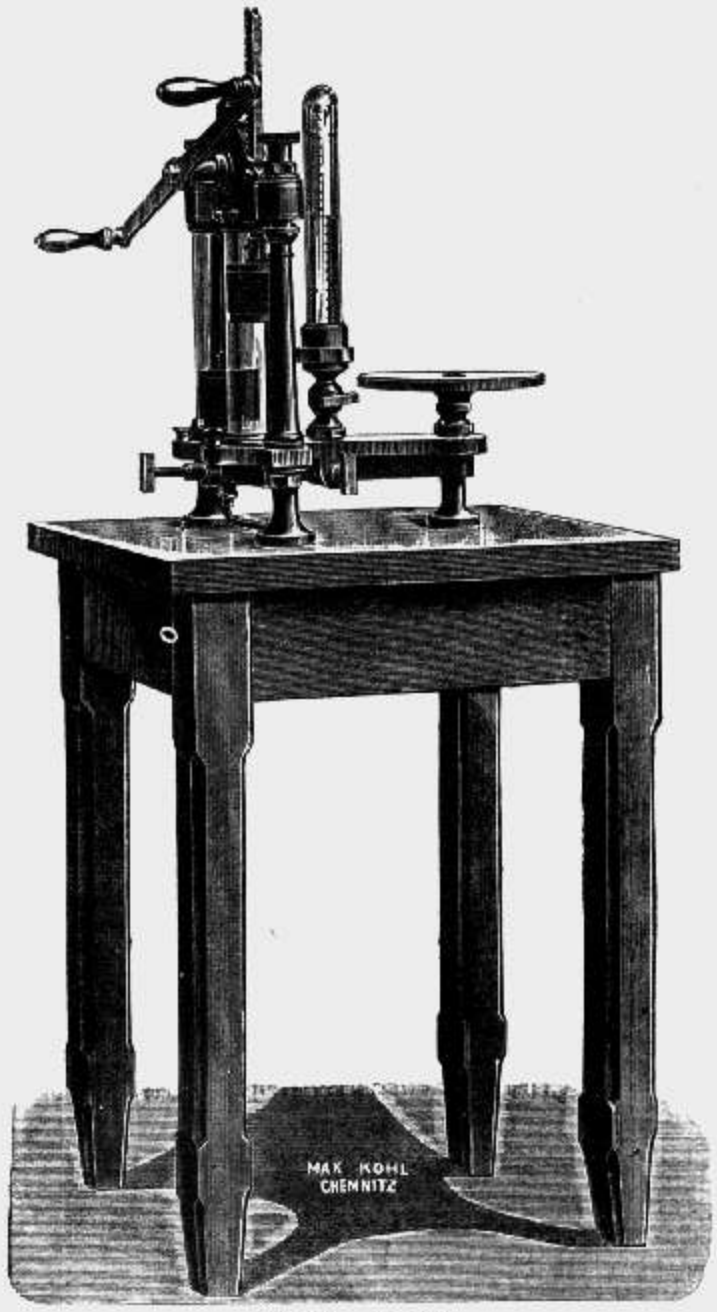


52 892. 1 : 4.

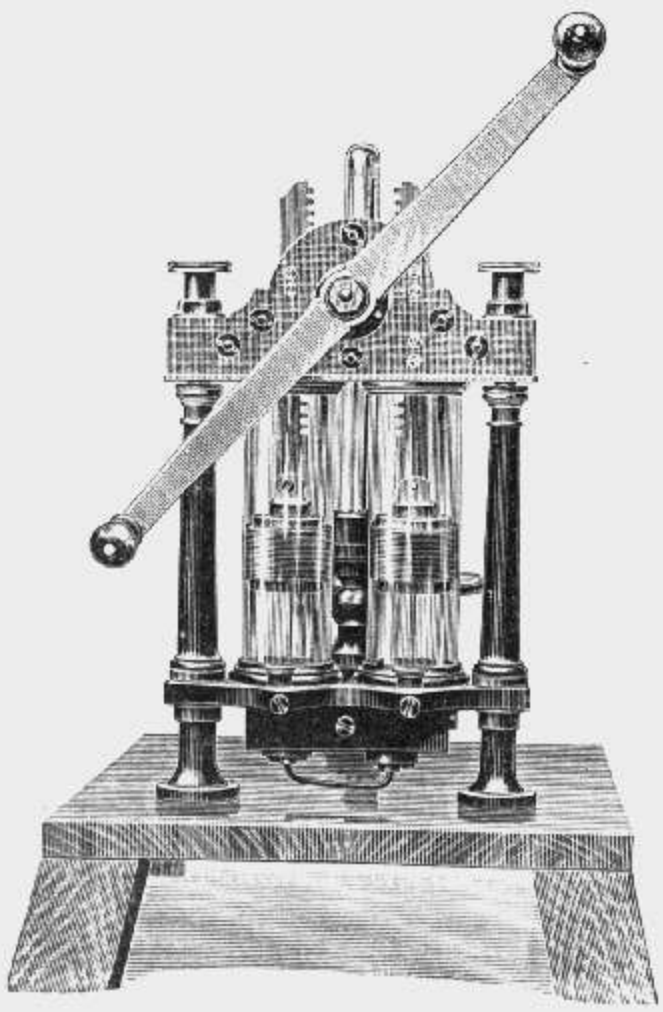
	£ s. d.
52,890. **Device** for considerably rarifying the air in the clearance before each stroke. **Extra price**	1. 4. 0
Can only be used for Pumps Nos. 52,887, 52,888 and 52,889.	
52,891. **Stopcock Vacuum Pump with 2 Barrels,** Figure, barrels 60 mm internal diameter and 350 mm length, with glass plate 280 mm diameter, with Grassmann cock for entirely obviating the influence of clearance; without receiver	15. 10. 0
This Vacuum Pump rarifies twice as quickly as a single-barrel one and exhausts up to 1.5 or 2 mm.	
Largest **Receiver** for use with above: No. 53,015	0. 6. 6
52,892. **Model of a Babinet Vacuum Pump Stopcock,** Figure, of wood	1. 0. 0
52,893. **Model of a Grassmann Vacuum Pump Stopcock,** Figure, of wood	1. 0. 0
52,894. **Vacuum Pump after Bianchi,** Figure, with Glass Barrel, double-acting, with steel valves placed outside the barrel, with steel Babinet stopcock, very nicely constructed, with neat, firm iron base; **Glass Plate** 280 mm diameter on special tripod, with **Barometer Gauge,** 300 mm high, firmly attached; connecting tubing screwed at both ends	31. 0. 0
The Vacuum Pump gives 4 mm for large and 2 mm exhaustion for small receivers in an extraordinarily short space of time. The valves — contrary to the original construction described in most text-books — being placed outside the cylinder can be very easily cleaned. **Price is exclusive of Receivers.** Largest **Receiver** for use with above: No. 53,015	0. 6. 6



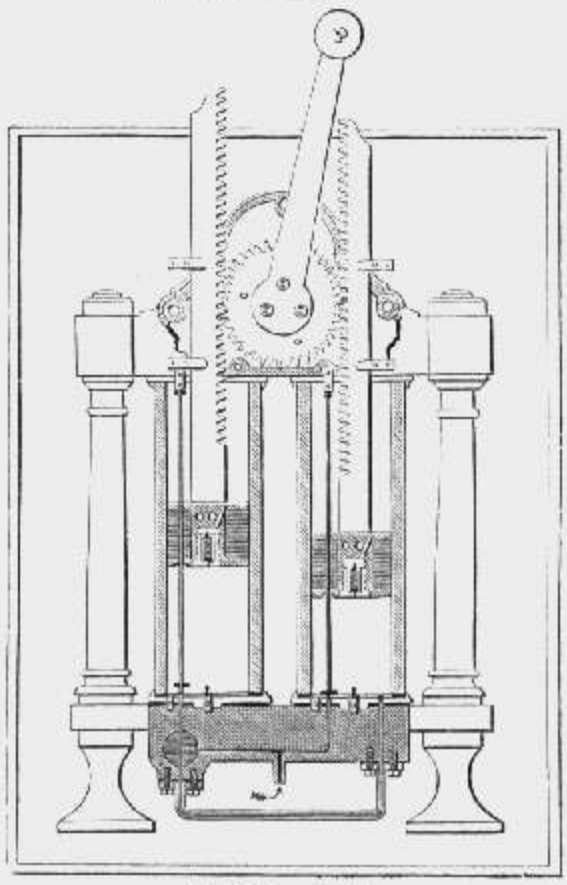
52 895. 1 : 12.



52 897. 1 : 10.

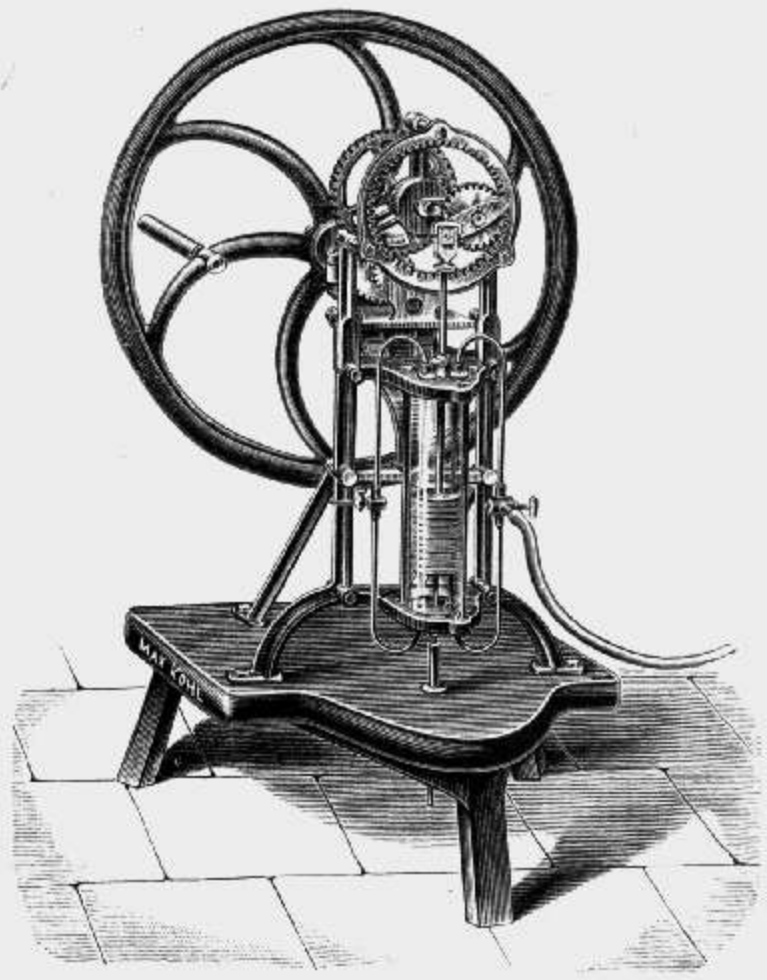


52 898. 1 : 7.



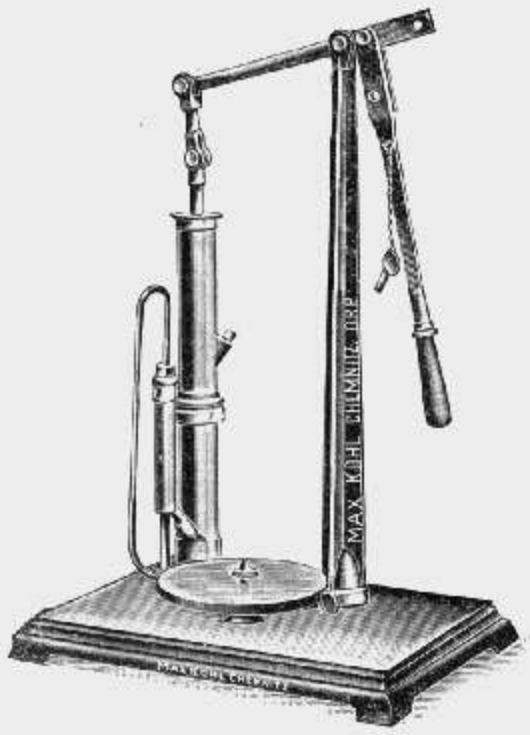
52 900. 1 : 10.

(1. 936, 938, 939, 940.



52 896. 1 : 11.

	£ s. d.
52,895. **Vacuum Pump after Bianchi, with Electric Motor Drive,** worm gearing and chain transmission, Figure, with glass barrel, double-acting, with Steel Valves placed outside the barrel, with steel Babinet stopcock, with firm iron stand, **Glass Plate** 280 mm diameter on special tripod with **Barometer Gauge,** 300 mm high, firmly attached, No. 50,142, cf. Fig. 52,894 on p. 387, connecting tubing screwed at both ends . . .	55. 0. 0
Price exclusive of Receivers. Largest **Receiver** for use with above: No. 53,015	0. 6. 6
The pump is driven by a 1/3rd H. P. Direct Current Motor. The following are included in the price: Starting Rheostat, 1 double-pole Switch and 1 Plug Box with plug. When ordering, kindly state kind of current and voltage. If this is not given we supply the motor for a pressure of 110 volts D. C.	
52,896. **Vacuum Pump after Deleuil,** Figure, with glass barrel 90 mm internal diameter and 320 mm height, metal piston with guide passing freely in the cylinder, with Babinet cock, with neat iron stand; can be used for evacuating and compressing; all cocks of steel; **Glass Plate** 280 mm diameter on special tripod, with **Barometer Gauge** 300 mm high	33. 0. 0
Price exclusive of Receivers. Largest **Receiver** for use with above: No. 53,015	0. 6. 6
52,897. **Vacuum Pump with 2 Vertical Glass Barrels,** Figure, 55 mm internal diameter and 220 mm height; with **Glass Plate** 250 mm diameter and **Barometer Gauge** 300 mm high, with steel valves fitted outside the cylinder and with steel Babinet cock; **on polished Oak Table**	20. 0. 0
Price exclusive of Receivers. Largest **Receiver** for use with above: No. 53,014	0. 5. 6
It is advisable, however, to choose the next smallest, No. 53,013	0. 4. 9
52,898. — idem, on low oak block, Figure	18. 0. 0
52,899. — idem, with glass barrels **50 mm** internal diameter, **200 mm** high, **Barometer Gauge** 200 mm high	15. 0. 0
52,900. **Model of a Double Barrel Vacuum Pump,** Figure, of wood, pasteboard and metal, showing plainly the play of the pistons, valves and rods, with Babinet cock	3. 0. 0



52 901. 1 : 10.



52 903. 1 : 10.

High-Vacuum Pumps with Oil-packed Piston, Kohl's System, German Patent.

The advantages of these Oil Vacuum Pumps are that they are very easy to work, generate a high vacuum, are rapid in their action, and can be run in a simple, convenient and clean manner without any special preparation. The Oil Pumps yield in a few minutes what it takes the Sprengel mercury vacuum pump 1 hour to attain. These pumps are therefore peculiarly adapted both for demonstration purposes and specially for rapid working in laboratories.

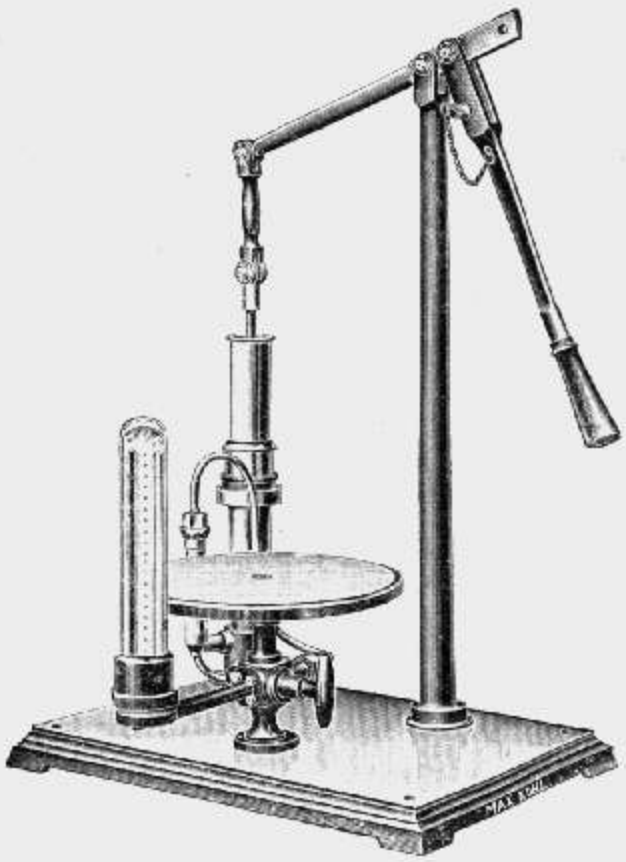
We would remark that in all pumps for which a vacuum of 0.0014 mm mercury column is guaranteed, **a vacuum of 0.0008 mm** can be reached.

Every Oil Vacuum Pump is accompanied by a Test Certificate. The test is made in our shops with the MacLeod Vacuum Gauge having a 500 ccm measuring bulb (see No. 52,746).

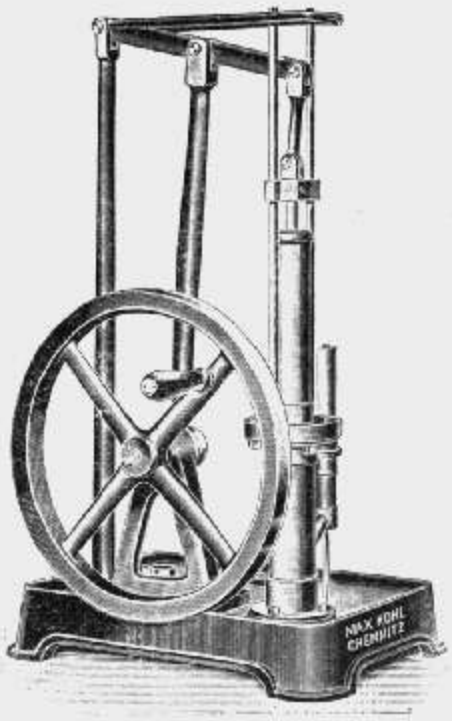
If, in the case of Pumps fitted with Electric Motors, a motor is desired for a different kind of current or a different voltage from that quoted, a corresponding change in price is made. When ordering pumps with electric motor drive, the type of current, network voltage (and in the case of alternating or three-phase current, the freqency also) should be stated on each occasion.

Complete description sent if desired.

	£ s. d.
52,901. **Vacuum Pump with Oil-packed Piston** and oil non-return valve, Kohl's system, German Patent, Figure, with hand lever, with 1 barrel 40 mm internal diameter, stroke 160 mm; with **Plate** 180 mm diameter, without receiver	5. 0. 0
The pump exhausts to $^1/_{50}$th mm. Largest **Receiver** which can be used: No. 53 011	0. 3. 0
52,902. — idem, with Fly-Wheel, for Hand and Power Drive, cf. Fig. 52,909	6. 10. 0
52,903. **Vacuum Pump with Oil-packed Piston** and oil non-return valve, Kohl's system, German Patent; **larger,** Figure; with Hand Lever, with 1 Barrel 50 mm internal diameter; Stroke 160 mm; without Plate or Receiver	6. 0. 0
The pump exhausts to $^1/_{40}$th **mm.**	
52,904. — idem, with Hand Lever, with **Plate** 240 mm diameter, and **Barometer Gauge** 200 mm high, Figure	8. 10. 0
Largest **Receiver** that can be used: No. 53,013	0. 4. 9
52,905. — idem, with Fly-wheel, for Hand and Power Drive, without Plate, cf. Fig. 52,909	7. 10. 0
52,906. — idem, with Fly-wheel and with **Plate** 240 mm diameter and **Barometer-Gauge** 200 mm high	10. 0. 0
52,907. **Vacuum Pump with Oil-packed Piston** and oil non-return valve, Kohl's system, German Patent, Figure, with Hand Lever, larger than preceding; with 1 Barrel 60 mm internal diameter; Stroke 190 mm; without Plate	8. 10. 0
The pump exhausts to $^1/_{50}$th **mm.**	



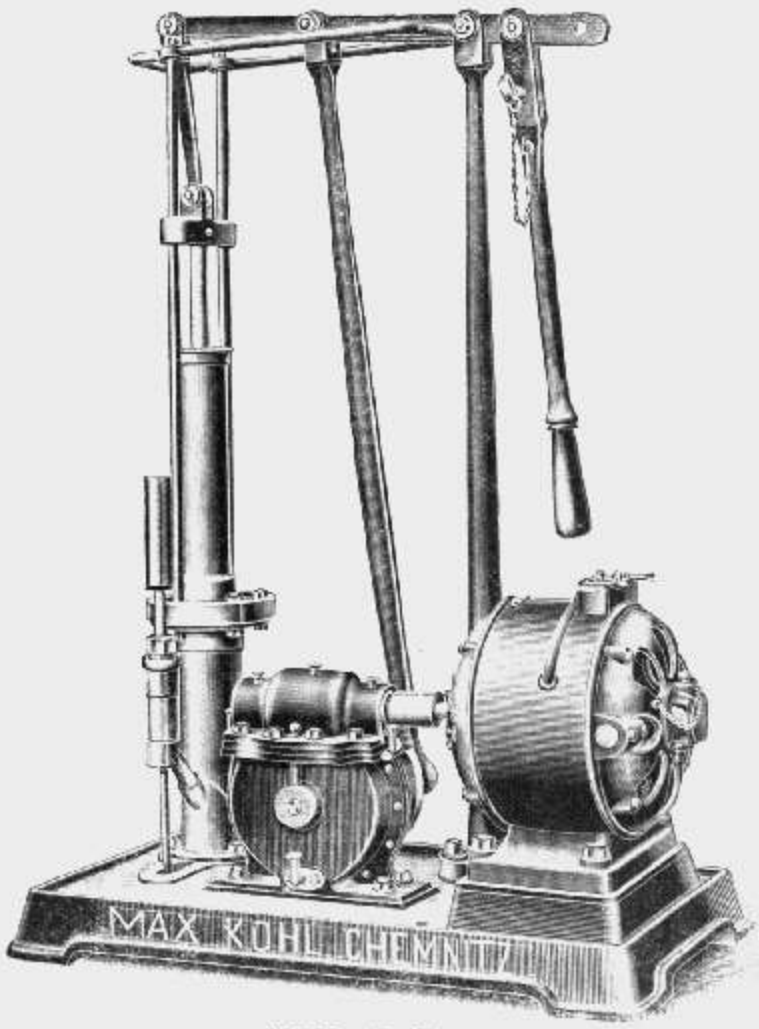
52 904. 1 : 10.



52 909. 1 : 10.



52 907. 1 : 9.

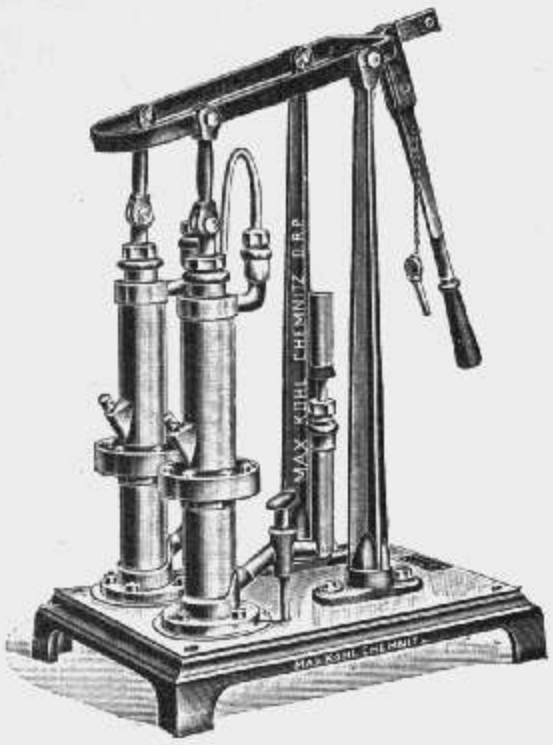


52 911. 1 : 10.

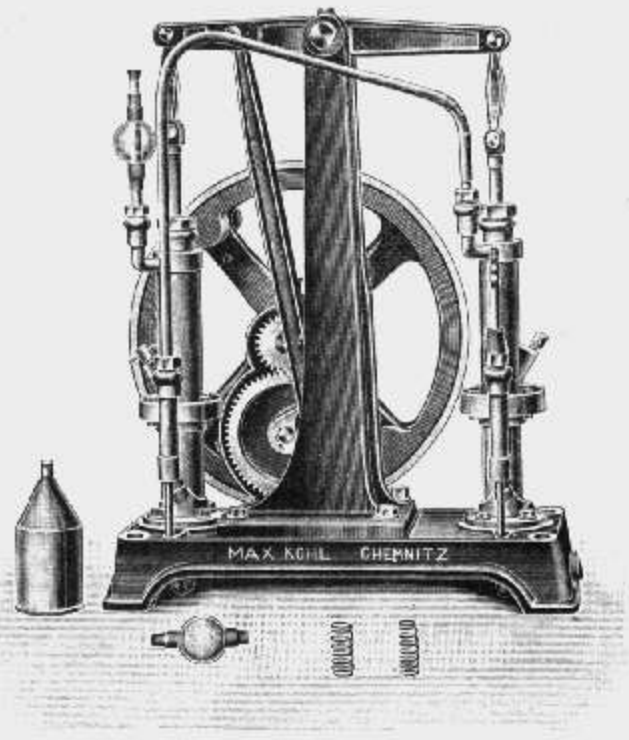
	£	s.	d.
52,908. **Vacuum Pump with Oil-packed Piston** and oil non-return valve, Kohl's system, German Patent; with Hand Lever and with **Plate** 240 mm diameter and **Barometer Gauge** 200 mm high	11.	0.	0
52,909. — i d e m, with Fly-wheel, for Hand and Power Drive, without Plate, F i g u r e	10.	0.	0
52,910. — i d e m, with Fly-wheel and with **Plate** 240 mm diameter and **Barometer Gauge** 200 mm high	12.	10.	0
Largest **Receiver** for use with above: No. 53,013	0.	4.	9
52,911. — i d e m, **driven by a $^1/_6$th H. P. Electric Motor** with worm gearing, motor for **110 volt** Direct Current, with Starter, without Plate, F i g u r e	22	10.	0

Vacuum Pumps No. 52,903—52,910 are specially intended for rapid work in laboratories.

Cl. 943, 3652, 4711, 4713.



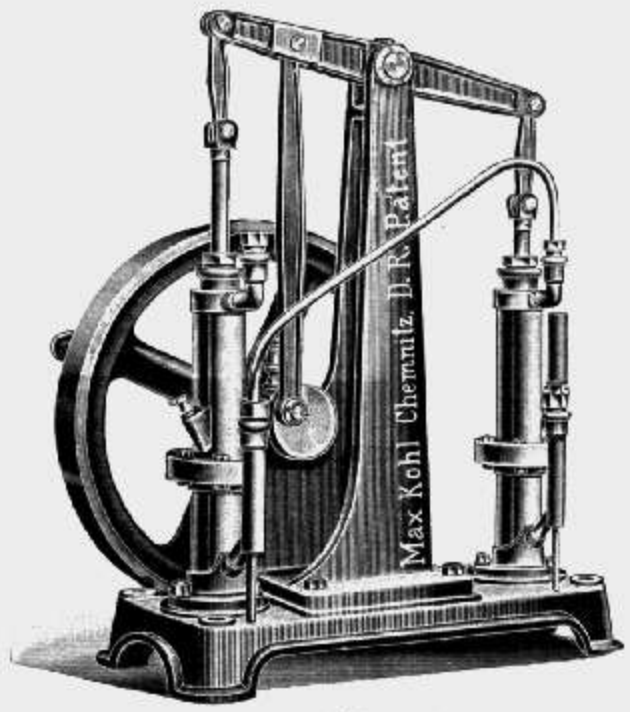
52 915. 1 : 10.



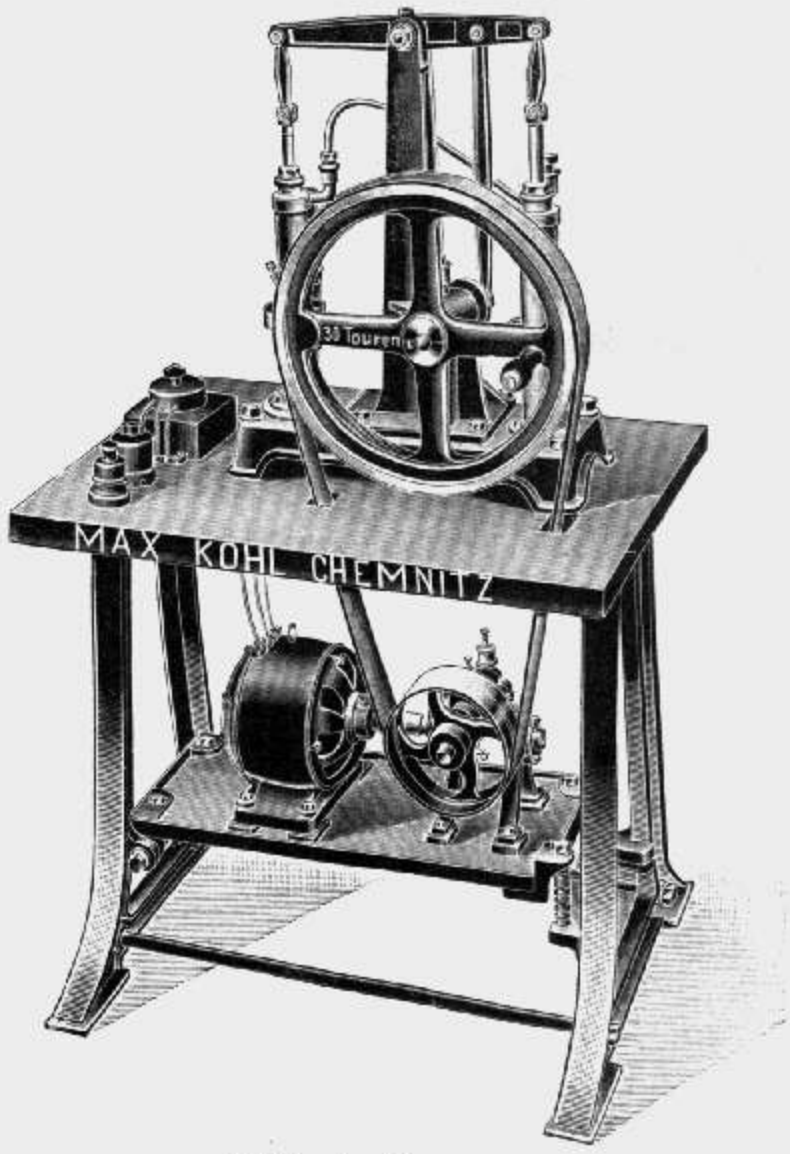
52 917. 1 : 8.

	£ s. d.
52,912. **Vacuum Pump** as No. 52,911, with **220 volt** D. C. Motor	23. 5. 0
52,913. — i d e m, with **Plate** 240 mm diameter and **Barometer Gauge** 200 mm high; **110 volt** D. C. Electric Motor	25. 0. 0
Largest **Receiver** for use with above: No. 53,013	0. 4. 9
52,914. — i d e m, with **220 volt** D. C. Electric Motor	25. 15. 0
52,915. **Duplex Vacuum Pump with Oil-packed Piston** and oil non-return valve, Kohl's system, German Patent, F i g u r e, with Hand Lever, 2 Barrels of the same size 50 mm in internal diameter; Stroke 120 mm, for exhausting glow lamps and X-Ray Tubes as well as for rapidly obtaining a vacuum, without Plate	17. 10. 0
The pump exhausts to $^1/_{500}$th **mm**.	
52,916. — i d e m, with **Plate** 240 mm diameter and **Barometer Gauge** 200 mm high . .	20. 0. 0
Largest **Receiver** for use with above: No. 53,013	0. 4. 9
52,917. **Duplex Vacuum Pump with Oil-packed Piston** and oil non-return valve, Kohl's system, German Patent, with Fly-wheel and Gearing, F i g u r e, for Hand and Motor Drive, with 2 Barrels of same size of 50 mm internal diameter; Stroke 120 mm; without Plate	24. 10. 0
The pump exhausts to **0.0014 mm.**	
To facilitate the working of the Pump, especially when commencing to pump, we have provided the pump with a toothed wheel gearing, as experience shows that it is much easier to expend a small amount of energy in turning a wheel 80—100 times a minute than to turn one 30—50 times a minute with a correspondingly larger amount of energy. The cog-wheels are cased in.	
52,918. — i d e m, with **Plate** 240 mm diameter and **Barometer Gauge** 200 mm high . .	27. 0. 0
Largest **Receiver** for use with above: No. 53,013	0. 4. 9
52,919. **Duplex Vacuum Pump with Oil-packed Piston** and oil non-return valve, Kohl's system, German Patent, F i g u r e, with Fly-wheel, without gearing; arranged for Hand and Motor Drive; with 2 Barrels of equal size of 50 mm internal diameter; stroke 120 mm; without Plate	22. 10. 0
The pump exhausts to **0.0014 mm.**	
52,920. — i d e m, with **Plate** 240 mm diameter and **Barometer Gauge** 200 mm high . .	25. 0. 0
Largest **Receiver** for use with above: No. 53,013	0. 4. 9
52,921. — i d e m, **driven by a $^1/_3$rd H. P. 110 volt Direct Current Electric Motor,** F i g u r e, **on table** with polished oak top and iron frame; without Plate	45. 0. 0
The air pump is mounted on a table with polished oak top and iron frame. The shelf underneath, as seen in the illustration, carries the $^1/_3$rd H. P. D. C. Electric Motor fitted with worm gearing. The starting rheostat as well as the necessary switchgears are mounted on the table top.	

Cl. 944, 4712.



52 919. 1 : 9.



52 921. 1 : 13.

The price includes the accessories illustrated — transmission, belt, motor, starter, switches and leads mounted on the table. £ s. d.

If desired we can supply an A. C. or a 3-phase Motor for driving, the price being correspondingly increased.

52,922. — i d e m, with **220 volt Direct Current** Electric Motor 46. 0. 0

52,923. — i d e m, as No. 52,921, with **Plate** 240 mm diameter and **Barometer Gauge** 200 mm high, with **110 volt** D. C. Electric Motor 47. 10. 0

52,924. — i d e m, with **220 volt D. C.** Electric Motor 48. 10. 0

52,925. **Duplex Vacuum Pump with Oil-packed Piston** and oil non-return valve, Kohl's system, German Patent, **for Motor Drive,** larger, internal diameter of Barrels, 75 mm; Stroke 160 mm; without Motor and Plate 27. 10. 0

The pump exhausts to **0.0014 mm.**

52,926. — i d e m, with **Plate** 280 mm diameter and **Barometer Gauge** 300 mm high . . 31. 0. 0

Largest **Receiver** for use with above: No. 53.015 . . . . . 0. 6. 6

52,927. — i d e m, driven by a ½ H. P. Direct Current Electric Motor for 110 volts, on table with polished top and iron frame, without Plate, cf. Fig. 52,921 . . . . . 50. 0. 0

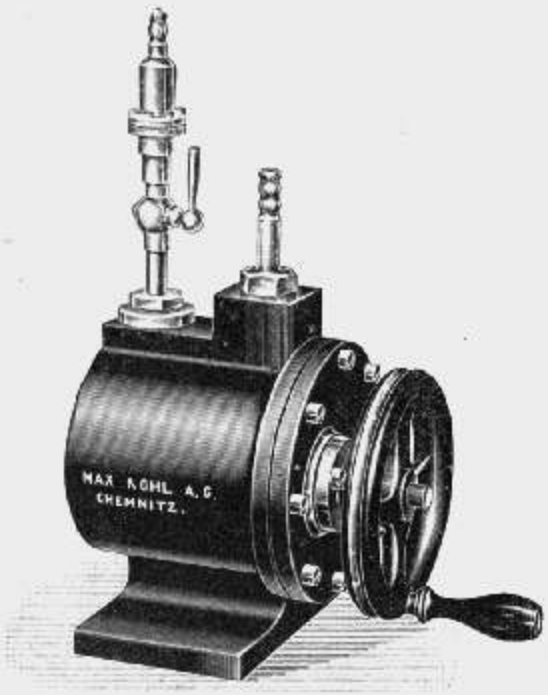
52,928. — i d e m, with **220 volt D. C.** Electric Motor 51. 5. 0

52,929. — i d e m, with **Alternating Current Asynchronous Motor** and belt releasing device 55. 0. 0

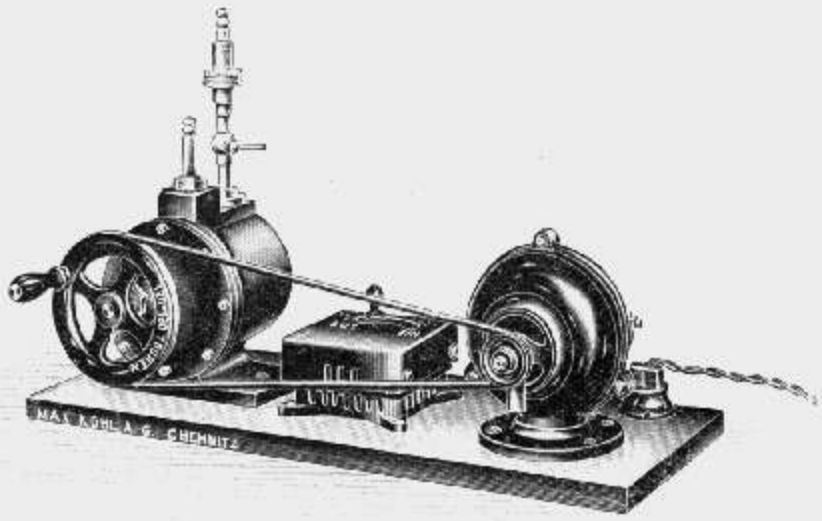
52,930. — i d e m, with **Plate** 280 mm diameter and **Barometer Gauge** 300 mm high, with **110 volt D. C.** Electric Motor 53. 10. 0

52,931. — i d e m, with **220 volt Direct Current** Electric Motor 54. 15. 0

52,932. — i d e m, with **Alternating Current Asynchronous Motor** and belt releasing device 58. 10. 0



52946. 1:4.



52949. 1:9.

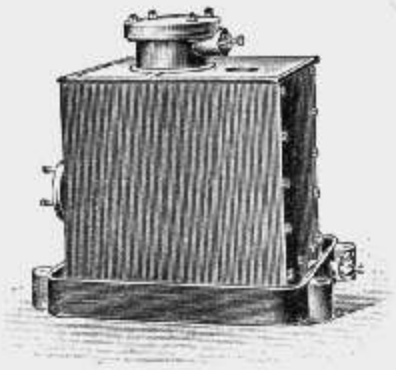
	£ s. d.
52,933. **Duplex Vacuum Pump with Oil-packed Piston** and oil non-return valve, Kohl's System, German Patent, for Motor Drive, still larger than preceding; internal diameter of Barrels, 100 mm; Stroke 220 mm; without Motor or Plate . . . . . The pump exhausts to **0.0014 mm**.	49. 0. 0
52,934. — i d e m, with **Plate** 320 mm diameter and **Barometer Gauge** 300 mm high . .	44. 5. 0
Largest **Receiver** for use with above: No. 53,016	0. 11. 6
52,935. — i d e m, driven by a ¾ H. P. Direct Current Electric Motor for 110 Volts, on table with polished top and iron frame; without Plate, cf. Fig. 52,921, p. 393 . . .	62. 10. 0
52,936. — i d e m, with **220 volt D. C.** Motor	63. 5. 0
52,937. — i d e m, with **Plate** 320 mm diameter and **Barometer Gauge** 300 mm high, with **110 volt D. C.** Motor	66. 15. 0
Largest **Receiver** for use with above: No. 53,016	0. 11. 6
52,938. — i d e m, with **220 volt D. C.** Motor	67. 10. 0
52,939. **Duplex Vacuum Pump with Oil-packed Piston** and oil non-return valve, Kohl's system, German Patent, for Motor Drive, **larger than preceding:** internal diameter of Barrels, 125 mm; Stroke, 250 mm; without Plate, cf. Fig. 52,921, p. 393 . . . . . The pump exhausts to **0.0014 mm**.	47. 10. 0
52,940. — i d e m, with **Plate** 320 mm diameter and **Barometer Gauge** 300 mm high . .	51. 15. 0
Largest **Receiver** for use with above: No. 53,016	0. 11. 6
52,941. — i d e m, driven by a 1 H. P. **110 volt Direct Current** Motor; on table with polished top and iron frame, without Plate, cf. Fig. 52,921, p. 393	77. 10. 0
52,942. — i d e m, with **220 volt D. C.** Motor	78. 5. 0
52,943. — i d e m, with **Plate** 320 mm diameter and **Barometer Gauge** 300 mm high; with **110 volt D. C.** Motor	81. 15. 0
Largest **Receiver** for use with above: No. 53,016	0. 11. 6
52,944. — i d e m, with **220 volt D. C.** Motor	82. 10. 0

Rotary Oil Vacuum Pumps and Enclosed Vacuum Pumps.

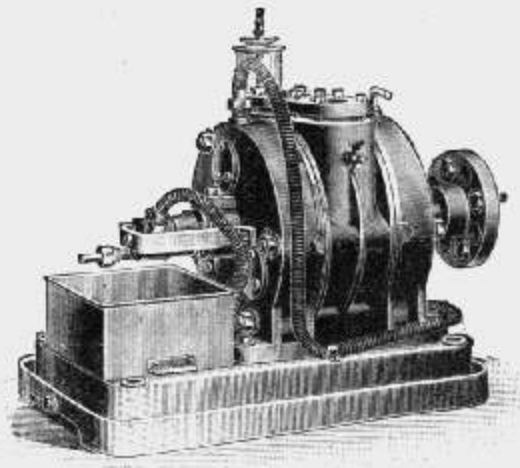
Rotary Oil Vacuum Pump, Fig. 52,946, with driving wheel, arranged for Hand and Cord Drive; suitable both for teaching and for Laboratories and Incandescent Lamp Factories; can be used specially as a preliminary pump for the Rotating Mercury Vacuum Pump.

Size		1	2	3
For Hand and Cord Drive	List No.	**52,945**	**52,946**	**52,947**
	Price £	**7. 0. 0**	**8. 0. 0**	**10. 0. 0**

Water Air Pumps: see pp. 22—27.



52 955. 1 : 15.



52 962. 1 : 15.

Size		1	2	3
Power required at 160—130 r. p. m. . . . approx. H. P.		1/8	1/8	1/6
With 110 volt Direct Current Motor, on board with driving cord, switch, starter, connecting lead 4 m long, plug and plug-box	List No.	**52,948**	**52,949**	**52,950**
	Price £	**15. 0. 0**	**16. 0. 0**	**19. 0. 0**
With 220 volt Direct Current Motor, Accessories as above	List No.	**52,951**	**52,952**	**52,953**
	Price £	**15. 10. 0**	**16. 10. 0**	**19. 10. 0**

Rotary Enclosed Vacuum Pumps: can be used as Vacuum Pumps or Compressors, Figs. 52,955 and 52,962.

Maximum r. p. m. . . . . approx.		1500	1500	1000	800	800
Max. quantity of air absorbed, approx. litres per minute		145	320	520	1660	2670
As a Vacuum Pump	Highest Vacuum, Mercury Column . . . . . mm	—	—	1.5	1.5	1.5
	Power required approx. H. P.	—	—	0.9	3.0	4.5
	List No.	—	—	**52,955**	**52,956**	**52,957**
	Price with Cooling Device and Oil Box . . . . . £	—	—	**23. 15. 0**	**49. 5. 0**	**53. 10. 0**
	Packing . . . . . £	—	—	**0. 10. 0**	**1. 0. 0**	**1. 2. 0**
	Weight net . . . approx. kg	—	—	110	250	275
	Weight gross . . approx. kg	—	—	170	340	360
As Compressor	Max. Over-pressure approx. atm.	3	3	2.0	2.0	2.0
	Power required at max. pressure approx. H. P.	0.95	1.9	2.0	7.0	10.5
	List No.	**52,958**	**52,959**	**52,960**	**52,961**	**52,962**
	Price with Cooling Device, without Oil box . . . . . £	**9. 10. 0**	**12. 0. 0**	**20. 0. 0**	**46. 10. 0**	**51. 0. 0**
	Packing . . . . . £	**0. 2. 0**	**0. 2. 0**	**0. 6. 0**	**0. 15. 0**	**0. 18. 0**
	Weight net . . . approx. kg	8,5	17	50	175	200
	Weight gross . . approx. kg	14	25	85	250	270

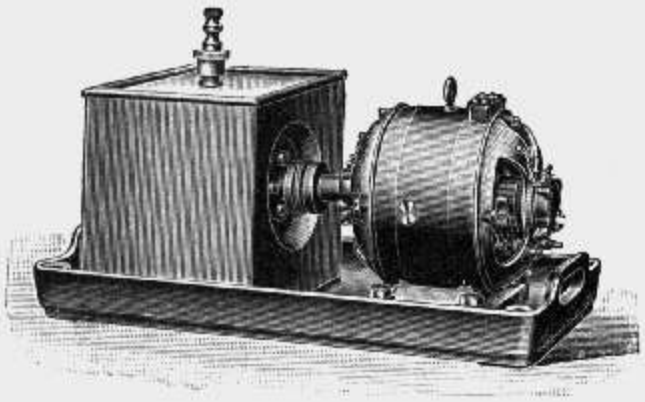
These Rotary Pumps, Figs. 52,955 and 52,962, are specially suited for Laboratory use. They have no dead space and can thus produce high vacua — even to pressures of 1.5 mm mercury column; the Pumps can also be used as Compressors and employed thus they give 1.2—2 atm. over-pressure. When employing the Pumps as Compressors a correspondingly greater driving force is necessary if the Pumps are to be used to full advantage (see Table).

The Vacuum Pumps are supplied with Oil Box, Fig. 52,955; by placing the Pumps under oil they are cooled better and good packing and lubrication are obtained.

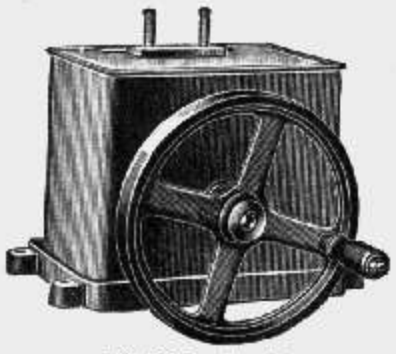
Pumps Nos. 52,956, 52,957, 52,961 and 52,962 have Water Cooling for the rotary part and the side part; in the case of Nos. 52,955 and 52,960 this Cooling is only extended to the lateral parts.

The data regarding the quantity of air absorbed only apply when the air has a free passage and with maximum speed of Pump; with lower speed the quantity of air absorbed decreases as the speed.

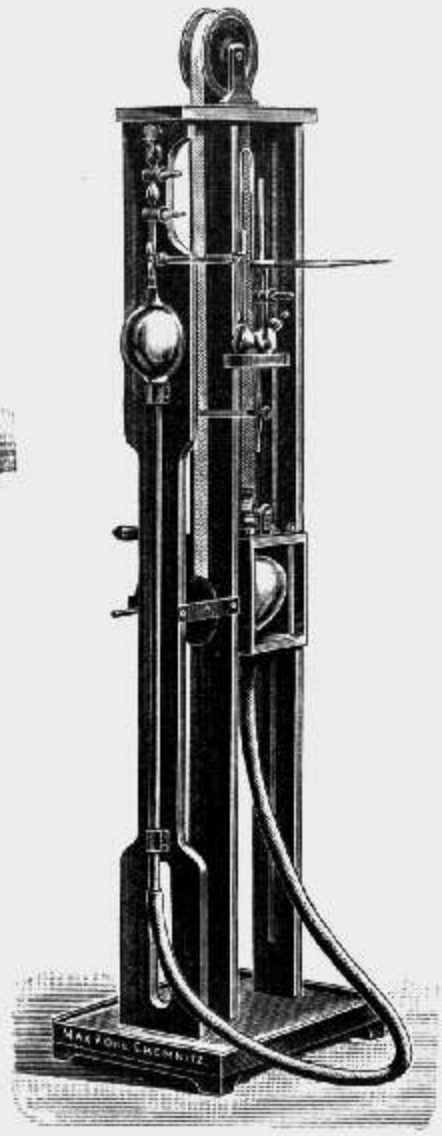
Max Kohl A. G. Chemnitz, Germany.



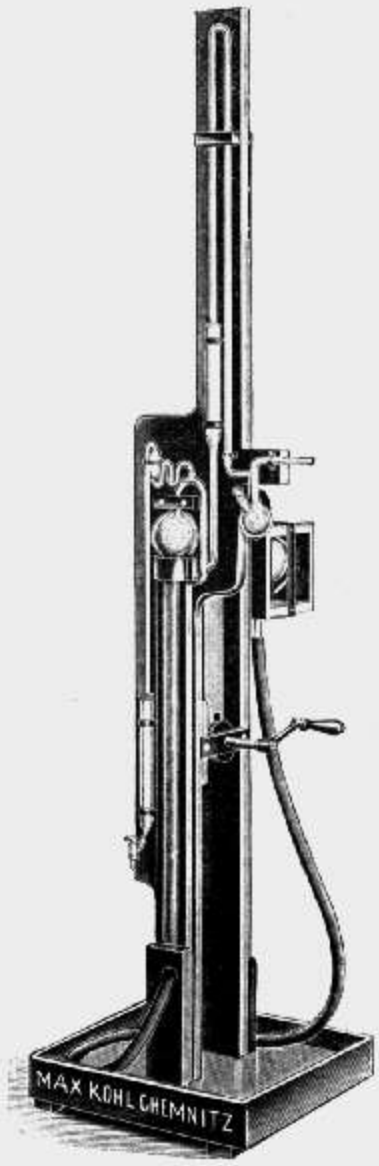
52 964. 1 : 10.



52 983. 1 : 10.



52 986. 1 : 15.



52 987. 1 : 17.

Rotary Vacuum Pumps (Enclosed Air Pumps) with Electric Motors, mounted on one baseplate, Fig. 52,964, with Oil box.

— **with Direct Current Motor,** Fig. 52,964.

Revolutions per minute	approx.	1400	1350	1000	800	800
Quantity of air absorbed, approx. litres per minute		135	290	522	1660	2670
Highest Vacuum, Mercury Column . . .	mm	2.5	2.5	1.5	1.5	1.5
For 110 volts Direct Current . . .	List No.	**52,963**	**52,964**	**52,965**	**52,966**	**52,967**
	£	**23. 5. 0**	**27. 5. 0**	**49. 0. 0**	**85. 0. 0**	**97. 0. 0**
Starter for above	£	**0. 8. 0**	**0. 8. 0**	**1. 2. 0**	**2. 6. 0**	**4. 2. 0**
For 220 volts Direct Current . . .	List No.	**52,968**	**52,969**	**52,970**	**52,971**	**52,972**
	£	**23. 10. 0**	**27. 10. 0**	**49. 0. 0**	**85. 0. 0**	**97. 0. 0**
Starter for above	£	**0. 8. 0**	**0. 8. 0**	**1. 2. 0**	**2. 6. 0**	**4. 2. 0**

— **With three-phase Motor.**

Revolutions per minute	approx.	1400	1400	940	690	700
Quantity of air absorbed, approx. litres per minute		135	300	492	1430	2340
Highest Vacuum, Mercury Column . . .	mm	2.5	2.5	1.5	1.5	1.5
For 120 volts 3-phase Current . .	List No.	**52,973**	**52,974**	**52,975**	**52,976**	**52,977**
	£	**20. 5. 0**	**24. 5. 0**	**49. 0. 0**	**89. 0. 0**	**101. 0. 0**
Star-delta Switch or **Starter for above**	£	**1. 0. 6**	**1. 0. 6**	**1. 14. 0**	**2. 11. 0**	**2. 11. 0**
For 210 volts 3-phase Current . .	List No.	**52,978**	**52,979**	**52,980**	**52,981**	**52,982**
	£	**20. 5. 0**	**24. 5. 0**	**49. 0. 0**	**89. 0. 0**	**110. 0. 0**
Star-delta Switch or **Starter for above**	£	**1. 0. 6**	**1. 0. 6**	**1. 14. 0**	**2. 11. 0**	**2. 11. 0**

The D. C. Motors of Nos. 52,963, 52,964, 52,968, 52,969 are Series Motors, the remainder being shunt wound. The 3-phase Motors of Nos. 52,973, 52,974, 52,978, 52,979 have short-circuited rotors, the remainder having rotor with slip-rings.

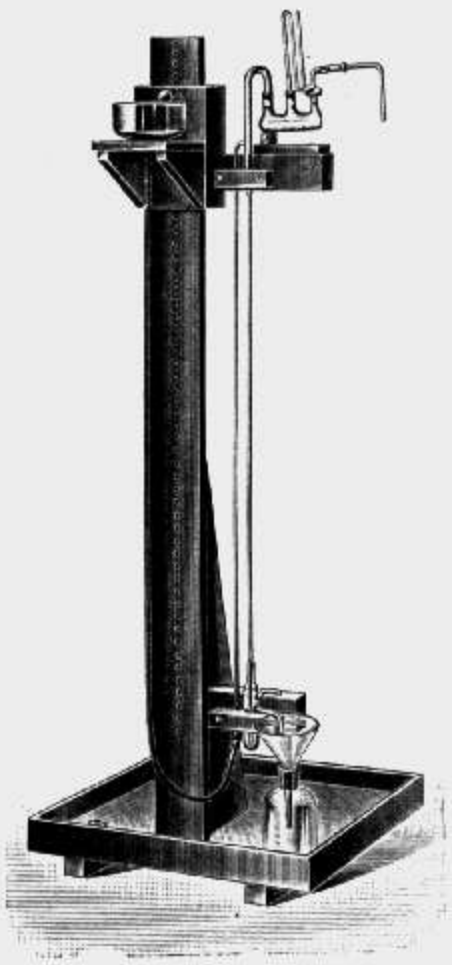
The prices are understood to be for the Pump with Electric Motor Coupling and Baseplate or ⊓-Rails in the two larger models.

Please note remarks appended to Nos. 52,955—52,962.

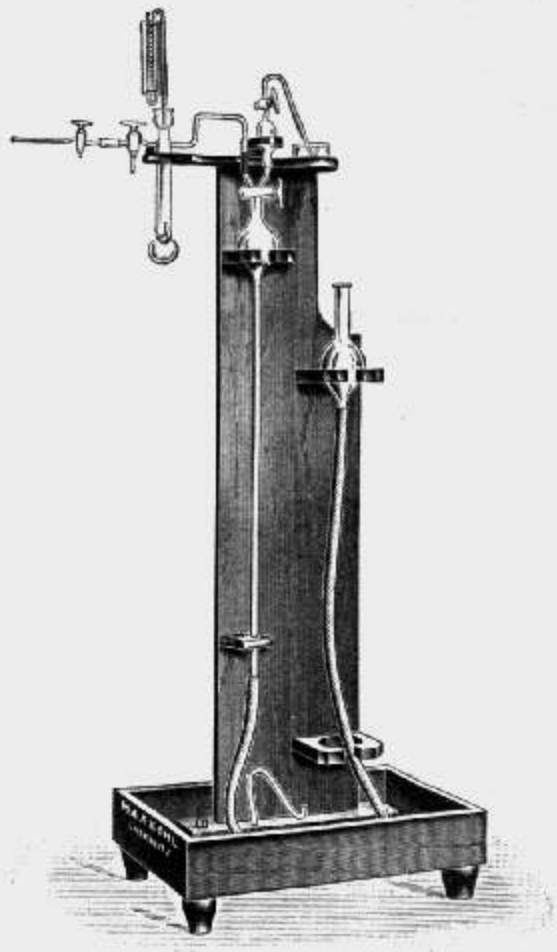
Cl. 3664, 3665, 947, 3354.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



52 988. 1 : 15.



52 989. 1 : 15.

52,983. **Rotary High-Vacuum-Pump,** Figure, Semi-Enclosed Vacuum Pump for belt or hand drive; gives alone up to 0.05 mm mercury column (Ztschr. f. d. phys. u. chem. U. **19,** 1906, p. 73) . . . . . £ 15. 15. 0

A higher vacuum than that mentioned above can be attained by using a separate preliminary pump, e. g. a water air pump. For obtaining a vacuum of 0.003 mm it is advisable to use a second pump, built like the above, as preliminary pump (see also No. 52,985). The best speed is about 400 r. p. m. when working without preliminary pump, and when working with preliminary pump about 200 r. p. m.

52,984. — idem, with **110 volt Direct Current Motor,** on one board, with starter . . . 30. 0. 0

The price varies if the motors are for a different current or voltage. In the case of 3-phase or alternating current, kindly state frequency.

52,985. **Two High Vacuum Pumps with 110 volt Direct Current Motor,** on one board, one working as a preliminary pump; vacuum attainable, 0.003 mm mercury column; quantity of air sucked up 70 and 35 litres per minute respectively 50. 0. 0

Mercury Vacuum Pumps.

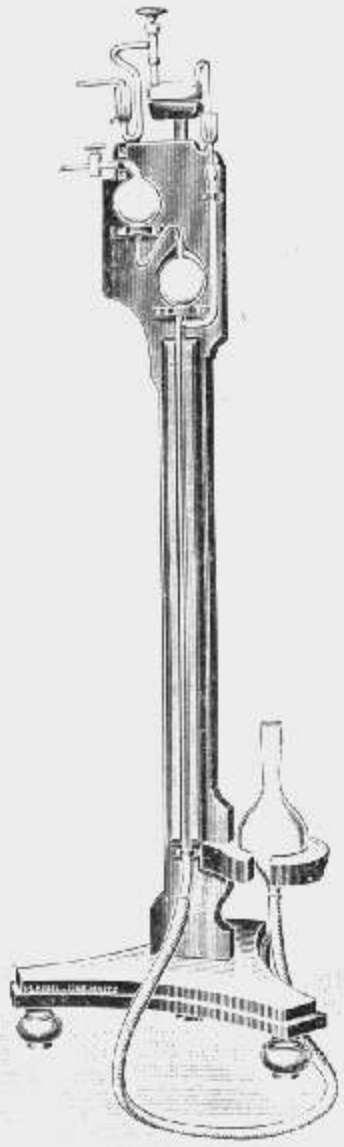
52,986. **Mercury Vacuum Pump** after Geissler, Figure, with polished oak stand; capacity of transport vessel, 1—1.5 litre 10. 0. 0

The glass parts are the best product of the glass blower and are fitted with first rate cocks; the pump has three attachments for glass apparatus, massive and handy winding device; all metal parts excellently finished. Can, if desired, be provided with Supports, so as to be able to connect the air pump, by a length of tubing, with plates Nos. 50,139—50,142, p. 400.

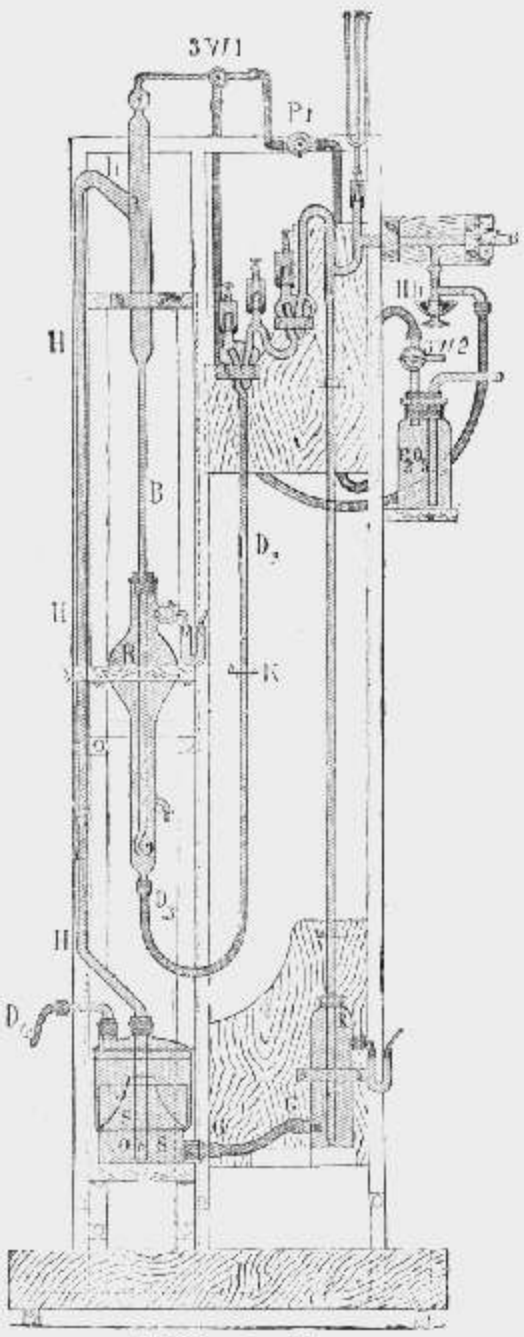
52,987. **Mercury Vacuum Pump** after Töpler-Hagen-Neesen, Figure (M. P. I, Figs. 527—528 [566—567]), with winding device, with all latest improvements 9. 0. 0

52,988. **Mercury Vacuum Pump** after Sprengel, Figure, without cocks, on stand, holding 1 litre mercury (W. D. Fig. 175 [160]) 3. 15. 0

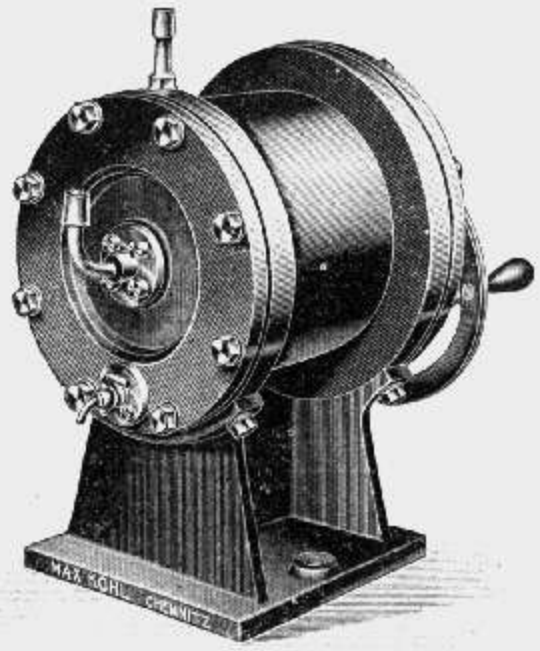
52,989. — idem, after Greiner and Friedrichs, Figure (Fr. phys. Techn. I, 2, Fig. 2614 [1, Fig. 323]) 7. 10. 0



52 990. 1 : 15.



52 991. 1 : 13.



52 992. 1 : 6.

52,990. **Mercury Vacuum Pump** after Spies, Figure (Ztschr. f. d. phys. u. chem. U. **8**, 1894/95, p. 336) . . . . . £ 7. 0. 0

52,991. **Automatic, Constant-action Mercury Vacuum Pump** after Kahlbaum, Figure, for physical and chemical purposes; consisting of a Sprengel Mercury Air Pump combined with a Mercury Hoisting Apparatus (Wied. Ann. **53**, p. 199, 1894; Ztschr. f. Instrumentenkunde, **13**, p. 73, 1893) 14. 10. 0

52,992. **Rotary Mercury High-Vacuum Pump with iron Drum,** Kohl's System, **German Patent applied for,** Figure, with toothed gearing and driving wheel. The Pump can be driven either by hand or motor 15. 0. 0

With the aid of this Pump, in conjunction with a preliminary pump (the latter must produce a vacuum of 15—10 mm) it is possible to obtain the highest vacua that can possibly be obtained with Mercury Vacuum Pumps, and this in the minimum of time. This Pump is therefore eminently suitable both for the manufacture of glow lamps, Röntgen tubes, etc. and for demonstrating in physical instruction, also for use in laboratories. As regards a Preliminary Pump it is advisable to use one of the Rotary Oil Vacuum Pumps Nos. 52,901—52,906, or a Water Air Pump. A charge of about 1,5 litres (20 kg) mercury is necessary and should if required be ordered separately.

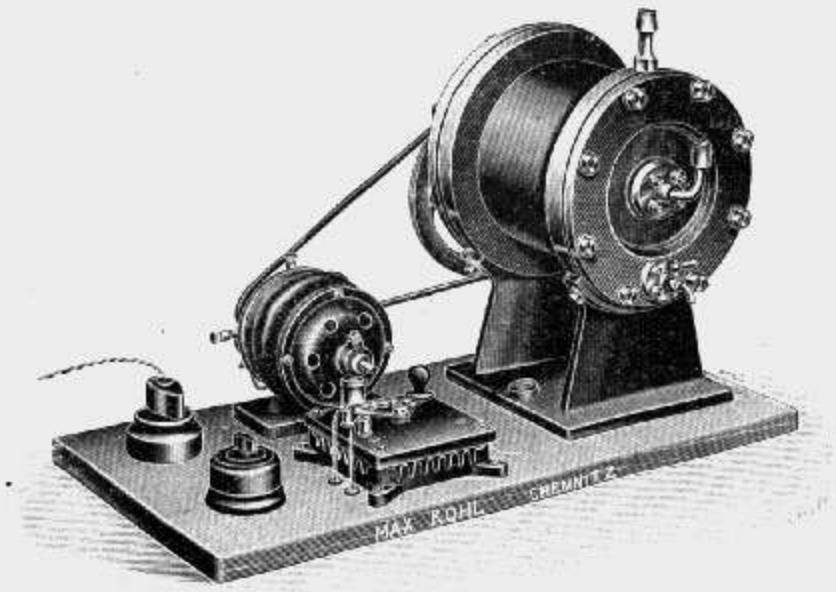
The Pump is of small and compact construction, is rapid in its action, and contains no glass, porcelain, or rubber parts. The rotating part and the carcase are of iron, being thus unbreakable. The Pump is very smooth in its action.

Every Pump is tested in our works for its efficiency by means of a Mac Leod Vacuum Gauge and a certicate giving result of test is supplied with the Pump.

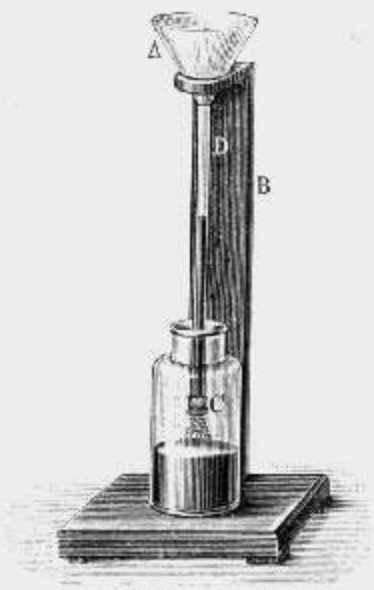
52,993. — The same Rotary Mercury High-Vacuum Pump **with $^1/_{16}$ H. P. 110 volt Direct Current Motor,** Figure, with starter, switch, connecting lead 4 m long, with plug box and plug, with leather cord; the whole **mounted on one board** 22. 0. 0

(1. 951, 952, 5098.

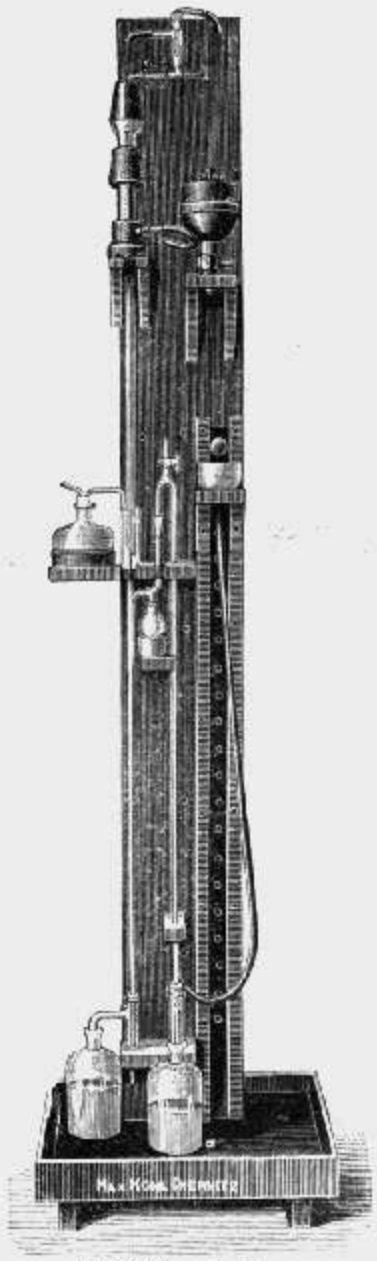
Max Kohl A. G. Chemnitz, Germany.



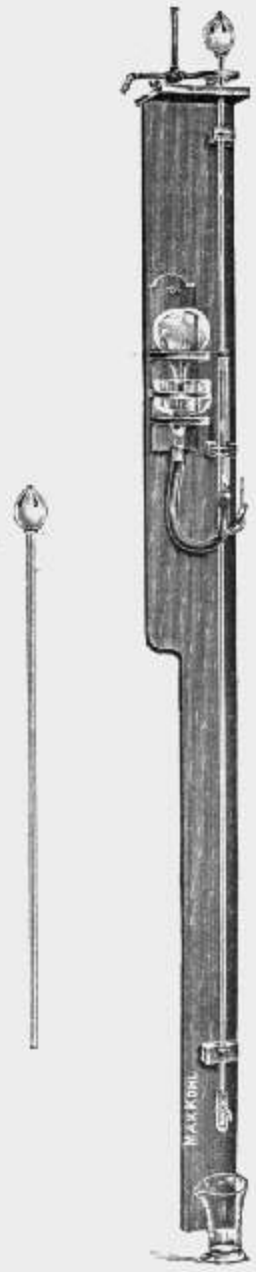
52 993. 1 : 8.



53 001. 1 : 6.



52 998. 1 : 15.

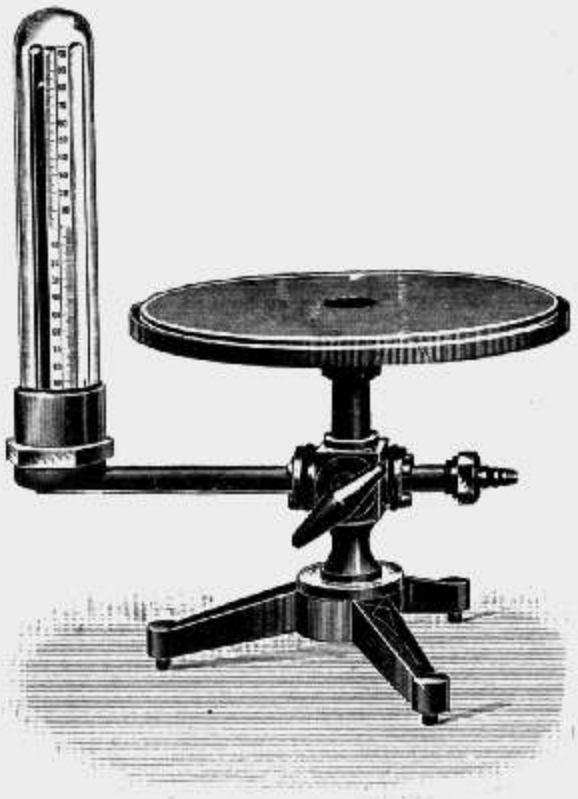


53 000. 1 : 18.

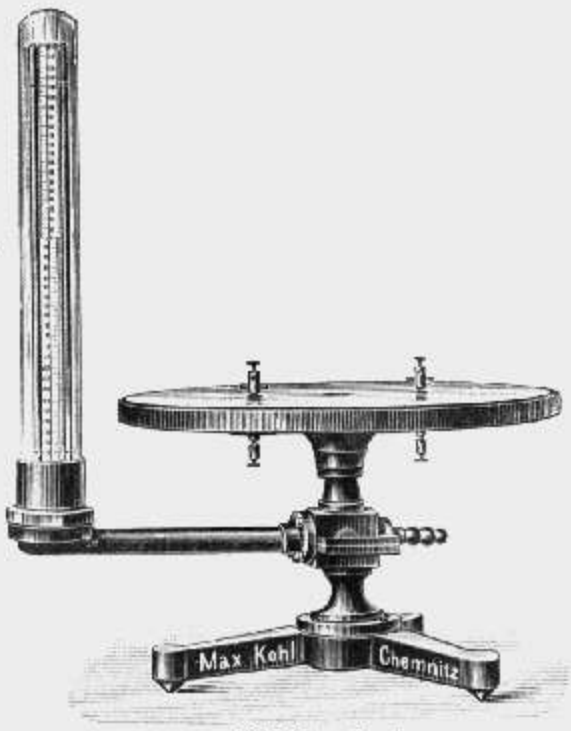
		£ s. d.
52,994. **Rotary Mercury High Vacuum Pump** as No. 52,992, **with 220 volt Direct Current Motor**		22. 10. 0
50,135. **Water Air Pump** of glass, for preliminary exhausting, No. 50,135		0. 3. 6
51,292. **Mercury**, chemically pure	1 kg	0. 8. 0
52,997. **Rotary Mercury Vacuum Pump**, Kohl's System, **with rotary Oil Vacuum Pump** (as preliminary pump), both driven by one Motor **for 110 volts Direct Current**, mounted on baseboard with starter, switch, connecting leads, plug and box plug Illustration sent if desired.		32. 10. 0
52,998. **Mercury Distilling Apparatus** after Weinhold, Figure, **for gas heating;** supplies chemically pure, dry mercury and requires no attention (Carls Rep. **15**, p. 1) The Apparatus consists of an oak stand, a Sprengel Mercury Vacuum Pump, the Distilling Apparatus with gauze burner, a gas pressure regulator, a heat regulator, the necessary bottles, etc.; it works quite **automatically** for hours and without any loss in mercury. Indispensable for those possessing Mercury Vacuum Pumps.		8. 0. 0
52,999. — idem, arranged for **heating by Spirit** Illustration sent on application.		9. 0. 0
53,000. — idem, simpler, on wall board, Figure, with gas ring		2. 2. 0
53,001. **Mercury Filtration Apparatus** after Wiedemann, Figure, consisting of a stand and funnel with long tube closed by a piece of wash-leather (W. u. E. phys. Prakt. Fig. 365; Ztschr. f. d. phys. u. chem. U. **4**, 1891, p. 255)		0. 8. 0
51,304. **Mercury Press,** see Figure 51,304, p. 215		0. 12. 0



50 139. 1 : 5.



50 140. 1 : 5.



50 141. 1 : 6.



53 011. 1 : 9.



53 017. 1 : 4.

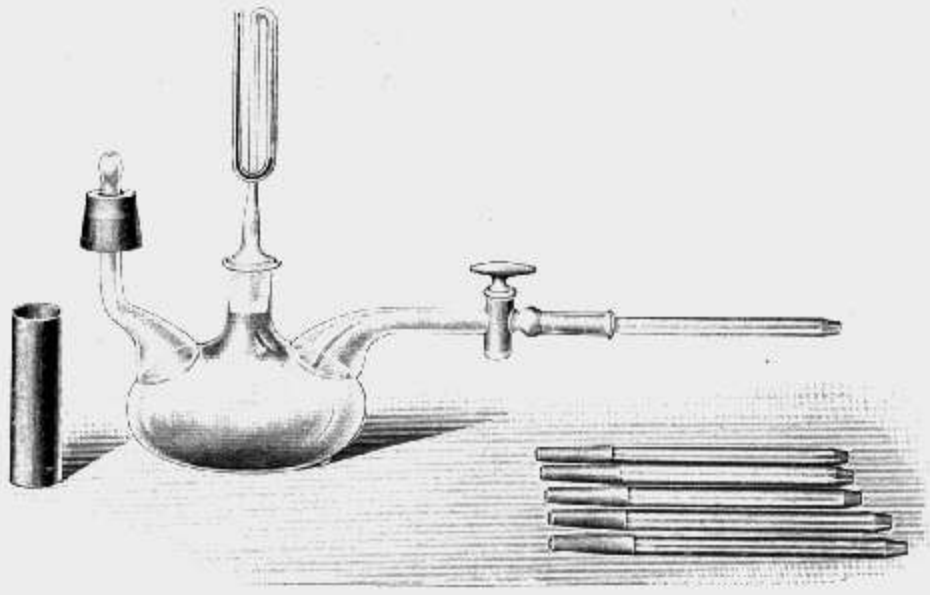
Accessories for Vacuum Pumps.

	£ s. d.
50,139. **Plate for Vacuum Pump,** 24 cm diameter, Figure	1. 16. 0
Without Receiver. Largest **Receiver** that can be used: No. 53,013	0. 4. 9
50,140. — idem, **with Barometer Gauge** 200 mm high, Figure	2. 14. 0
50,142. — idem, larger, 28 cm diameter, **with Barometer Gauge** 300 mm high, steel cock with brass handle	4. 15. 0
Largest **Receiver** that can be used: No. 53,015	0. 6. 6
50,141. — idem, **larger still,** 32 cm diameter, Figure, with **Barometer Gauge** 300 mm high, with **electric lead** under the receiver, plug terminals can be taken off plate; steel cock with brass handle	5. 5. 0
Largest **Receiver** that can be used: No. 53,016	0. 11. 6

When using Receivers Nos. 53,008—53,014 it is not possible to employ the lead terminals of this plate as at least one terminal is covered over by the receiver.

Cl. 21, 22, 959, 960, 961.

Max Kohl A. G. Chemnitz, Germany.



53028. 1 : 5.



53029.

50,143. **Rubber Tubing for Air Pumps,** wire clad inside, braided; see No. 50,143, p. 25. Price per metre . . . . . £ s. d. 0. 3. 6

Receivers, Fig. 53,011, of good glass with wide flange and grip, finely ground.

List No.	53,008	53,009	53,010	53,011	53,012	53,013	53,014	53,015	53,016
Internal Height mm	105	130	160	185	210	235	260	315	365
Internal Diam. mm	60	105	80	130	160	185	210	235	260
Diameter of air Pump Plate mm	140	140	140	180	200	240	250	280	320
£	1 s. 9 d.	2 s. 0 d.	2 s. 3 d.	3 s. 0 d.	4 s. 0 d.	4 s. 9 d.	5 s. 6 d.	6 s. 6 d.	11 s. 6 d.

The details given in the Table as to the diameter of air pump plates show the smallest glass plate which can be used with the receiver. For instance, Receiver No. 53,014 is suitable for a plate diameter of 250 mm; it is advisable, therefore to choose the smaller one, Nr. 53,013, if the larger is not absolutely necessary. In addition to the largest Receivers suitable for each plate it is desirable to select some smaller receivers for each air pump as the smaller the receiver the more favourable the action of the pump. The largest item given should be selected as well as Nos. 53,008, 53,010 and 53,012. We may say that the sizes of receivers suitable are appended to the description of the apparatus concerned.

53,017. **Stuffing Box Receiver,** Figure, **105 mm** internal diameter, **150 mm** internal height, for Bell No. 53,069 and Fan No. 53,066 . . . . . 0. 16. 0

The air pump plate for this receiver must be at least 140 mm diameter.

53,018. — idem, **120 mm** internal diameter, **160 mm** internal height, for above experiments and for Electric Cascade No. 53,085 . . . . . 0. 18. 0

The air pump plate must be 180 mm.

53,019. — idem, **160 mm** internal diameter, **210 mm** internal height, for the largest air pumps having a plate of 200 mm diameter 1. 2. 0

This receiver is necessary for Bells Nos. 53,070 and 53,071 as well as for the double Fan No. 53,067.

Rubber Discs of soft, red patent rubber for placing on the plate of the air pump so as to do away with the troublesome operation of smearing the receivers with tallow.

List No.	53,020	53,021	53,022	53,023	53,024	53,025	53,026
Diameter mm	145	185	205	245	255	285	325
£	0. 4. 0	0. 6. 0	0. 7. 0	0. 9. 0	0. 10. 0	0. 14. 0	0. 18. 0

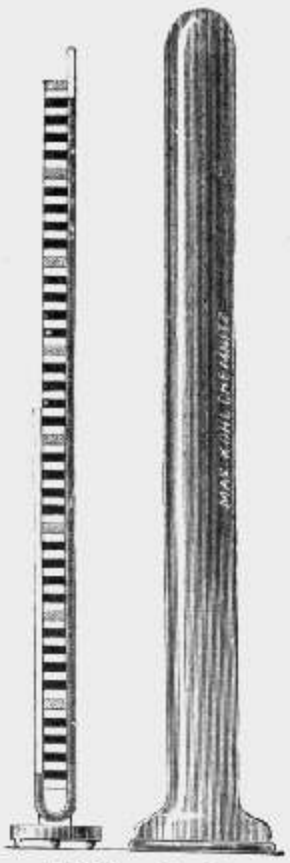
53,028. **Drying Apparatus** for the air pump, Figure, with stopcock, mercury manometer attachment and **6 Tube Attachments** 1. 0. 0

The apparatus is arranged for drying by concentrated sulphuric acid. It is ground with great precision, being thus perfectly air-tight.

53,029. **Barometric Gauge,** small, Figure. 0. 8. 0

53,030. — idem, larger, tube 200 mm long, in glass bell with iron base 1. 0. 0

Max Kohl A. G. Chemnitz, Germany.



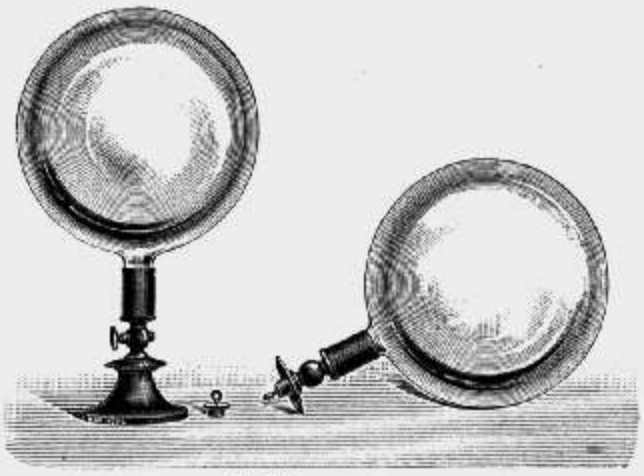
53031. 1 : 10.



53032. 1 : 14.



53 033. 1 : 5.



53 034. 1 : 7.



53035. 1 : 6.



53038. 1 : 4.

Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
53,031. **Standing Barometer** in receiver 85 cm high, with iron base, Figure (W. D. Fig. 167 [153]), filled	1. 14. 0
53,032. **Receiver with Barometer and Manometer,** Figure, the barometer with charge .	0. 12. 0

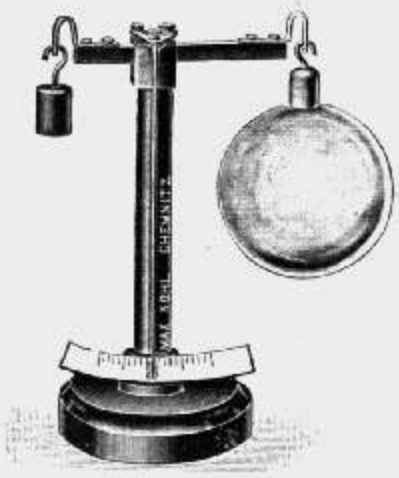
Auxiliary Apparatus for Air Pumps.

53,033. **Glass Sphere for weighing air,** Figure, with two stopcocks, 120 mm diameter (W. D. Fig. 154 [168])	0. 10. 0
53,034. **Two Glass Spheres** of 200 mm diameter, for determining the specific gravity of air, one of these being provided with foot for standing on the air pump, also with hook and tare pan, Figure (M. P. III, Fig. 91 [II, 2, Fig. 85])	1. 10. 0
53,035. **Magdeburg Hemispheres,** Figure, 100 mm diameter, of iron, with brass stopcock and ground base	0. 16. 0
53,036. — idem, **120 mm** diameter	1. 0. 0
53,037. — idem, **200 mm** diameter	1. 10. 0
53,038. **Dasymeter (Baroscope),** small, Figure (W. D. Fig. 169 [155])	0. 10. 0
Dasymeters Nos. 53,038 and 53,039 are for use with Receiver No. 53,012, and Dasymeter No. 53,040 with Receiver No. 53,015; for No. 53,038 No. 53,011 suffices, but the larger receiver is preferable.	
53,039. — idem, larger, Figure	0. 12. 0
53,040. — idem, very large, for very large Air Pumps	1. 0. 0
53,041. **Dasymeter (Baroscope)** after Prof. Friedr. C. G. Müller, Figure, **with pointer and scale,** globe about 200 ccm (Müller, Techn. d. phys. Unterr., 1906, Fig. 87)	0. 18. 0
Smallest receiver that can be used: No. 53,011	0. 3. 0
52,794. **Demonstration Aneroid Barometer,** see Fig. 52,794, p. 375	2. 10. 0
52,791. **Bourdon Tube,** see Fig. 52,791, p. 375, for explaining the principle of the Spring Manometer and of the Aneroid Barometer, on base, with scale and pointer	1. 2. 0

Cl. 3856, 970, 964, 5714, 3357, 972.



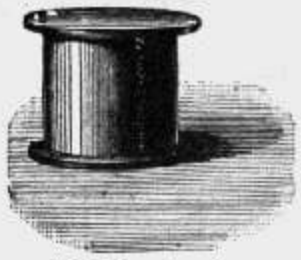
53 039. 1 : 4.



53 041. 1 : 3.



53 048. 1 : 5.



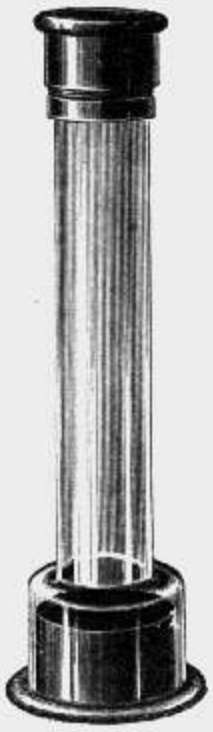
53 044. 1 : 6.



53 052. 1 : 6.



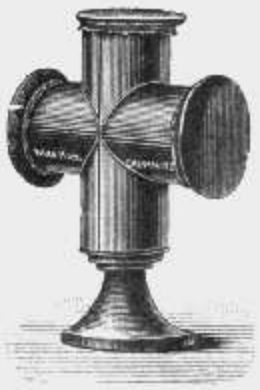
53 049. 1 : 6.



53 050. 1 : 3.



53 051. 1 : 2.

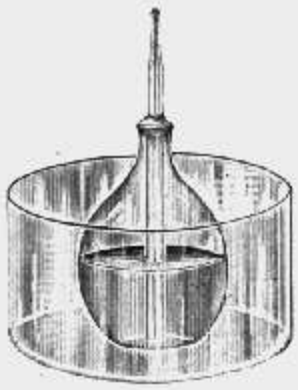


53 053. 1 : 6.

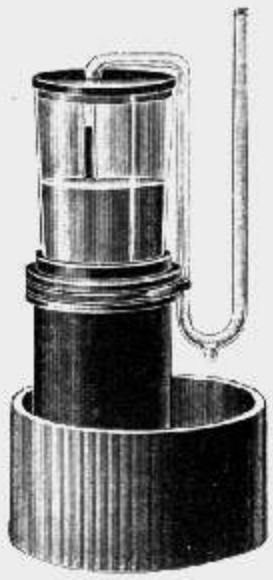
	£	s.	d.
53,044. **Apparatus for Bursting Bladders,** Figure, **90 mm** external diameter, **of metal** .	0.	6.	0
53,045. — idem, **150 mm** external diameter, **of metal**	0.	8.	0
53,046. — idem, **90 mm** external diameter, **of glass**	0.	2.	0
53,047. — idem, **140 mm** external diameter, **of glass**	0.	3.	0
Nos. 53,044 and 53,046 can be used with small air pump: for Nos. 53,045 and 53,047 the diameter of the air pump plate should be at least 180 mm.			
53,048. **Apple Cutter,** Figure, consisting of a receiver with fitting on top for holding an apple	0.	8.	0
53,049. **Mercury Shower Apparatus,** Figure, for showing the **pressure of the air** and **the porosity of solids,** with stopcock and foot, arranged for taking various fabrics . . .	0.	16.	0
In this apparatus the forcing of mercury into the air pump is entirely obviated.			
53,050. — idem, according to Figure 53,050, arranged for taking various materials	0.	8.	0
53,051. **Rubber Balloon,** Figure, with stopcock, for showing the expansion of the enclosed air under the receiver (Gan.-Man. Fig. 130; M. T. p. 122)	0.	2.	0
53,052. **Small Tripod with vessel underneath,** Figure, for sucking a perforated egg by means of the air pump	0.	3.	0
53,053. **Apparatus for showing the uniform pressure of air in all directions,** Figure . .	0.	16.	0
Large white metal pipe, cross shaped, with three openings, covered over with rubber.			
53,054. — idem, **with three brass hemispheres** arranged above, sideways and underneath	1.	4.	0



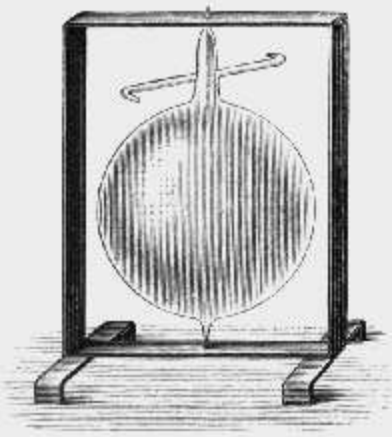
53 055. 1 : 9.



53 056. 1 : 3.

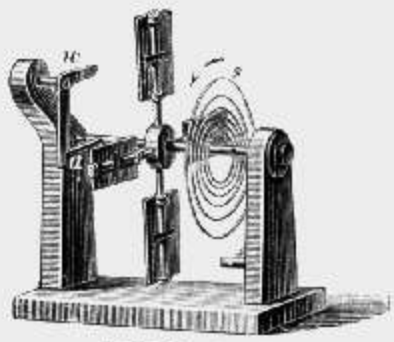


53 057. 1 : 3.



53 058. 1 : 6.





53 066. 1 : 3.

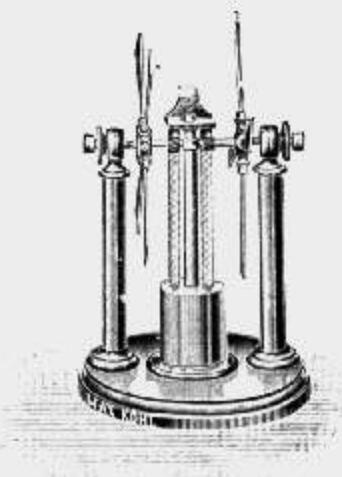


53 059. 1 : 8.



53 060. 1 : 12.

53 063. 1 : 10.



53 067. 1 : 4.

	£	s.	d.
53,055. **Syphon Fountain,** Figure, with stopcock and foot	1.	0.	0
The apparatus after being exhausted is then placed in a water vessel. After the stopcock is opened the water is driven in a jet into the tall glass tube by the action of the atmospheric air.			
53,056. **Small Heron's Ball,** Figure, for placing under the receiver, with catching vessel	0.	2.	0
53,057. **Mercury Syphon,** ceases to flow in vacuo. Figure (W. D. Fig. 170 [156]) . . .	0.	4.	0
Receiver No. 53,011 is necessary.			
53,058. **Air Reaction Wheel,** Figure (Fr. phys. Techn. I, 2, Fig. 2689)	0.	3.	0
Receiver No. 53,011 is required.			
53,059. **Fall Cylinder** after Weinhold, 0.6 m high, Figure (W. D. Fig. 173 [158]), with long rod so as to enable it to be used as a stuffing box receiver	1.	6.	0
The plate of air pump must be 180 mm in diameter.			
53,060. **Fall Tube (Newton's Tube),** Figure, with stopcock and base, 70 cm high . . .	1.	2.	0
53,061. **Fall Tube** with stopcock and base, 1 m high	1.	6.	0
53,062. — idem, 1.5 m high	1.	12.	0

Cl. 991, 988, 985, 5026, 976, 977, 978, 983, 984.

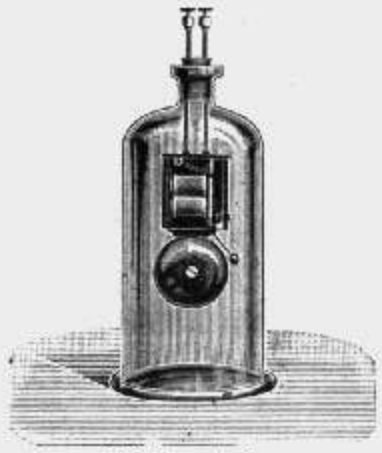
Max Kohl A. G. Chemnitz, Germany.



53 070. 1 : 3.



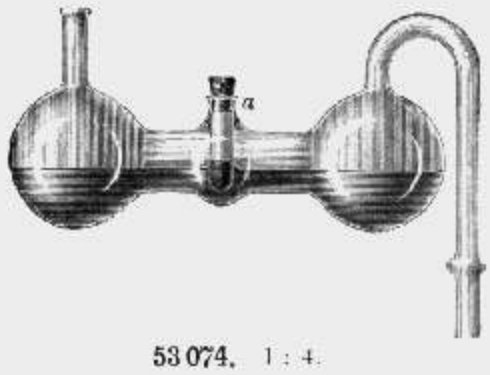
53 071 and 53 019. 1 : 8.



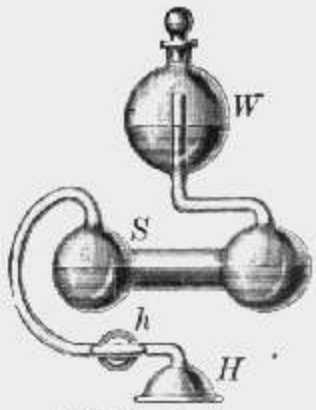
53 072. 1 : 8.



53 073. 1 : 8.



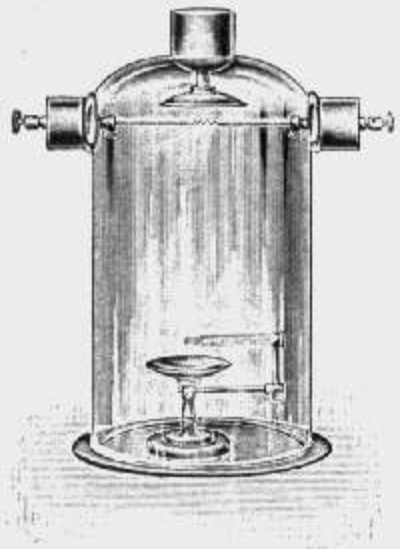
53 074. 1 : 4.



53 076. 1 : 6.

Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
53,063. **Fall Tube** after Puluj, Figure, **evacuated** and sealed up, 90 cm high, with base. An electromagnet is placed above the upper end and when the current is closed this magnet holds fast a small iron disc and a down feather provided with a light iron wire. When the current is opened both bodies drop simultaneously, reaching the bottom at the same time.	1. 10. 0
53,064. — idem, **not evacuated,** for showing, along with No. 53,063, the behaviour of the two bodies in an air filled space	1. 8. 0
53,065. — idem. **with stopcock,** for evacuating on the spot, for showing the fall in air and in vacuo	1. 12. 0
53,066. **Wind Fan,** for air resistance, Figure (W. D. Fig. 174 [159])	0. 15. 0
53,067. **Double Fan,** with two adjustable vanes, set into uniform rotation by two heavy racks, Figure	1. 10. 0
52,667. **Cohesion and Adhesion Tube** after Leduc and Sacerdote, see No. 52,667, p. 361	0. 12. 0
53,069. **Bell with clockwork,** for showing the small extent of the propagation of sound in rarified air. No. 53,069 can be used with the small Stuffing Box Receiver No. 53,017; the largest receiver, No. 53,019, is required for Nos. 53,070—53,071.	0. 10. 0
53,070. — idem, hung with three cords in iron frame having rubber feet, Figure, for damping as far as possible the transmission of sound to the air pump	0. 14. 0
53,071. — idem, with visible clockwork, suspended by means of fibres, Figure, without receiver	1. 0. 0
53,072. **Electric Bell** in a receiver, suspended from rubber, Figure (M. T. p. 123)	0. 12. 0
53,073. **Apparatus for forming ice** by evaporation of ether, Figure, after Böttger (W. V. Fig. 409), without receiver	0. 3. 0
53,074. **Freezing Apparatus** after Carré, Figure (W. D. Fig. 391 [371]), for producing ice by evaporation, with enclosed ether vessel, **on stand**	0. 11. 0
53,075. — idem, with stand, but without ether glass (W. D. Fig. 390 [370])	0. 9. 0
53,076. — idem, for placing direct on the air pump plate, Figure (W. D. Fig. 392 [372])	0. 10. 0



53 077. 1 : 7.



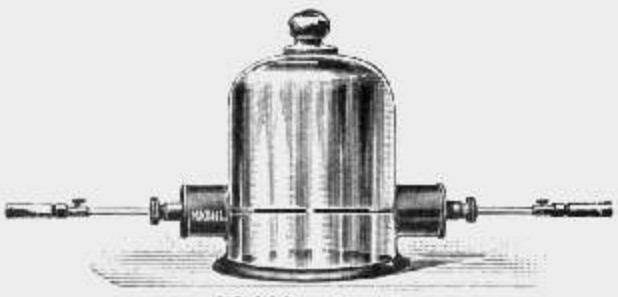
53 078. 1 : 9.



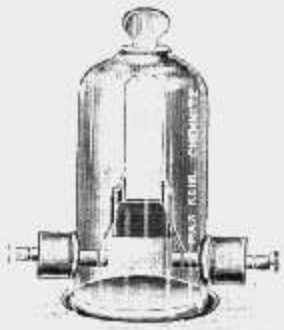
60 577. 1 : 7.



60 577a. 1 : 8.



53 082. 1 : 9.



53 083. 1 : 8.



60 578. 1 : 4.

	£ s. d.
53,077. **Apparatus** after Davy, Figure, **for the reflection of heat in vacuo,** receiver with two concave mirrors, heating wire and thermometer, for placing on the air pump (Gan.-Rein. Fig. 408)	3. 3. 0
53,078. **Apparatus for demonstrating the cooling Action of Gases,** Figure, after Tyndall (Tyndall, Wärme, Fig. 83), with lateral hose stopcock for leading in gases and a stopcock connecting with the air pump; for placing on the air pump plate	2. 0. 0
60,577. **Electric Egg,** Fig. 60,577, with stopcock and base, for demonstrating Geissler Tubes (M. P., 9th Edn., III, Fig. 240)	1. 7. 0
60,577 a. — idem, Figure, with holders for taking carbon rods, for demonstrating the electric arc	1. 10. 0
60,577 b. — idem, entirely of glass, without holders	0. 18. 0
53,082. **Receiver with Carbon Rods for producing an electric arc,** Figure The air pump plate must be 240 mm diameter.	1. 12. 0
53,083. **Glow Lamp Filament in Receiver,** after Hartl, Figure, for showing that the carbon filament does not burn up in vacuo, but does so easily in air (Ztschr. f. d. phys. u. chem. U. **10**, 1897, p. 235)	0. 15. 0
60,578. **Geissler Tube,** with stopcock and base, for setting on the air pump, Figure	0. 16. 0
53,085. **Electric Cascade,** consisting of Stuffing Box Receiver No. 53,018 and Uranium Glass (W. D. p. 869 [807]) The air pump plate must be 180 mm diameter.	0. 19. 0
53,086. **Rubber Bladder**	0. 2. 6
53,087. **Model of a Bellows,** Figure, with glass window for demonstrating its mode of action	0. 9. 0
53,088. **Bellows,** simple construction	0. 2. 6

Cl. 3884, 4117, 4978, 5348, 989, 4147, 990.

Max Kohl A. G. Chemnitz, Germany.



53 087. 1 : 5.



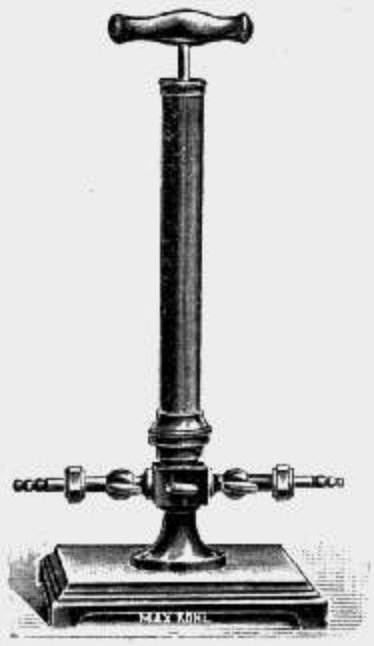
53 089. 1 : 8.



53 096. 1 : 8.



53 099. 1 : 5.



53 091. 1 : 7.



53 101. 1 : 6.



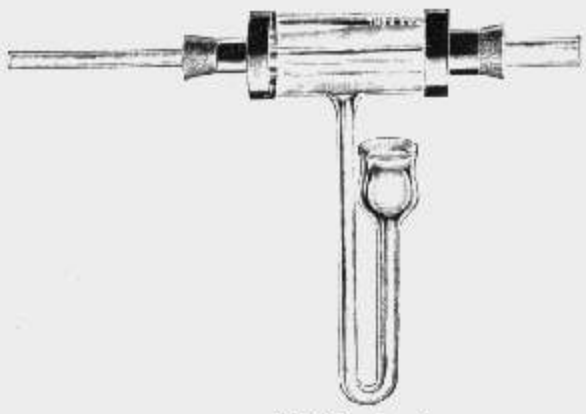
53 102. 1 : 6.

Max Kohl A. G. Chemnitz. Germany.

	£ s. d.
53,089. **Model of Compression Pump,** Figure, with rubber ball	0. 12. 0
53,090. **Sectional Model of a Compression Pump** (Kleiber, Oberstufe, Fig. 241)	1. 5. 0
53,091. **Compression Pump** after Silbermann (M. P. I, Fig. 553 [851]), Figure The pump has a massive iron base, being provided with two valves and three stopcocks. It admits of compressing to **6 atm.**	4. 16. 0
53,092. — idem, with manometer	6. 0. 0
Gasometers and Aspirators, see under Nos. 51,244—51,277, pp. 211—213.	
53,094. **Compression Apparatus** after Pouillet (M. P. I, Fig. 493 [534]), with compression screw and hand-wheel, for demonstrating the deviations from Boyle's Law The apparatus has two tubes of 2 m length, also rule, and is tested at 130 atmospheres pressure.	17. 0. 0
53,095. — idem, with bevel gearing	20. 0. 0
53,096. **Air Reaction Wheel,** Figure (W. D. Fig. 178 [163]), of glass, with brass holder and base, for blowing by the mouth	0. 6. 0
53,097. — idem, entirely of metal	0. 8. 0
53,058. **Air Reaction Wheel for the Air Pump,** see Fig. 53,058, p. 404	0. 3. 0
53,099. **Gas Reaction Wheel,** Figure, for driving with house gas or under the air pump receiver. When worked with gas the neck of the flask is half filled with water; the house gas flowing out is ignited (Fr. phys. Techn. I, 2, Fig. 3690)	0. 6. 0
52,593. **Repulsion Apparatus** after Hartl, see Fig. 52,593, p. 352	1. 4. 0
53,101. **Steam Reaction Wheel (Heron's Rotating Ball)** of glass, in iron stand, Figure (Fr. phys. Techn. I, 2, Fig. 3691 [I, Fig. 641])	0. 5. 0
53,102. — idem, entirely of metal, Figure, with spirit cup	0. 14. 0



53103. 1 : 11.



53108. 1 : 6.



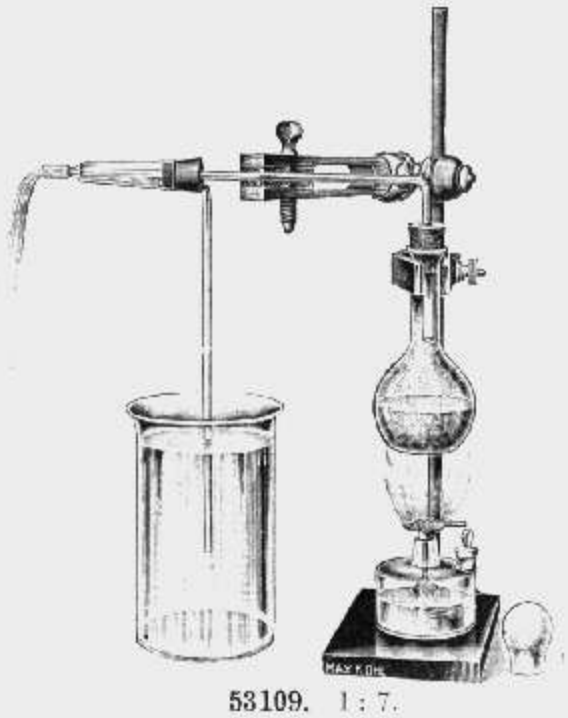
53112. 1 : 5.



53114. 1 : 4.



53105. 1 : 4.



53109. 1 : 7.



53115. 1 : 4

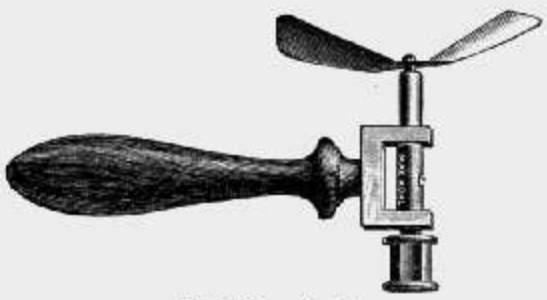
Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
53,103. **Draught Apparatus** after Meidinger, Figure, comprising wide tube with burner and three lateral openings on to which lights are fixed	0 18. 0
It is possible to show with this apparatus the causes of draught, also the back draught in chimneys and the action of the wind on the draught in chimneys.	
53,104. **Sheet Iron Cone with lateral tube** for showing the sucking action of chimney cowls (M. T. p. 128)	0. 3. 0
53,105. **Apparatus for Suction Phenomena of Outflowing Gases,** after Clement and Desormes, Figure (M. P. I, Fig. 578 [596])	0. 8. 0
53,106. **Apparatus for Suction Phenomena** (W. D. Fig. 179 [161]), with tapered blow pipe	0. 2. 0
53,107. — idem, with constricted tube (W. D. Fig. 180 [165])	0. 2. 0
53,108. **Apparatus for Suction Phenomena,** of glass, with brass mounts, Figure (M. P. I, Fig. 580 [598])	0. 10. 0
53,109. **Model of Injector (Steam Jet Pump)** after Reichert, Figure, complete, with stand, boiling flask, spirit lamp, wood clamp and beaker	0. 14. 0
53,110. — idem, without accessories named above (M. P. I, Fig. 581 [599])	0. 3. 0
Sectional Model of the Steam Injector: see Section "**Heat**".	
53,111. **Pulverising Tube** of glass (M. P. I, Fig. 582 [600])	0. 0. 4
53,112. **Apparatus for demonstrating the Breathing of human beings,** Figure, after Meutzner (Ztschr. f. d. phys. u. chem. U. **5**, 1892, p. 305)	0. 10. 0
53,113. — idem, with stand	0. 14 0
53,114. **Sectional Model** of a **Clack Valve,** of metal, Figure	0. 15. 0
53,115. **Sectional Model** of a **Ball Valve,** of metal, Figure	0. 15. 0
53,116. **Sectional Model** of a **Conical Valve,** of metal, Figure	0 15. 0
53,117. **Sectional Model** of a **Plate Valve,** of metal, Figure	0. 15. 0

Water Air Pumps: see Nos. 50,127—50,165, pp. 22—27.

Cl. 5867, 3358, 1008, 1001, 1000, 3359, 1002.

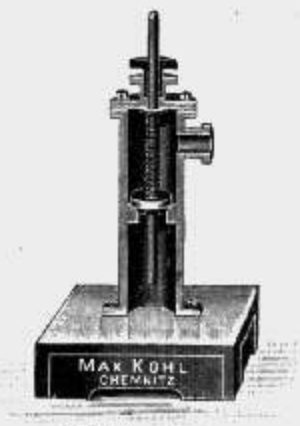
Max Kohl A. G. Chemnitz, Germany.



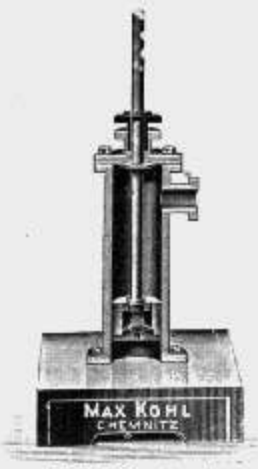
53 122. 1 : 3.



53 116. 1 : 4.



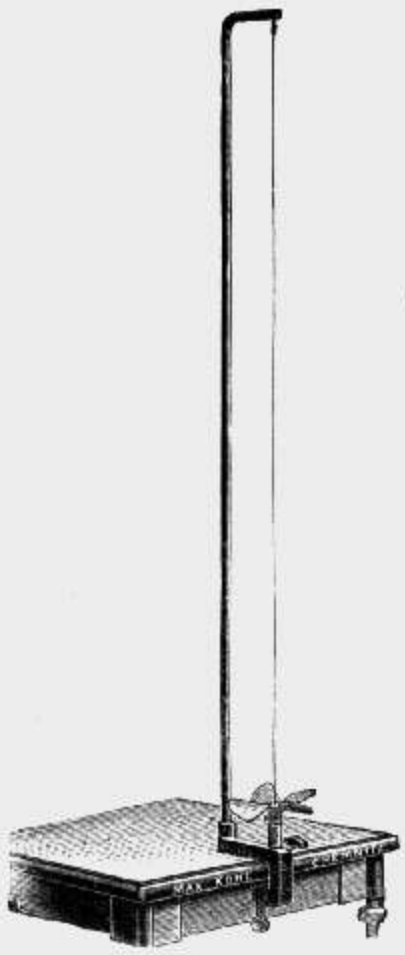
53 117. 1 : 4.



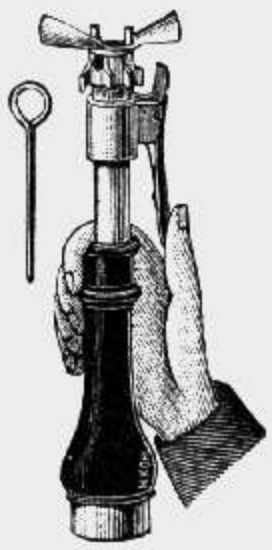
53 118. 1 : 4.



53 119. 1 : 4.



53 123. 1 : 11.



53 124. 1 : 1.

53 126. 1 : 7.

	£	s.	d.
53,118. **Sectional Model** of a **Membrane Valve**, of metal, Figure	0.	15.	0
53,119. **Sectional Model** of a **Safety Valve**, with adjustable weight, of metal, Figure	0.	15.	0
53,120. **Robinson's Cross Cups**, Models (M. T., Fig. 91)	0.	6.	0
53,121. **Windmill**, of cardboard (M. T., Fig. 105)	0.	3.	0
53,122. **Screw Flyer (Propeller)** free-flying, Figure (W. D. Figs. 183 and 184 [168 and 169]), with throwing apparatus	0.	6.	0
53,123. — idem, flying upwards on a 1 m long wire, thus obviating any damage to objects, Figure	0.	16.	0
53,124. **Throwing Apparatus** wound by a spring, Figure, with **one screw flyer**	0.	12.	0
By winding up the spring to a greater or less degree it is possible to regulate the height to which the flyer will ascend. The distance of ascent can be as much as 30 metres.			
53,125. **10 Screw Flyers** for above, as spares	0.	2.	0
53,126. **Throwing Apparatus for Boomerangs**, after Pfaundler, Figure, with 6 small aluminium boomerangs of different shapes (M. P., 10th Edn. I, Fig. 327)	1.	8.	0
53,127. **Boomerang** (W. D. Fig. 185 [170])	0.	1.	0
53,128. **Model of a Parachute** (M. T. I, Figs. 588 and 589 [605 and 606])	0.	8.	0

Wind Vane and Wind Wheel for demonstrating the Propeller Fan: see No. 52,006.

Water Air Pumps: see Nos. 50,127—50,165, pp. 22—27.
Anemometers and Wind Vanes: see **Meteorology.**

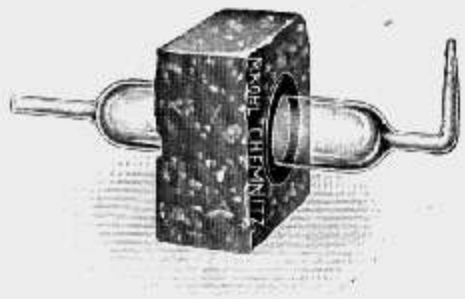
Cl. 1009, 1003, 1004, 1005, 1006, 1010, 1011, 4942.



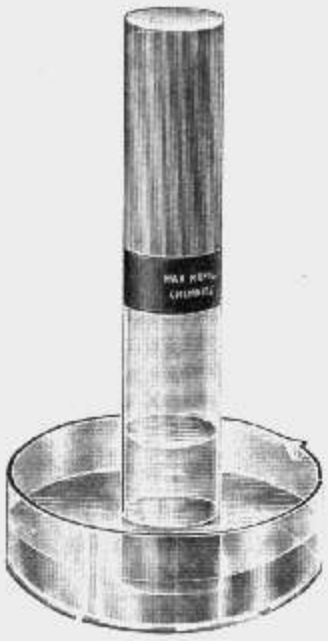
53 130. 1 : 9.



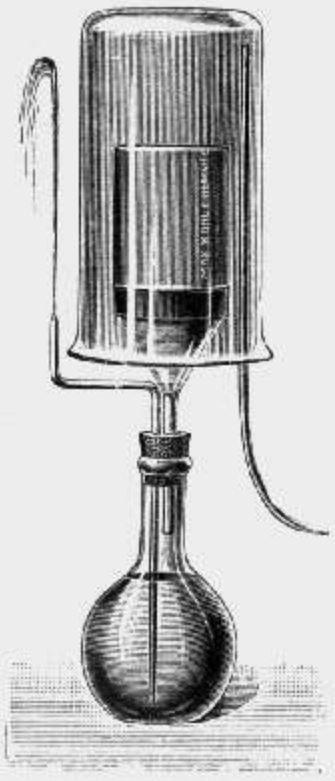
53 129. 1 : 6.



53 131. 1 : 6.



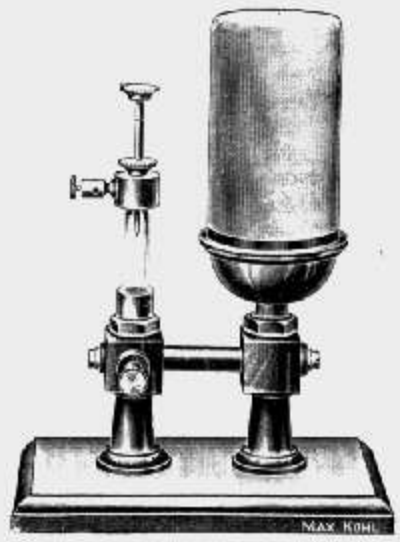
53 132. 1 : 3



53 134. 1 : 5.



53 136. 1 : 5.



53 137. 1 : 4.

Molecular Effects of Gaseous Bodies.

	£ s. d.
53,129. **Döbereiner's Tinder Box,** Figure	0. 7. 0
53,130. **Air Gun,** Figure, a separate compression pump is not necessary	1. 4. 0
53,131. **Brick with Fitting,** Figure, for Pettenkofer's Experiment to show the Diffusion of Gases through porous walls (Kleiber, Oberstufe, Fig. 18; M. T. p. 129)	0. 12. 0
53,132. **Apparatus for showing the Diffusion of Gases through porous Partition Walls (Transfusion),** Figure (M. P. III, Fig. 145 [I, Fig. 619])	0. 4. 0
53,133. — idem, **with Manometer** (M. T., Fig. 92)	0. 4. 0
53,134. **Gas Endosmose Apparatus,** after Weinhold, Figure (W. D. Fig. 188 [173]) . .	0. 6. 0
51,751. **Double Sphere on Stand,** for showing the expansion of gases (W. D. Fig. 60 [55]) and the mixing (diffusion) of two gases, after Berthollet (Gan.-Man., Fig. 163), see Fig. 51,751, p. 250	0. 10. 0
53,136. **Demonstration Gas Indicator,** Figure	0. 8. 0

Mercury is introduced into the U-tube until the lower current terminal is immersed therein. The upper contact is inserted as per illustration, the two terminals are then connected with a cell and a bell, and house gas is allowed to flow on to the diffusion partition. The gas diffuses in the funnel and forces the mercury out of the left limb of the tube until the circuit is finally closed.

53,137. **Gas Indicator** after Ansell, Figure, for showing the presence of firedamp . . .	1. 2. 0
53,138. — idem, as suggested by Bunsen, Figure	0. 12. 0
53,139. **Silver-Plated Copper Plate** for Moser's breath figures (Fr. phys. Techn. I, 2, p. 1034)	0. 5. 6
53,140. **Endosmometer** after Beclai, Figure	1. 0. 0

Cl. 1012, 5889, 5115, 1015, 1016, 5854, 1017.

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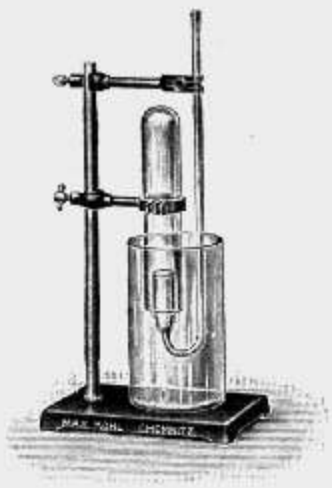
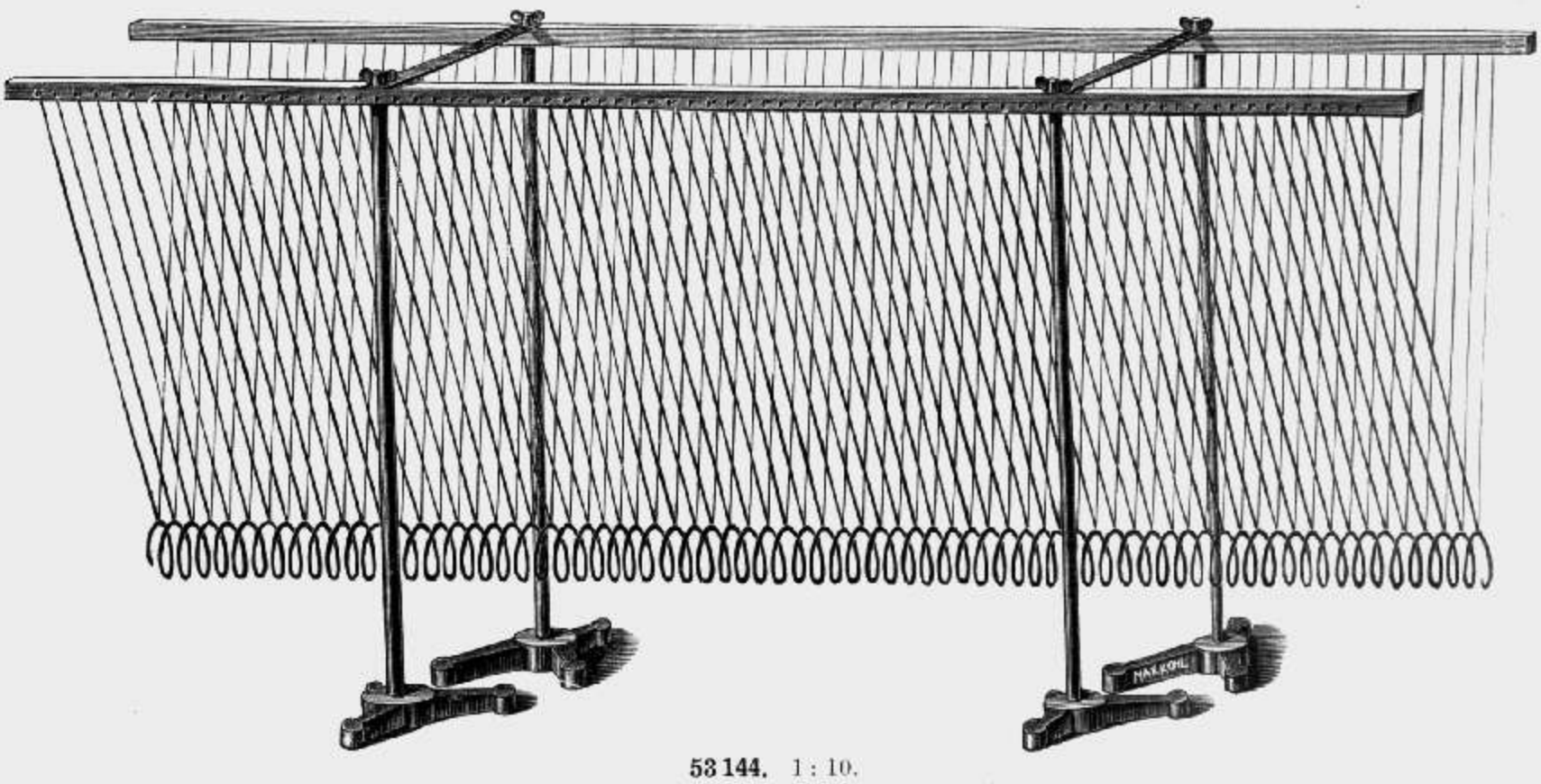
53 138. 1 : 8.



53 140. 1 : 9.



53 143. 1 : 10.



53 144. 1 : 10.

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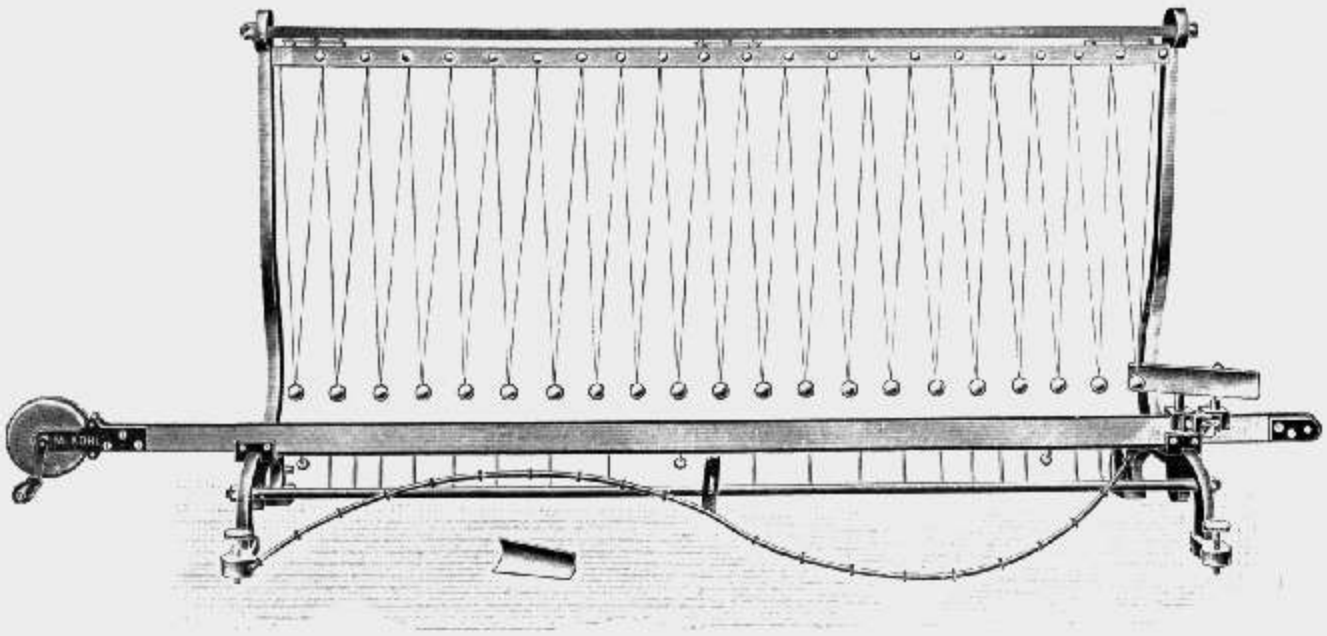
53,141. **Apparatus for showing the absorption of Gases through Solids and Liquids** (M. P. II, Fig. 263 [I, Figs. 612 and 615])	0. 2. 0
53,142. **Absorptiometer** after Bunsen, for the Absorption of Gases through Liquids (M. P. III, Fig. 265 [I, Fig. 616])	6. 0. 0
53,143. **Effusiometer** after Henniger, Figure, for determining the velocity of outflow of Gases (Kohlrausch, Praktische Physik, 10th Edn., p. 91)	1. 6. 0

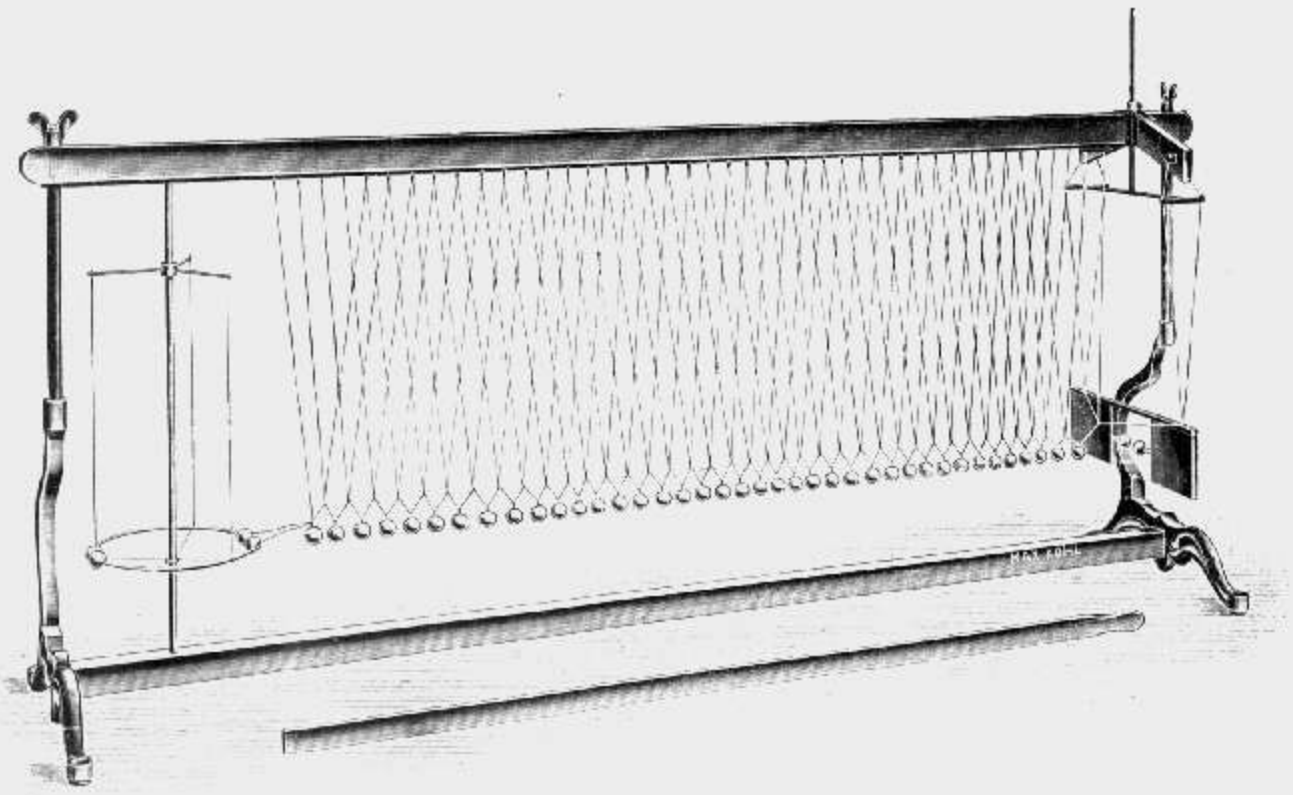
Wave Motions.

	£ s. d.
53,144. **Longitudinal Wave Machine** after Weinhold, Figure (W. D. Fig. 196 [181], plate IV), for explaining the reflection of waves at the free and fixed end, as well as the existence of stationary waves, with copper spiral 170 cm long, fixed on rotary pegs	3. 12. 0
53,145. — idem, each winding weighted with a lead ball	4. 10. 0

Apparatus for showing the Elasticity of Air: see p. 366.



53146. 1 : 10.



53148. 1 : 14.

53,146. **Wave Machine** after Mach, Figure, for demonstrating progressive and stationary **Longitudinal and Transverse Waves,** also for converting transverse waves into longitudinal and *vice-versa* . . . . . £ 5. 0. 0

The Machine is provided with a driving arrangement by means of which the different waves can easily be produced. A precise description is appended to each machine.

53,147. **Longitudinal and Transverse Wave Apparatus** after van Schaïk (Ztschr. f. d. phys. u. chem. U. **14**, 1901, p. 89; M. T. p. 86), showing the longitudinal and transverse oscillations simultaneously 8. 0. 0

53,148. **Wave Machine, Model for Hertzian Waves,** after Silvanus Thompson, Figure (S. P. Thompson-Lummer, Sichtbares und unsichtbares Licht, 1898, Fig. 150; Slaby, Die Funkentelegraphie, p. 11, 1901) 6. 0. 0

The radiator (primary station) forms a heavy mass of brass, suspended from fibres, and has a difinite period of oscillation, which is relatively large. The resonator (secondary station) is a circle cut out of brass, this also being suspended from fibres.

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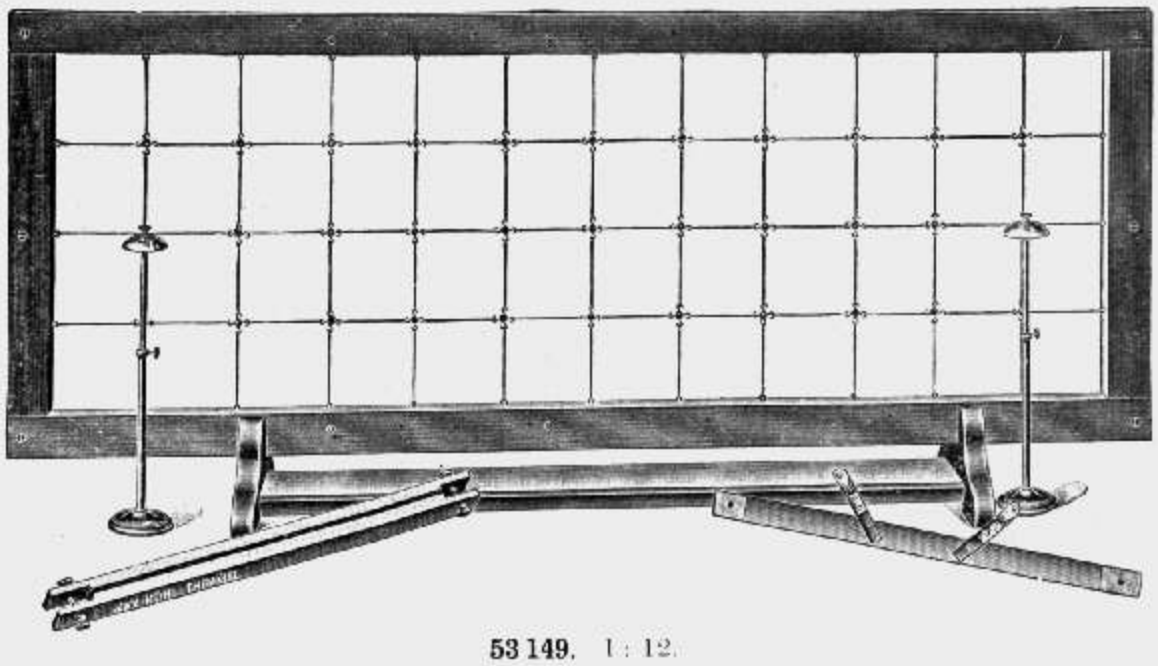
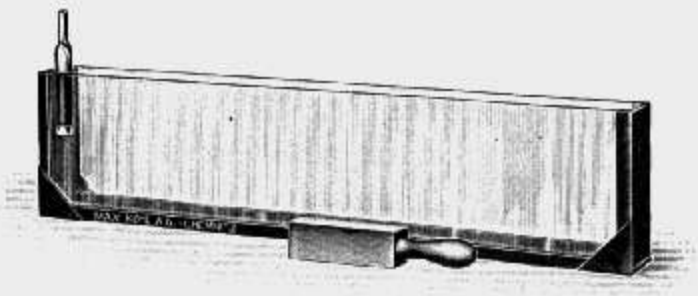


53 149. 1 : 12.



53 152. 1 : 17.



53 153. 1 : 6.

	£ s. d.
53,149. **Wave Machine** after Hillig, Figure, with a single and a double clamping board and with two adjustable bell cups fixed on stands	4. 0. 0

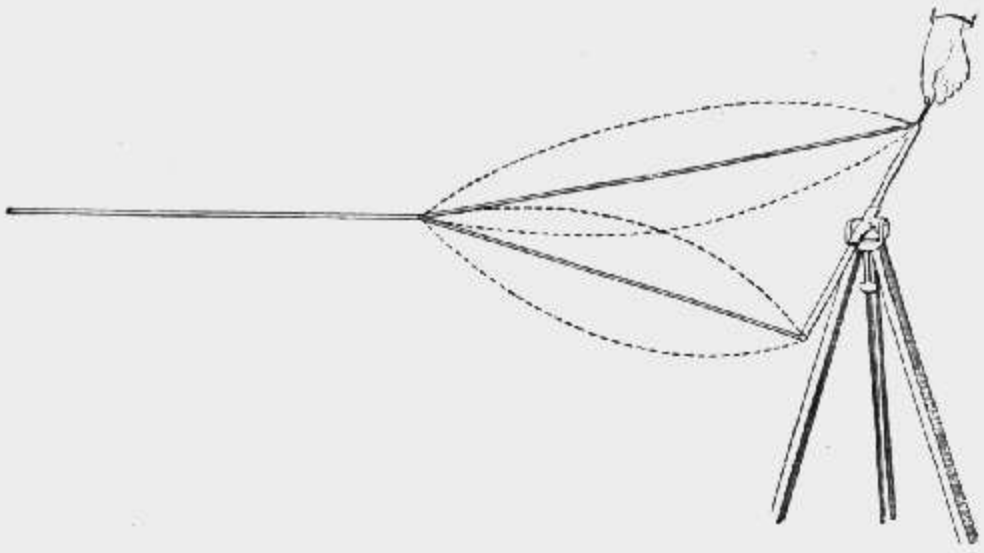
The apparatus represents an ether stratum and consists of a wood frame 1.5 × 0.5 m upon which a number of lead balls 1 cm in diameter are strung, being connected with each other and with the frame by means of spiral springs. It is possible to demonstrate with this apparatus (1) the longitudinal wave; (2) the transverse wave; (3) the water wave (gravitation wave, in which the frame is placed horizontally); (4) the velocity of propagation (if the centre is plucked both bells ring simultaneously: equal velocity of propagation in the same medium); (5) polarisation; and (6) Huygens's Principle. A description is appended to each apparatus.

* 53,150. **Apparatus for Demonstrating Wave Motions,** after Grimsehl (Ztschr. f. d. phys. u. chem. U. **19**, 1906, p. 271), for demonstrating the Propagation, Reflection, and Interference of Water Waves	3. 15. 0
* 53,151. **Lantern Slide** for explaining Wave Motions . . . . . Each	0. 1. 6
53,152. **Wave Trough** after Weber, Figure, with glass walls	2. 4. 0
* 53,153. **Apparatus for the Repulsion and Interference of Wave Motion,** Figure (Fr. phys. Techn. I, 2, Figs. 3637 and 3639 [I, Figs. 565 and 566]), comprising an iron plate and dropping vessel for mercury on a movable stand, and two different elliptical vessels	1. 4. 0

One vessel is filled with mercury until a smooth surface is formed. If now mercury is allowed to drop out of the dropping vessel in a focus of the ellipse, very visible waves are produced the repulsion and interference of which are rendered visible in a very pretty manner. The phenomena can also be projected by means of the mirror and lens No. 53,154.

* 53,154. **Adjustable Mirror and Large Bi-convex Lens for above,** to enable the phenomenon to be projected by means of the lantern	2. 5. 0

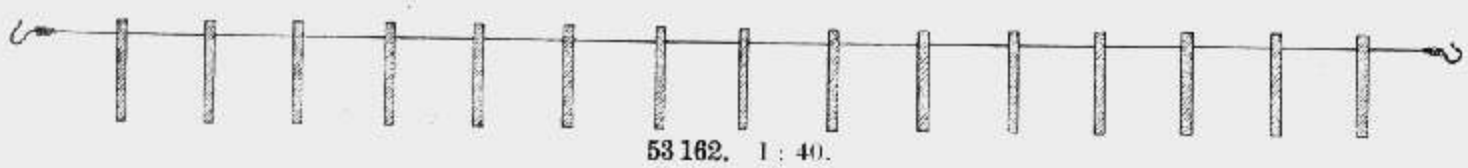
* Can be used with the Projection Apparatus.



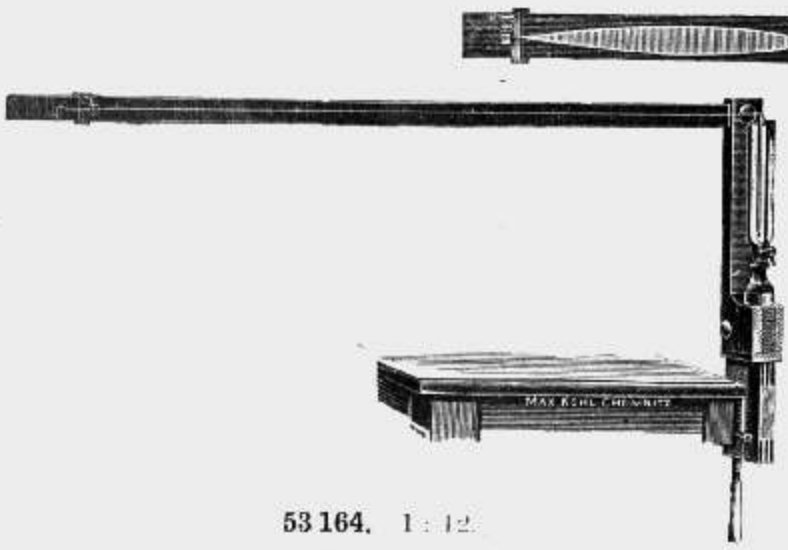
53 155.



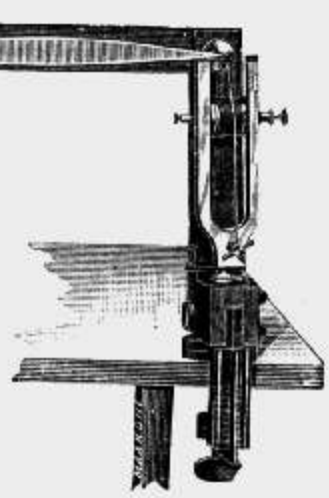
53 161. 1 : 5.



53 162. 1 : 40.



53 164. 1 : 12.



53 166. 1 : 9.

	£ s. d.
53,155. **Rope Wave Apparatus** after Volkmann, Figure (Fr. phys. Techn. I, 2, Figs. 3426, 3436, 3437; Ztschr. „Natur und Schule", Vol. I, pp. 273—282 and pp. 342—350), for demonstrating the propagation, reflection, interference and polarisation of simple waves and trains of waves, the influence of the cord tension and of the cord weight on the wave-velocity, and of the compensation of waves of opposite phases	2. 5. 0
The apparatus consists of two end supports with hooks, 1 swinging lever for interference experiments, 2 polarisers, and 18 wire spirals. In addition, 3 to 4 stands are necessary for the experiments and are not included in the price; it is also advisable to provide stand clamps.	
53,156. **4 Stands** for Volkmann's Rope Wave Apparatus	1. 0. 0
53,157. **4 Stand Clamps** for preceding Stands	1. 0. 0
53,158. **Indiarubber Cords** for transverse waves, 3 m long (W. D. p. 244 [217])	0. 3. 0
53,159. — idem, weighted for half their length with wood balls	0. 12. 0
53,160. **Brass Wire Spiral on Silk Fibre,** for reflection of transverse waves (W. D. p. 245 [218])	0. 5. 0
53,161. **Brass Wire Spiral with Steel Rod** for clamping, Figure (M. T. pp. 86 and 87), for generating transverse and longitudinal waves	0. 2. 0
53,162. **Apparatus after Rosenberg,** Figure, for demonstrating the propagation and interference of oscillatory motions	0. 12. 0
The apparatus consists of a long metal wire to which small wood pieces of square section are fixed at equal distances apart, these pieces being of equal length.	

Cl. 3363, 4516, 1031, 1036, 1037.

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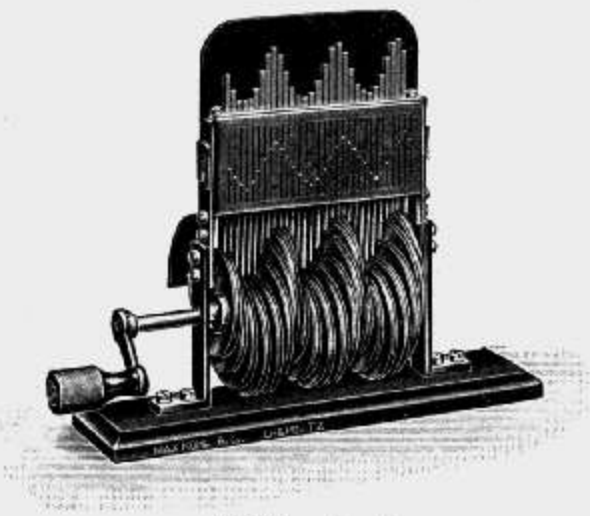
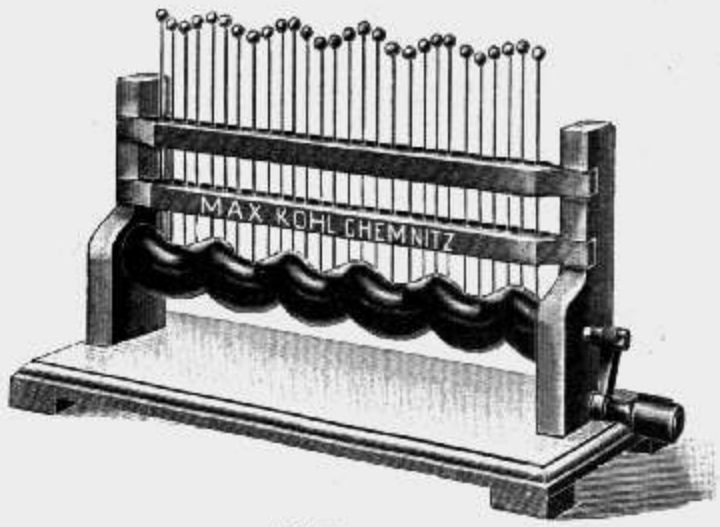
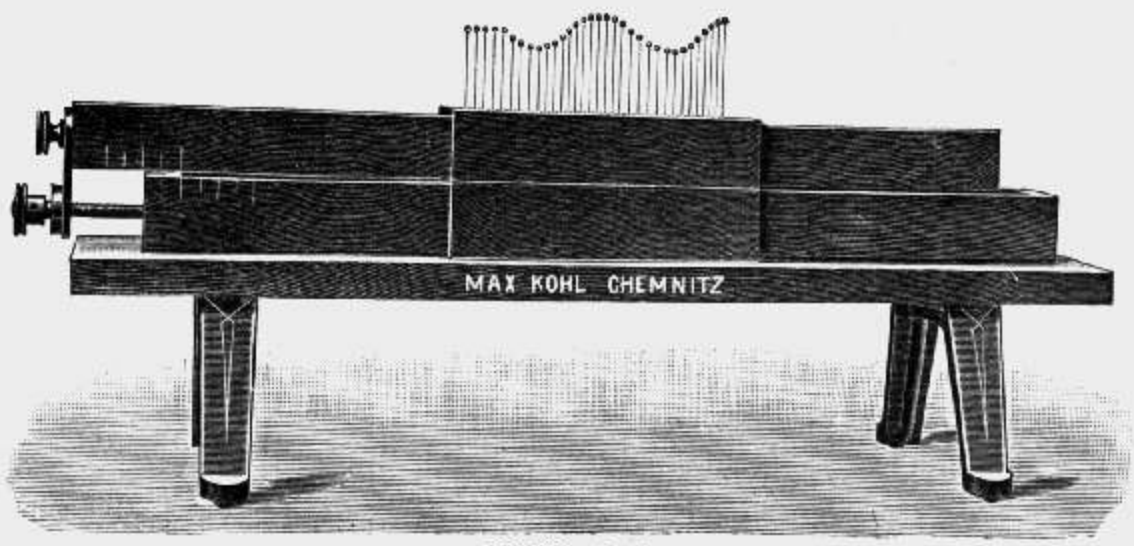


53169. 1 : 4.



53172. 1 : 6.



53173. 1 : 6.

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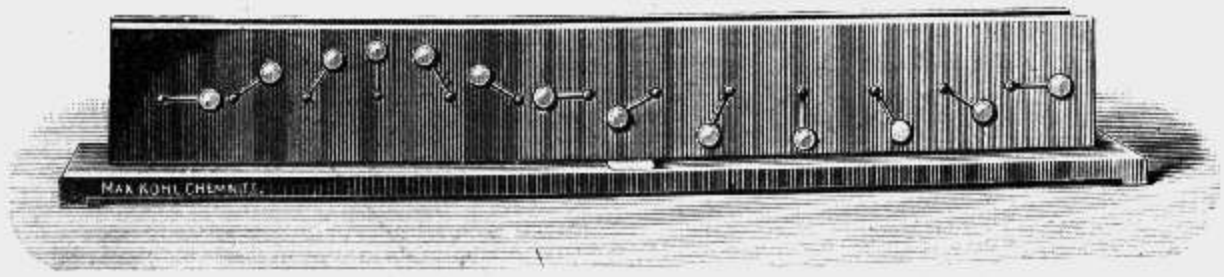
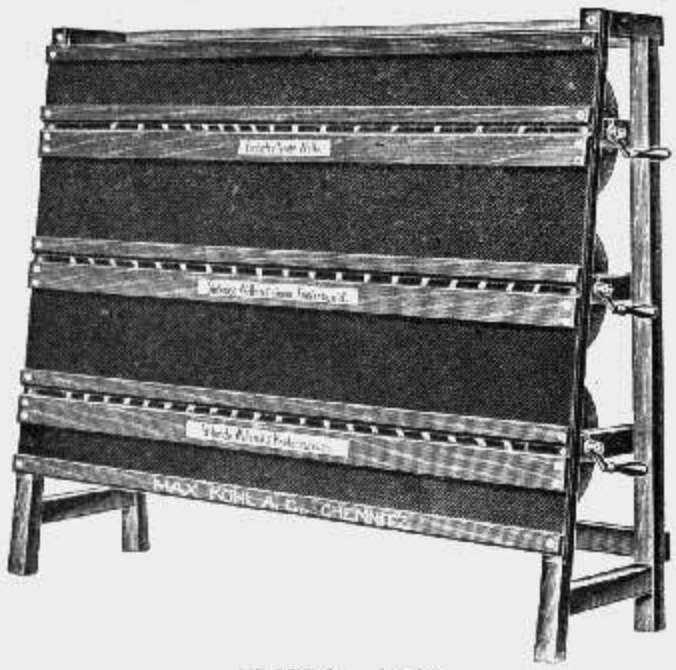
	£ s. d.
53,163. **2 Spiral Spring Models** for imitating sound vibrations (M. T. Fig. 96)	0. 6. 0
53,164. **Wave Apparatus after Melde;** a gut string of 90 cm length which is set in synchronous vibrations by a tuning fork, Figure (M. P. 1, Fig. 632 [659])	2. 10. 0
53,165. — idem, with platinum wire string 0.35 mm thick, which is rendered incandescent by an electric current for making the experiment more apparent	4. 0. 0
53,166. — idem, **larger,** with very massive fork and **electromagnetic drive** for permanently maintaining the vibrations, Figure, with gut string	5. 0. 0
53,167. — idem, with platinum wire string 0.5 mm thick	7. 10. 0
53,168. **Rotary Screw Spiral** after Friedr. C. G. Müller, for demonstrating **progressive sine waves** (M. T. p. 87)	0. 12. 0
*53,169. **Transverse Wave Machine for the Projection Lantern,** Figure (Fr. phys. Techn. I, 2, Fig. 3405)	2. 8. 0
53,170. — idem, with 10 angle-shaped rods for demonstrating a longitudinal wave. . .	2. 12. 0
53,171. **NEW. Wave Machine** after Steindel, for transverse and longitudinal waves and for demonstrating the interference of two waves	6. 0. 0
The Wave Machine comprises two machines of pattern No. 53,169, the excentries of which can be reciprocally adjusted so as to vary the phases of the two waves relatively to each other. The rods of the two machines are connected with each other by levers and set a third row of rods into motion, thus showing the interference of the two waves.	
53,172. **Transverse Wave Machine,** Figure	1. 10. 0
53,173. **Wave Machine** after Fessel and Plücker, Figure (M. P., 9th Edn., II, 1, Figs. 817 to 821), with two adjustable wave troughs and two sets of pins with balls on the ends for demonstrating **transverse, circular and elliptic wave motion,** of polished mahogany with iron legs	6. 0. 0

* Can be used with the Projection Apparatus.

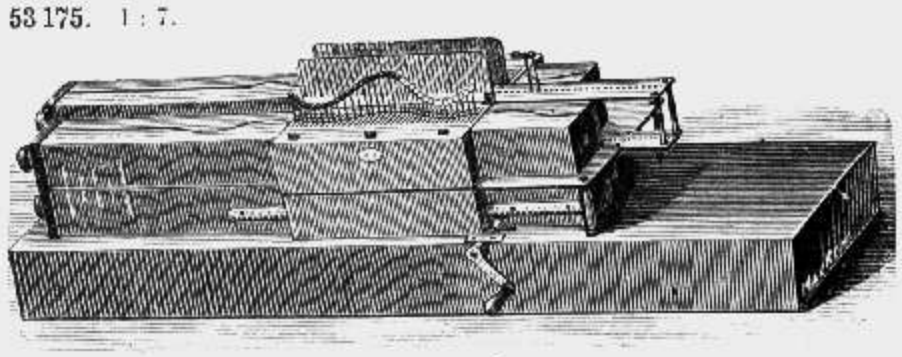


53175. 1 : 7.

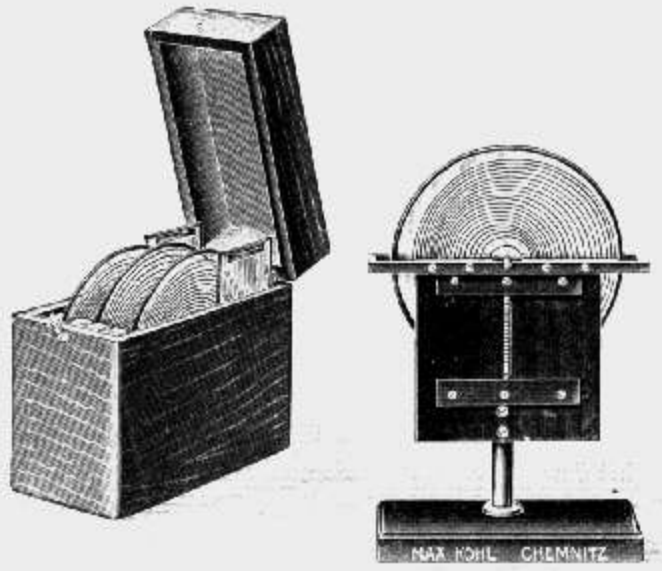


53176A. 1 : 13.

53176B. 1 : 12.



53174. 1 : 9.



53177a. 1 : 7.

	£ s. d.
53,174. **Wave Machine** after Fessel and Plücker, Figure, with a number of wave troughs; can be used simultaneously for demonstrating **double refraction**	16. 10. 0
53,175. **Wave Machine** after Christiani, Figure (W. D. Fig. 190 [175]), for imitating aqueous waves. The mechanism is visible, being closed in by glass plate	5. 0. 0
53,176. **Wave Machine** after Wheatstone (M. P. I, Figs. 607 and 608 [636 and 637]), with three different waves on one stand, 1 m long, Figs. A and B	4. 0. 0
* 53,177. **Projection Wave Machine,** cf. Fig. 53,177a, with four round and two rectangular photographed discs; without box	2. 0. 0
The round discs demonstrate (1) the reflection of the elementary repulsion in a closed tube; (2) the progressive longitudinal wave; (3) the stationary longitudinal wave, i. e. the wave motion in an open tube, which gives its fundamental tone; and (4) the stationary wave in a tube closed on one side, which gives the first over-tone (twelfth) of the fundamental tone. The rectangular discs are used for demonstrating the reflection of a single wave at the closed and open end of a tube.	
* 53,177a. — idem, Figure, with box for keeping the glass discs in	2. 5. 0
* 53,178. **Wave Machine** after Crova, Figure (M. P. II, 1, Fig. 193 [271]; Fr. phys. Techn. I, 2, Fig. 3409 [I, Figs. 508 and 509]), with three discs	2. 0. 0
(1) Stationary longitudinal wave. (2) Progressive longitudinal wave. (3) Two longitudinal waves with phase displacement.	

* Can be used with the Projection Apparatus.

Cf. 1025, 5541, 1024, 1026³, 1026², 5051.

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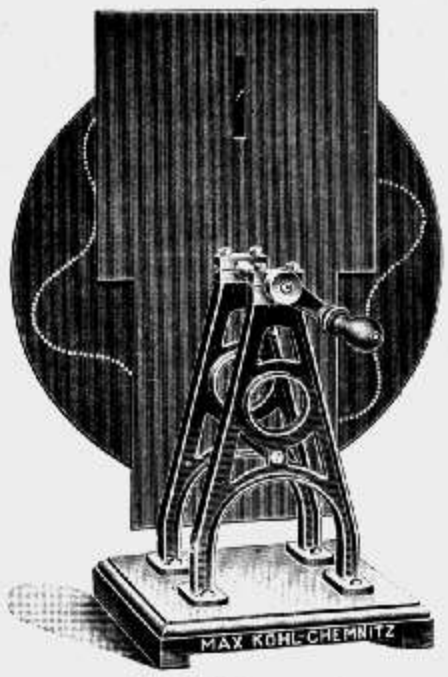
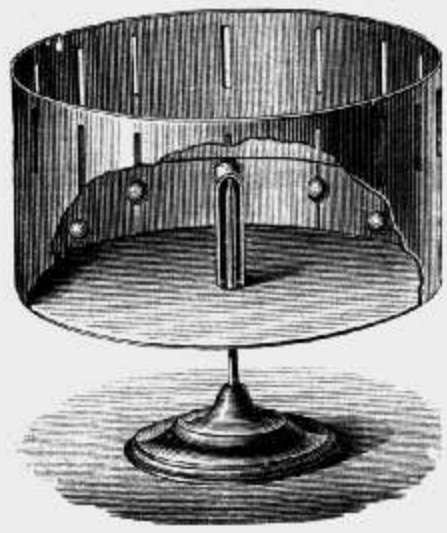
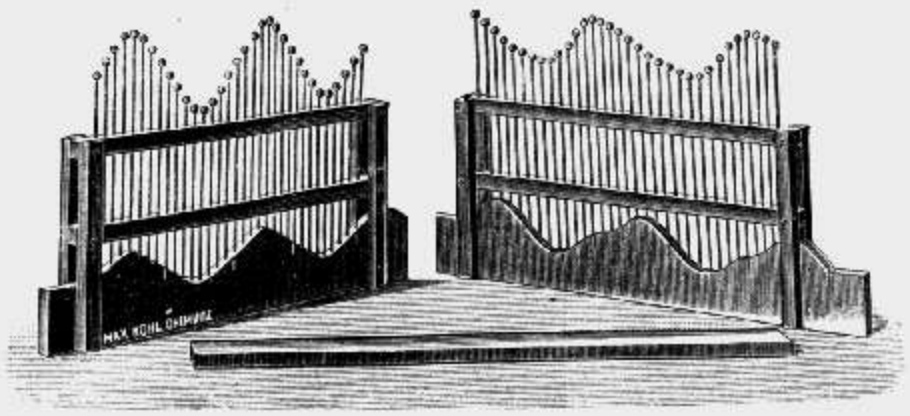


53 178. 1 : 6.

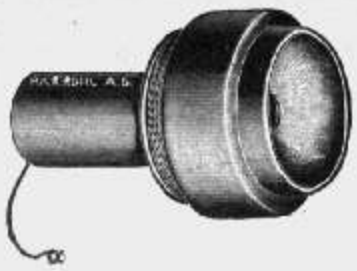


53 179. 1 : 11.



53 180. 1 : 7.

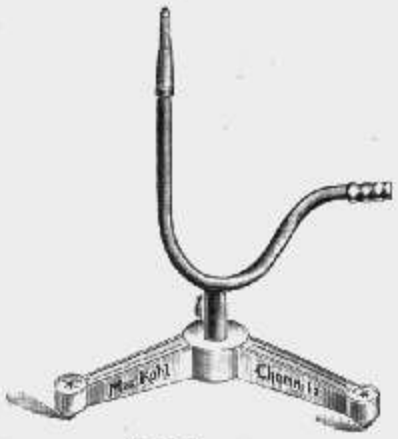
	£ s. d.
53,179. **Stroboscopic Cylinder,** on stand, Figure, with 18 wave strips, after Quincke (M. P. II, 1, Fig. 295 [394])	0. 18. 0
For demonstrating pendulum oscillation, longitudinal and transverse oscillations, vibrations of ether particles, reflection of cord waves, vibration of strings and of air strata in pipes, vibration of liquid particles and of progressive transverse waves.	
52,019. — idem, **fitting the Whirling Table,** with 18 wave strips, after Quincke	0. 14. 0
52,020. **Strips alone,** 18 in number, in case, with description	0. 6. 0
53,180. **Wave Apparatus for Explaining the Vibration of Sounds,** Figure (W. D. Fig. 255 [241]).	2. 10. 0
53,181. **Wave Machine** after Pfaundler (M. P., 10th Edn., I, Figs. 624 a—e and 803; Ztschr. f. d. phys. u. chem. U. **1**, 1888, p. 98), for deriving combined transverse waves, especially for the compounding of the wave of a fundamental tone with the waves of the uneven overtones	5. 10. 0
53,182. **Wave Machine** after Grimsehl, for the synthesis of vibrations, with the rod for the sine shaped wave of a fundamental tone and for two overtones (Ztschr. f. d. phys. u. chem. U. **17**, 1904, p. 34; Physikal. Ztschr. 1904)	8. 15. 0



53 183. 1 : 4.



53 184. 1 : 9.



53 187. 1 : 5.



53 189. 1 : 6.



53 185. 1 : 6.



53 186. 1 : 4.



53 191. 1 : 4.

Acoustics.

Propagation of Sound, Pressure Changes, Reflection, and Refraction of Sound.

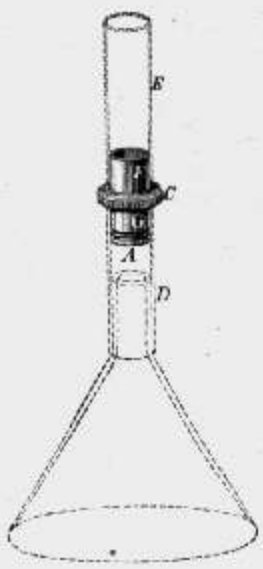
	£ s. d.
Bell with Clockwork for proving that air carries the sound waves, for placing under air pump receivers, see Nos. 53,069—53,071 on p. 405, also electric bell in receiver, No. 53,072.	
53,183. **2 String Telephones,** Figure (W. D. Fig. 204 [190])	0. 8. 0
53,184. **Apparatus for demonstrating the Propagation of Sound in Liquids and Solids,** Figure (Tyndall, Sound [der Schall], Fig. 28), comprising resonance box with attachments and tuning fork	1. 10. 0
The tuning fork is struck or bowed after being, together with its small wood base, screwed off the sound box, the sound, however, being scarcely audible. If it is now placed upon the box or on one of the wood or brass rods screwed to the box, the sound is considerably intensified. This intensification of sound also takes place when the tuning fork (together with wood base) is placed in the funnel of the glass tube, filled with water, and screwed on to the sound box, even though the wood base of the fork be not in contact with the wall of the funnel.	
53,185. **Sensitive Flame Burner,** after König, Figure, working with certainty with the usual gas pressure of 35 mm	1. 0. 0
53,186. — idem, after Weinhold, simpler, Figure, with wire net, without sound horn	0. 8. 0
53,187. — idem, after Weinhold (W. D. Fig. 198 [183]), Figure	0. 6. 0
For rubber bags for the latter apparatus, see Nos. 51,267—51,270, p. 212.	

Cl. 5857, 1048, 1040, 5788, 1038, 1039, 1759.

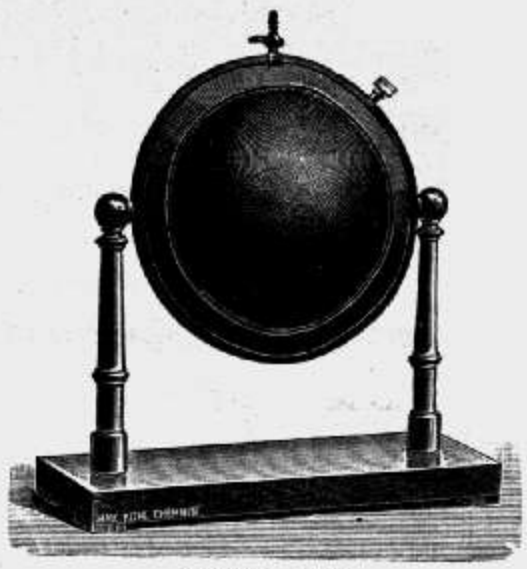
Max Kohl A. G. Chemnitz, Germany.



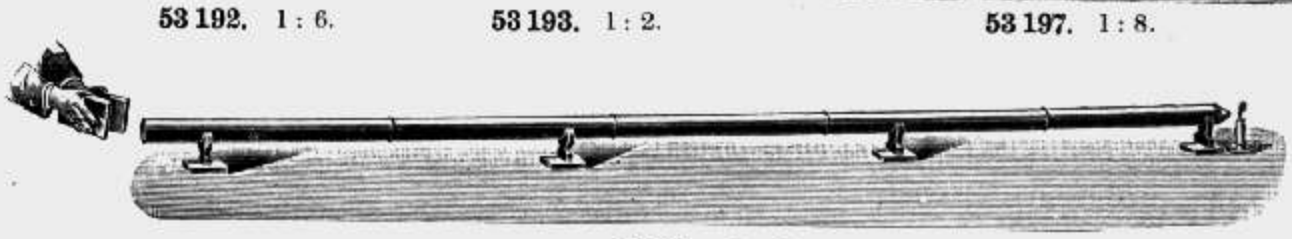
53192. 1 : 6.



53193. 1 : 2.



53197. 1 : 8.



53194. 1 : 24.



53196. 1 : 25.

Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
53,188. **Sensitive Flame,** after Rebenstorff, generating its own gas (Ztschr. f. d. phys. u. chem. U. **19**, 1906, p. 281) . . . . . The apparatus is fed with a mixture of equal parts of ether and benzol; the gas issuing from the burner nozzle becomes mixed with air and is ignited above the net. The sensitivity can be altered by regulating the air current by means of the rubber bellows. The differences in sensitivity on pronouncing different vowels can be shown.	0. 18. 0
53,189. **Air Concussion Apparatus** (Fr. phys. Techn. I, 2, Fig. 3708 [I, Fig. 668]), Figure, funnel-shaped with drum-stick	0. 10. 0
53,190. — idem, after Weinhold (W. D. Fig. 199 [184]), cylindrical, with drum-stick .	0. 9. 0
53,191. **Kundt's Manometer** with stopcocks, after Trussevitch, Figure, with funnel and indicator for the air currents, on stand (Fr. phys. Techn. I, 2, Figs. 3711 and 3735) . . . . . The flap valve, formed of a fish-bladder membrane, is placed inside a tight-fitting conical stopcock. By turning the stopcock through about 180° the valve can be used as a pressure or suction valve. The pointer shows the direction in which the flap opens. The apparatus should be connected, by means of a length of rubber tubing to be attached, with a suitable manometer, e. g., Kolbe's Thermoscope. The apparatus is peculiarly adapted for Rostovzev's experiment on the reflection of sound waves (Ztschr. f. d. phys. u. chem. U. **16**, 1903, p. 288), in conjunction with two concave mirrors and the pipe No. 53,192.	1. 0. 0
53,192. **Tuned Pipe** for above, on stand, Figure (Fr. phys. Techn. I, 2, Figs. 3726 and 3735)	0. 12. 0
53,193. **Apparatus for showing the Pressure Change in Sound Waves, after Szymanski,** Figure (Ztschr. f. d. phys. u. chem. U. **1**, p. 148; W. D. Fig. 201 [186])	0. 9. 0
52,730. **Pressure Level,** after Töpler, Figure 52,730, p. 368 (W. D. Fig. 141 [187]) . .	0. 5. 0
53,194. **Tyndall's Apparatus for showing the Propagation of Sound in Long Tubes,** Figure (Tyndall, Sound [der Schall], Fig. 4; Fr. phys. Techn. I, 2, Fig. 3709 [I, Fig. 669]), with telescopic sheet iron tube 3 m long, with supports	1. 4. 0
53,195. **Drawn Brass Tube,** after Rebenstorff, for demonstrating the conservation of the density of sound without lateral propagation (Ztschr. f. d. phys. u. chem. U. **19**, 1906, p. 279), as well as for thermal expansion in large dimensions (Ztschr. f. d. phys. u. chem. U. **20**, 1907, p. 248); total length 4 m; width 20 mm; in two parts, for heating by steam in the heat experiment	0. 10. 0
53,196. **Megaphone,** Figure, 2 m long, carrying distance 1000 m (W. D. Fig. 202 [188])	0. 10. 0
53,196 a. — **smaller,** of lacquered sheet iron	0. 6. 0
53,197. **Sondhaus's Lens,** Figure, for demonstrating the refraction of sound, on stand, 300 mm diameter (Fr. phys. Techn. I, 2, Fig. 3736) . . . . . Two rubber membranes stretched on a round metal frame can be filled with carbonic acid and a bi-convex lens blown.	1. 13. 0

Tone Manometers after Grimsehl: see No. 53,275, p. 429.
Sound Manometers after Dvořák: see later on in list.



53 201. 1 : 7.



53 199. 1 : 6.



53 204. 1 : 3.



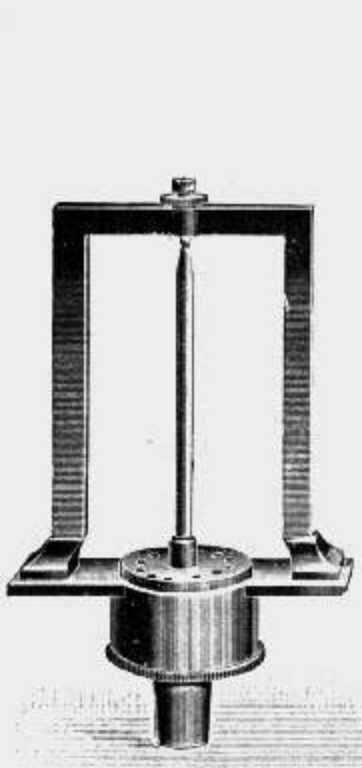
53 208. 1 : 3.

Sound Generation, Sirens and Blowers.

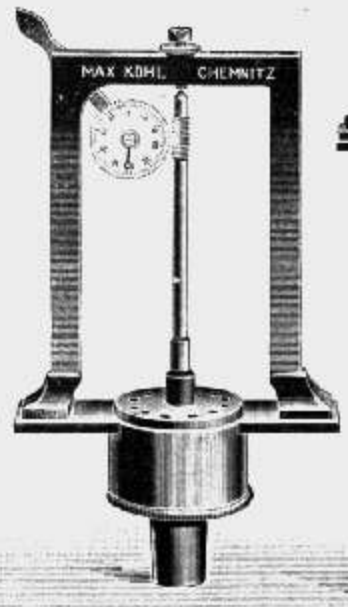
	£ s. d.
62,315. **Apparatus** after Wertheim, Figure 62,315, p. 957, for demonstrating the tones of steel when magnetized (M. P., 9th Edn., III, Fig. 530)	2. 10. 0
53,199. **Trevelyan's Rocker,** Figure (W. D. Fig. 206 [192]), with resonance box, for producing tones by a succession of concussions	0. 15. 0
53,200. — idem, without resonance box	0. 12. 0
53,201. — idem, after König, Figure	0. 14. 0
52,028. **Savart's Toothed Wheels,** see Fig. 52,028, p. 283; 4 wheels, giving the common chord, suitable for Whirling Table, of zinc	0. 9. 0
52,029. — idem, of brass	0. 12. 0
52,021. **Siren Disc,** Fig. 52,021, p. 283 (Seebeck's Siren), **with four rows of holes,** giving the major chord, for placing on the whirling table	0. 5. 0
53,203a. **Siren Disc, with 8 rows of holes,** giving the scale, for the Whirling Table . . .	0. 7. 0
53,203b. — idem, **with 8 rows of holes,** giving major and minor chords	0. 7. 0
53,204. **Pipe with 4 nozzles,** Figure, for blowing the preceding Siren Discs	0. 5. 0
52,026. **Siren Disc** after Oppelt, with 22 rows of holes, for placing on the Whirling Table The disc has 22 rows of holes; 15 give simple tones, 7 give different intervals as combined tones.	0. 16. 0
52,027. **Siren Disc** after Appunn, for placing on the Whirling Table, with 32 rows of holes; gives the simple chromatic scale, the passage of thirds, also the entire song, „Du Schwert an meiner Linken" in the four parts	3. 6. 0
52,024. **Wave Siren Disc** after König, for placing on the Whirling Table, with 2 tubes for blowing the rows of holes and the wave line	0. 15. 0
The Wave Siren Disc has 4 rows of holes having respectively 32, 40, 48 and 64 holes and a wave line on the edge corresponding to the algebraic addition of 4 sine curves corresponding with the above numbers of vibrations. When the wave line is blown upon, the result is a sound which is broken up by the ear into its single constituents, prima, third, fifth and octave. The disc is excellently adapted for explaining the sound action of the phonograph and gramaphone.	
52,025. — idem, after König, **larger,** shaped to correspond to the flame image of the tone. Is supplied in the intervals 8 : 9, 8 : 11, 8 : 12, 8 : 13, 8 : 15, 8 : 16, 8 : 18, 8 : 20, 8 : 23, 8 : 24 . . . . . Price each	3. 6. 0
53,208. **Universal Mouthpiece for blowing the cavum oris, flasks etc.;** comprising rubber tubing with flat tapering brass tube (W. D. p. 312), with conical endpiece for inserting in a valve aperture of the blowing table	0. 7. 0
53,209. **Siren** after Cagniard de Latour, Figure, **small pattern,** with row of 12 holes, without counting mechanism (Helmholtz, Tonempfindungen, 4th Edn., 1877, p. 22), with conical tube for placing on the wind chest. All holes are blown through simultaneously, thus adding to the intensity of the effect	1. 10. 0
53,210. — idem, with counting mechanism, Figure (M. P. I, Figs. 673—675 [699—701])	2. 0. 0
53,211. — idem, larger pattern, with series of 20 holes, without counting mechanism, Figure, with conical tube attachment for placing on the wind chest and with **wood base** for protecting	2. 10. 0
53,212. — idem, with counting mechanism	4. 10. 0

Cl. 3801, 1051, 1054, 4146.

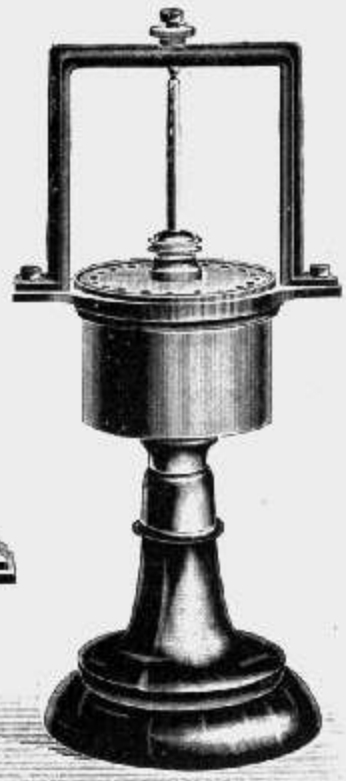
Max Kohl A. G. Chemnitz, Germany.



53209. 1 : 4.



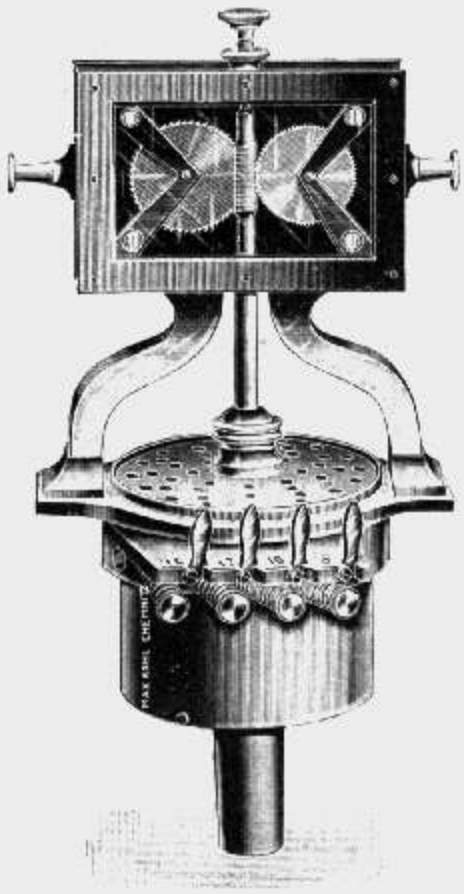
53210. 1 : 4.



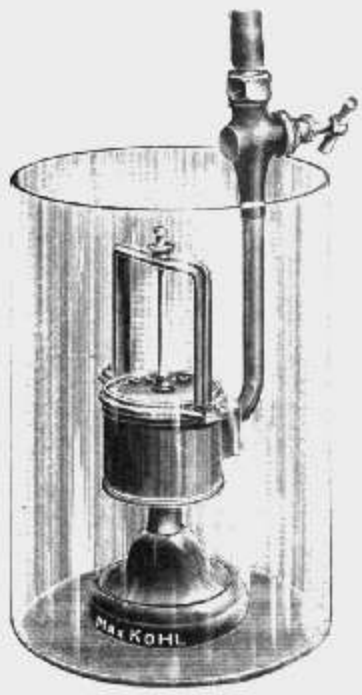
53211. 1 : 4.



53213A. 1 : 4.



53213B. 1 : 3.



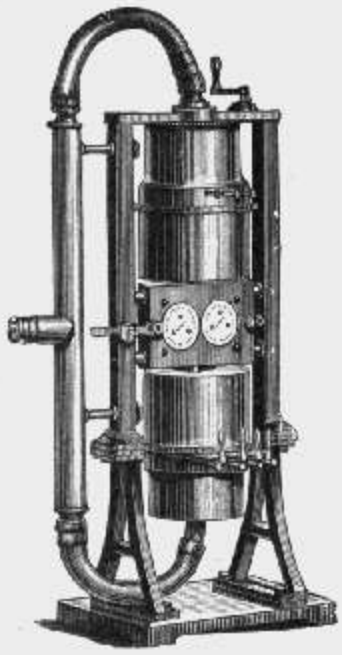
53214. 1 : 6.

53,213. **Chord Siren** after Dove, Figs. A and B, with 4 stops with stop catches, to enable the tones to be sounded singly or together, and with counting mechanism (Helmholtz, Tonempfindungen, 4th Edn., 1877, p. 23; M. P. I, Figs. 839, 840 [814, 815]) . . . . £ 6. 14. 0

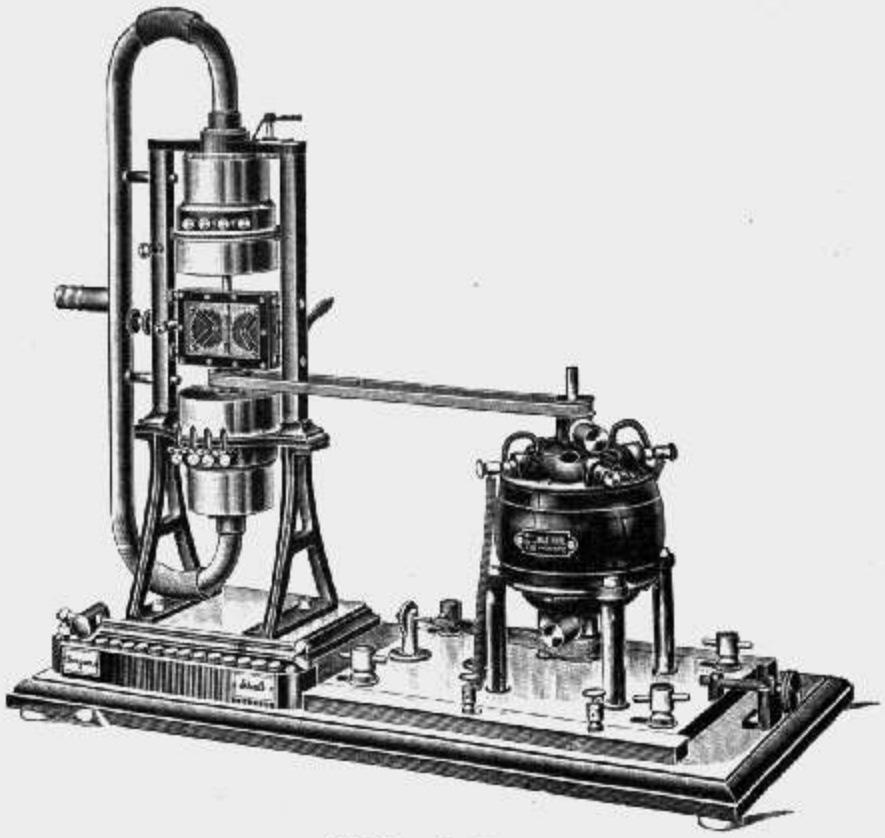
53,214. **Siren arranged to sound under water,** Figure, with glass vessel . . . . . £ 6. 0. 0

This Siren, built on the principle of Cagniard de Latour, is placed in the glass vessel supplied and connected by a length of tubing either with the water lead or with a tank placed on a higher level. If the stopcock is opened the water flows through the siren and the latter sounds.

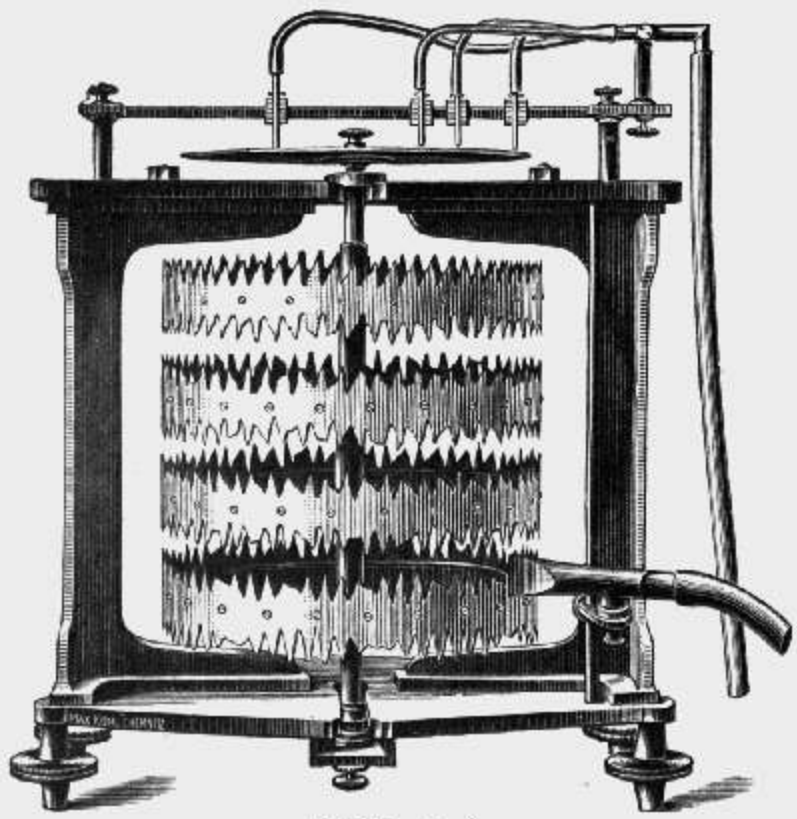
Cl. 3669, 3669a, 3669b, 3669c, 3669e, 3670.



53 215. 1 : 6.



53 216. 1 : 8.



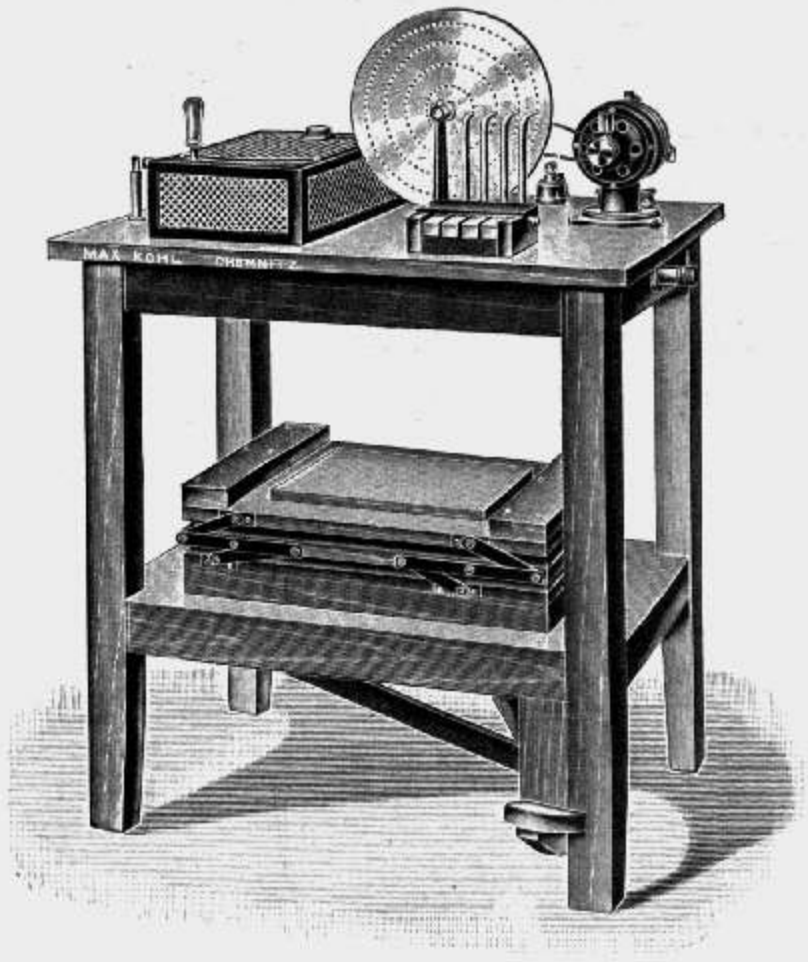
53 219. 1 : 6.

53,215. **Double Siren** after Helmholtz, for working by means of compressed air, Figure, with counting mechanism which closes an electric contact when set into action (Helmholtz, Tonempfindungen, Fig. 56, pp. 268, 291, 303, 652; M. P. I, Fig. 816 [841]; W. D. pp. 260 and 330) . . . . . £ s. d. 16. 0. 0

The Double Siren is very suitable for a large number of important experiments in acoustics and the theory of music, being particularly adapted for these purposes since the ratio of the frequencies of the single tones always remains unaltered. The following intervals of tone can be produced: unison, octaves, fifths, fourths, major third, minor third, whole tone and semi-tone. Special mention may be made of the experiments on the interference of sound, on vibration, on deep and deepest tones, on vibrations of the overtones, and on combined tones. The perforations of the one disc correspond to the tone ratios $c : e : g : d_1$, the perforations of the other correspond to $d : g : b : c_1$. The upper wind chest can be turned by a handle for the purpose of obtaining in the upper siren any phase difference as against the lower one.

Cl. 1059, 1060, 1055.

Max Kohl A. G. Chemnitz, Germany.



53 220. 1 : 13.

	£ s. d.
53,216. **Double Siren** after Helmholtz, driven by a 110 volt D. C. electric motor, Figure, with counting mechanism which when inserted closes an electric contact	26. 10. 0

The electric motor has a regulating resistance and a controllable brake device so as to be able to adjust the siren to any pitch with certainty. The apparatus is very simple to manipulate. The siren is driven by a thin belt, the motor being adjustable so as to keep the belt always taut. In other respects the siren is similar to No. 53,215.

If a different kind of current or voltage is desired the price is proportionately altered. When ordering kindly state **kind of current** and **voltage** for the motor; in the case of alternating and three-phase current the **frequency** should also be given.

53,217. **Electric Motor alone,** with board, adjusting arrangement and regulating resistance	10. 10. 0

Cf. the remarks mentioned under the preceding item.

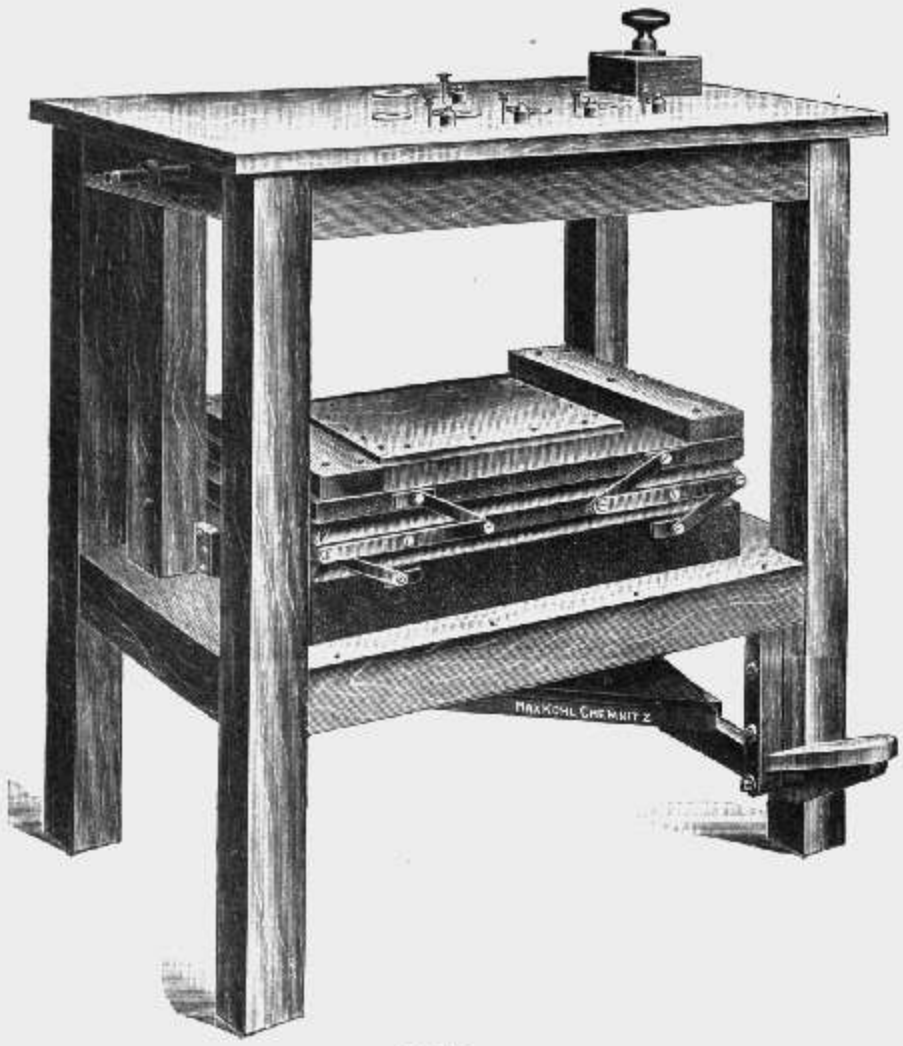
53,218. **Model of the Ship's Siren** with concentric, pierced cylinder jackets, the innermost being rotary (Bolte, Leitfaden f. d. Unterr. i. d. Physik an Navigationsschulen, 2nd Edn., Fig. 108); the essential parts, visible through glass, should be placed on the wind chest	2. 10. 0
53,219. **Large Wave Siren,** after König, Figure, for investigating sound impulses with wind chest and siren disc the rows of holes of which correspond to the periodicities of the primary tone and the repelled tones	45. 0. 0

The apparatus is for showing impulses and impulse-tones produced by the tones of different intervals; the impulses are attained when the rotation is slow and the impulse-tones when the rotation is rapid. A siren disc with holes is used for comparison with the tones produced by the wave siren.

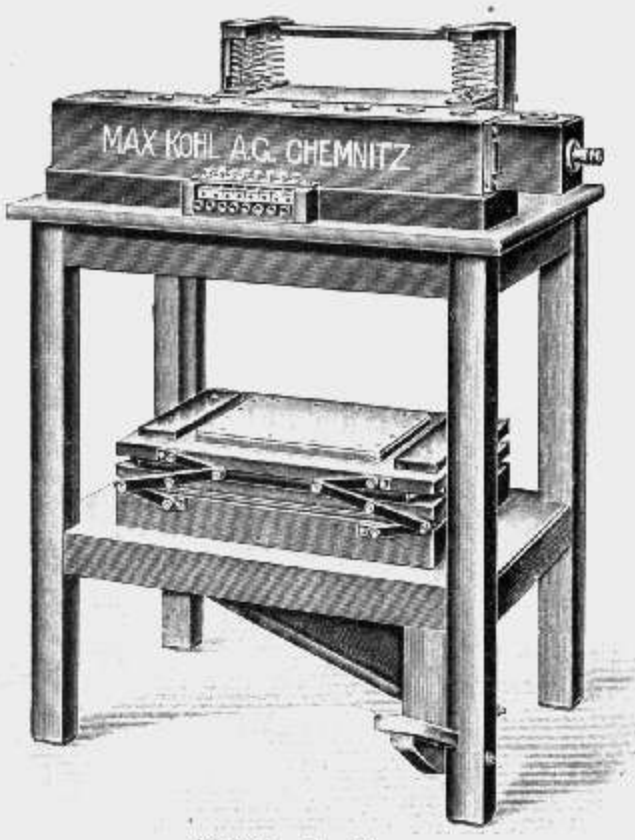
The curves, which are arranged cylindrically, result from the combination of the two sine curves pertaining to the interval. When a blast is applied a motion of the air results corresponding to that produced by the consonance of two actually simple tones, without any intermingling of overtones. Given in with the apparatus are the waves for the eight intervals 8 : 9 to 8 : 16, and an arrangement is fitted to allow the sirens to sound separately and together. The sirens are actuated by a cord pulley.

53,220. **Blowing Table with Siren,** Figure, for demonstration purposes (Model of the German Museum, Munich), siren with Electric Motor Drive; the four rows of holes give the major chord and can be blown either singly or together by using a keyboard. The motor has a regulating resistance so as to be able to raise the fundamental tone an octave, from 256 vibrations to 512 vibrations	22. 10. 0

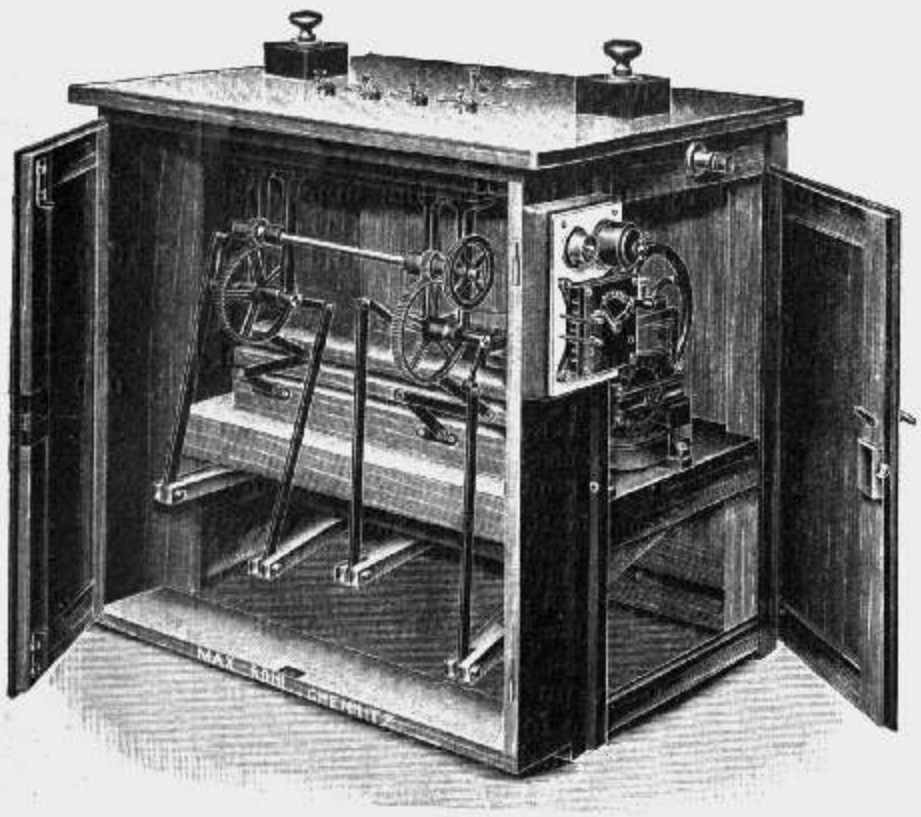
Unless otherwise stated when ordering, we supply the motor for 110 volts Direct Current.



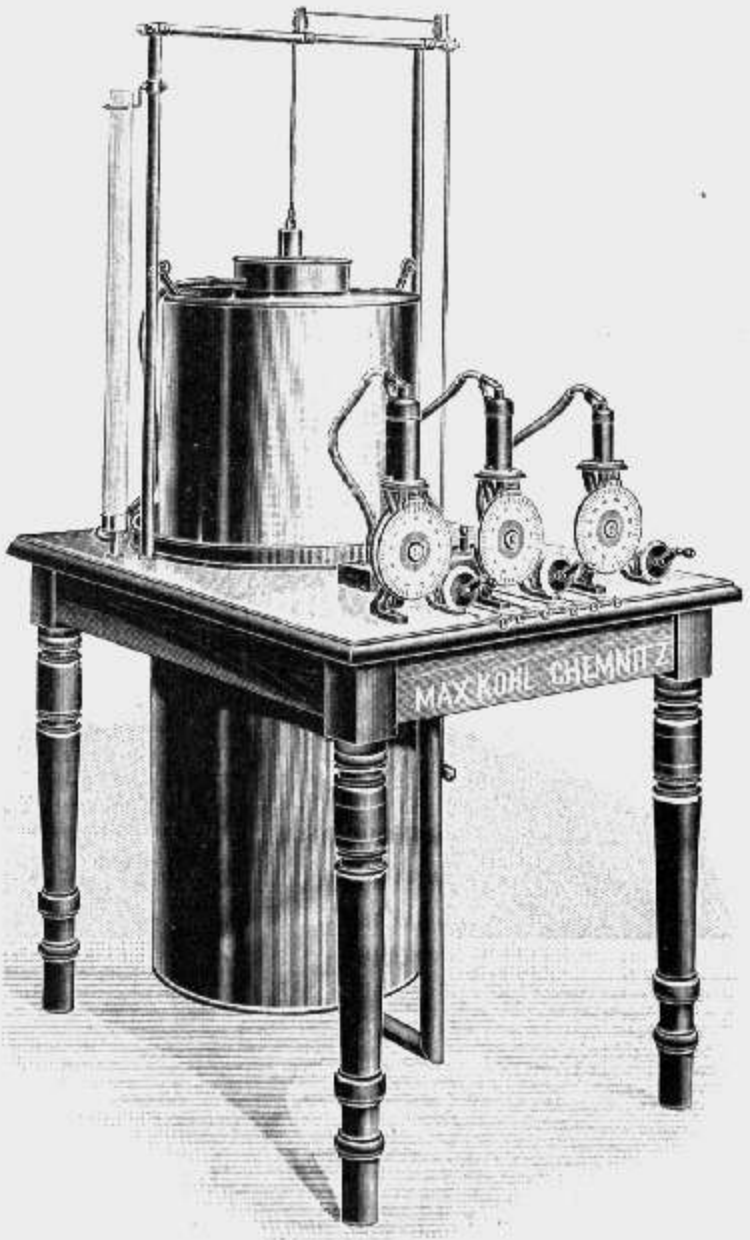
53 221. 1 : 10.



53 224. 1 : 12.



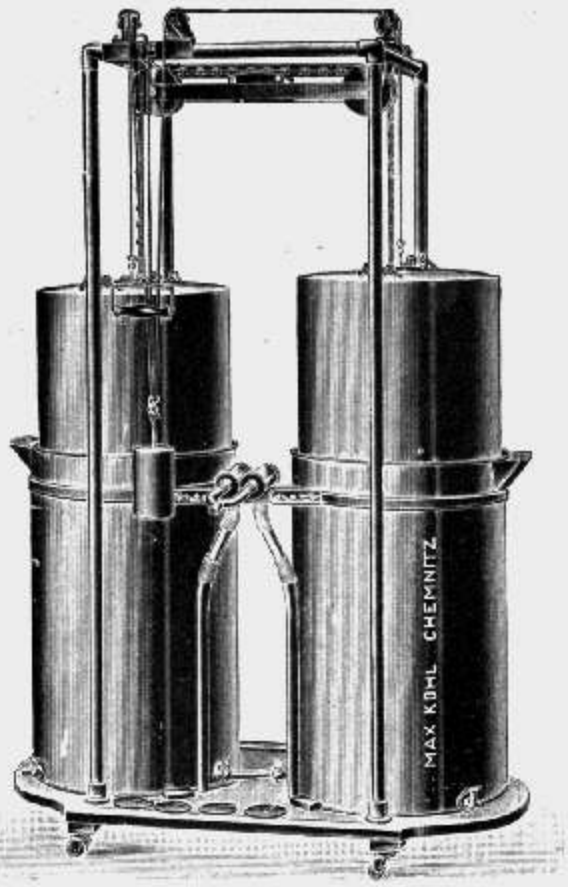
53 226. 1 : 12.



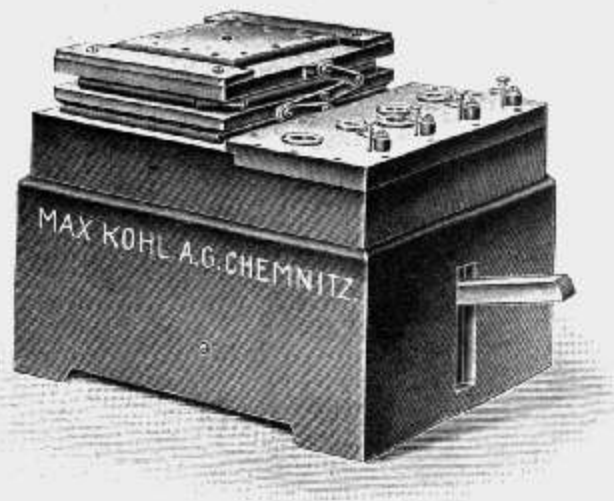
53 229, 53 492, 53 493, 53 494. 1 : 14.

Cl. 1061, 5930, 5108, 3370.

Max Kohl A. G. Chemnitz, Germany.



53 230. 1 : 12.

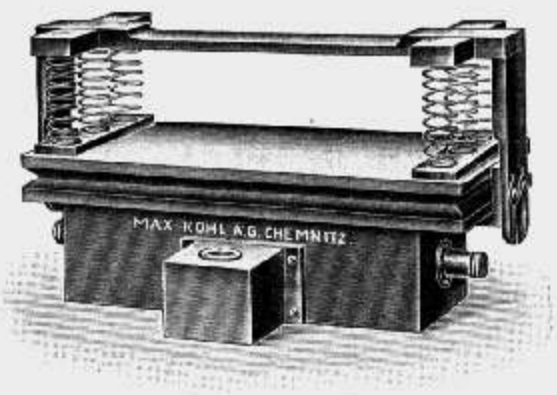


53 232. 1 : 15.

	£	s.	d.
53,221. **Blowing Table for Acoustic Experiments,** Figure, with two large and four small tube attachments with valves	7.	0.	0
The Blowing Table has a large valve for receiving large reed pipes, a tube attachment with plug seal for the overtone apparatus or a special wind chest; four valves for sirens and pipes, and two tube unions of different sizes with plugs, for various purposes. The table frame is constructed of pine, the top of oak.			
53,222. — idem, with eight valves, otherwise as No. 53,221	8.	0.	0
53,223. — idem, with thirteen valves, otherwise as No. 53,221	9.	0.	0
53,224. **Blowing Table with Wind Chest and Keyboard,** Figure, for all acoustic experiments; with a large valve for a large reed pipe or a tonometer; with eight small valves and two different pipe attachments for rubber tube connections. The valves are opened by a keyboard which can be regulated and fixed in place. Size of bellows 37 × 57 cm	15.	0.	0
53,225. — idem, with twelve valves	18.	0.	0
53,226. **Blowing Table with Electric Motor Drive,** Figure, with **110 volt D. C. Motor,** with fuse, switch and starting resistance, in lock-up cabinet with doors	24.	0.	0
With two large conical pipe attachments with plug seals, for taking tonometers and overtone apparatus; a large valve for large reed pipe; four valves for sirens and pipes and two hose unions of different sizes with plug seals, for various purposes. The table frame is of pine, the top of oak.			
53,227. — idem, with eight valves	25.	0.	0
53,228. — idem, with thirteen valves	26.	0.	0
53,229. **Blowing Table for Constant Pressure,** Figure, specially adapted for use in experiments with tone variators Nos. 53,481 et seq., for continuous experiments with Galton's whistle, Quincke's tubes, etc. Price without tone variators	9.	0.	0
53,230. **Double Blower,** after Whipple, for constant pressure, Figure, with two wind chambers arranged as gasometers. The chambers are employed alternately, the transfer being made quite easily	22.	0.	0
The blower gives a very uniform wind both when the chamber is filled and empty. The influence of the alteration in water level on the height of pressure is compensated by efficient arrangements. The pressure can be regulated. A Stern Tone Variator can be supplied with air for about 2½ minutes without interruption.			
53,231. **Wind Chest on Table,** with four small and three large valves, cf. Fig. 53,506, for use with the Whipple Double Blower No. 53,230	7.	10.	0
53,232. **Acoustic Bellows,** Figure, with four valves and a pipe attachment for taking reed pipes	4.	10.	0



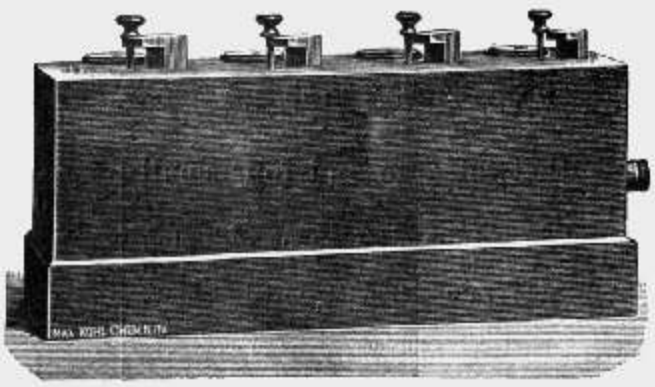
53 233. 1 : 10.



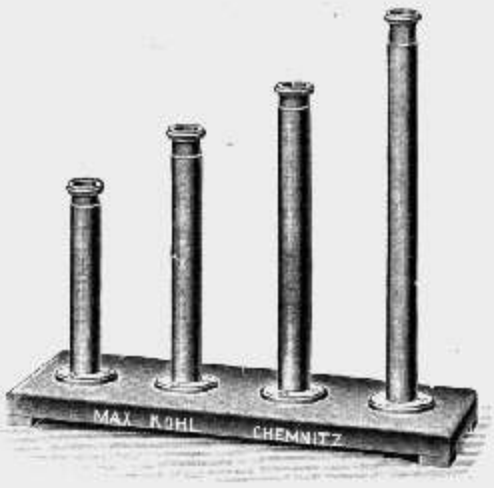
53 234. 1 : 9.



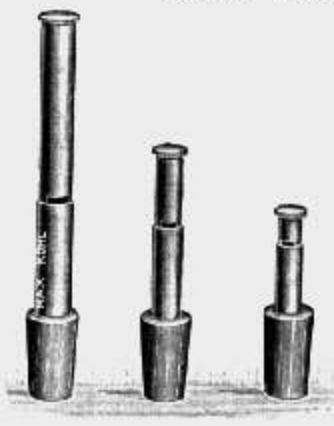
53 242. 1 : 8.



53 235. 1 : 5.



53 238. 1 : 7.



53 238 a. 1 : 4.

53,233. **Acoustic Bellows** after Bertram, Figure, hand driven, with four valves and a tube attachment for taking reed pipes. . . . . £ 3. 0. 0

53,234. **Wind Pressure Regulator** for Sirens, Figure 1. 16. 0

The apparatus is employed for lessening the impulses which cannot to be entirely avoided when foot bellows are used.

53,235. **Wind Chest,** Figure, with four valves, for placing on the blowing table having no valves or for use in conjunction with the water jet blower 1. 12. 0

The Wind Chest can also be worked with compressed air from steel bombs. In this case the following are necessary: 1 Steel Bomb No. 50,947 (£ **1. 16. 0**), 1 pressure reducing valve No. 50,953 (£ **2. 5. 0**). The cost of charging the bomb (No. 50,947) is £ **0. 10. 0.**

53,236. — idem, with eight valves 2. 10. 0

53,237. — idem, with thirteen valves 4. 0. 0

Vibrating Air Columns, Pipes, Sound Analysis.

53,238. **4 Tubes with pistons,** Figure, giving a chord when the pistons are successively drawn out 1. 16. 0

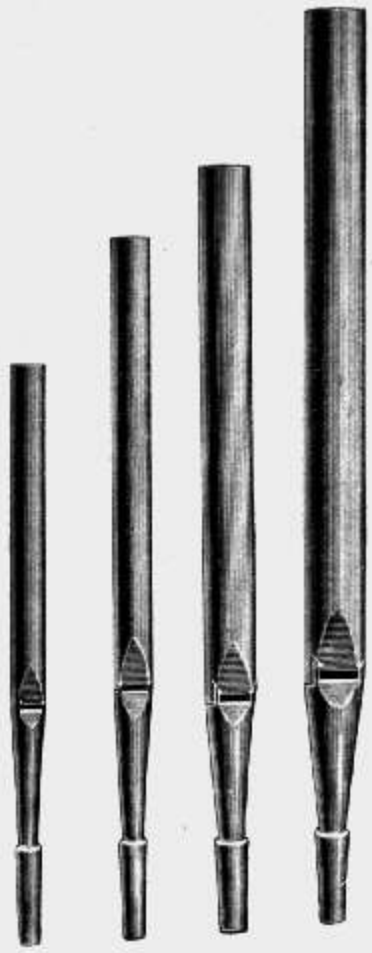
53,238 a. **3 Covered Pipes,** Figure, of metal, with wood mouthpiece, for the tones $c_3 = 1024$, $c_4 = 2048$ and $c_5 = 4096$ vibrations ($ut_5 = 2048$ v. s., $ut_6 = 4096$ v. s., $ut_7 = 8192$ v. s.) 0. 18. 0

53,239. **Labial Pipe** of wood, to be used open and closed 0. 10. 0

53,240. — of tin, cf. Fig. 53,245 . . . . . 0. 8. 0

53,241. — of wood, **with middle slide,** giving the same tone open and closed 0. 16. 0

Cl. 5992, 5996, 1083, 1066, 4099, 5054.



53 245. 1 : 8.



53 247. 1 : 11.



53 251. 1 : 3.



53 252. 1 : 3.



53 253. 1 : 3.



53 254.
1 : 25.



53 257.
1 : 8.

	£ s. d.
53,242. **Labial Pipe** of wood, Figure, for opening out to explain the internal arrangement	0. 10. 0
53,243. **Labial Pipe,** with side holes which can be closed and with adjustable wind orifice	0. 12. 0
53,244. **2 Long Brass Pipes,** one open, the other covered, for giving the succession of harmonic tones	0. 16. 0
53,245. **4 Labial Pipes** of **Zinc,** Figure, major chord c_1, e_1, g_1, c_2 (ut_3, mi_3, sol_3, ut_4)	1. 4. 0
53,246. **4 Labial Pipes of wood,** for the major chord c_1, e_1, g_1, c_2 (ut_3, mi_3, sol_3, ut_4), each pipe with slide for accurately tuning	1. 12. 0
53,247. **8 Labial Pipes,** Figure, for the diatonic scale c_1—c_2 (ut_3—ut_4)	2. 16. 0
53,248. — idem, larger, from c_0—c_1 (ut_2—ut_3)	4. 0. 0
53,249. **13 Labial Pipes** for the chromatic scale c_1—c_2 (ut_3—ut_4)	4. 10. 0
53,250. — idem, larger, from c_0—c_1 (ut_2—ut_3), each pipe with slide	6. 0. 0
53,251. **Organ Pipe Mouthpiece,** Figure, with adjustable upper lip	0. 8. 0
53,252. **Cornet Mouthpiece,** Figure	0. 4. 0
53,253. **Clarinet Mouthpiece,** Figure	0. 4. 0
53,254. **Large Double Pipe** with adjustable tone, Figure, 2 m long, 10 cm square, with one mouthpiece, with two slides and two adjustable pistons	3. 4. 0
53,255. **2 Open Pipes,** of the same tone, one of which can be tuned by a slide for producing impulses	1. 2. 0
53,256. **Labial Pipe, with parchment wall,** open, for putting out of tune by damping	0. 12. 0
53,257. **Labial Pipe,** Figure, with adjustable, graduated piston, for producing the tones of the scale c_1—c_2 (ut_3—ut_4)	0. 16. 0
53,258. **Small Double Pipe,** with two sliding pistons, for the chromatic scale from c_2—c_3 (ut_4—ut_5), forblowing with the mouth	0. 16. 0
53,259. **Horn without reed,** after Dvořák, for the tone c_1 (ut_3)	0. 3. 0

For Wind Chests for Pipes: see Nos. 53,235—53,237.
Blowing Tables and Blowers: see Nos. 53,221—53,233.

Cl. 5975, 4182, 1087, 4149, 4159, 1086, 1084.



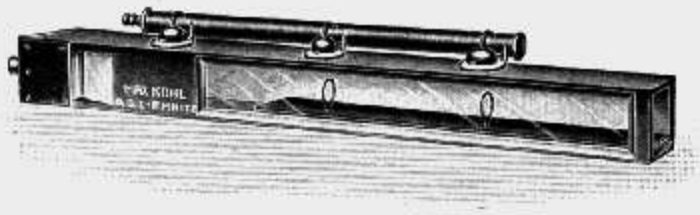
53 260.
1 : 9.



53 261.
1 : 10.



53 262. 1 : 10.



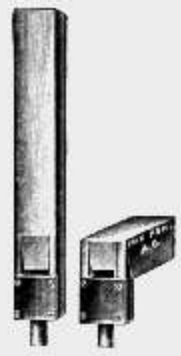
53 263. 1 : 11.



53 265. 1 : 8.



53 266. 1 : 13.



A B
53 267. 1 : 8.

53,260. **Labial Pipe with adjustable membrane,** for showing the vibratory nodes, Figure, of wood, with glass wall . . . . . £ 0. 16. 0

53,261. **Labial Pipe with adjustable membrane,** Figure (M. P. I, Fig. 653 [687]), for showing the vibratory nodes, with long glass tube 1. 0. 0

53,262. **Labial Pipe** with long glass tube and sliding piston, Figure 1. 4. 0

When the piston is in a vibratory node, the fundamental tone of the pipe is maintained, while in the other case it is altered.

* 53,263. **Manometric Flame Pipe,** after König, Figure, **with three gas flame manometers,** for demonstrating the nodal points, with glass wall and brass fittings, also with sheet iron inset so as to be able to project the phenomenon in reflected light by means of soap bubbles (W. D. Fig. 209 A [195 A]) 1. 16. 0

The pipe is placed on the small table supplied with our Projection Lanterns. The objective, however, must be set up, at right angles to its usual position, alongside the projection lantern, at a corresponding height, e. g. on one of the small tables Nos. 51,133—4, 51,136—7, or 51,139—40. The projection lantern itself is set up parallel to the screen. The optical bench is then unscrewed, the lantern alone rotated, and the pipe, with the objective, placed on the optical bench (cf. W. D. Fig. 210 [196]).

53,264. — idem, with Töpler's Flame Indicators (W. D. Fig. 209 B [195 B]) 1. 12. 0

53,265. **Kundt's Covered Pipe,** Figure, with 3 Water manometers and valves seals . . 2. 8. 0

53,266. **Labial Pipe,** Figure, in the nodes of which holes of different diameter can be opened 0. 16. 0

53,267. **2 similar Labial Pipes,** Figs. A & B, with mouthpieces in different directions, for showing that the position of the mouthpiece is without influence on the tone . . . 1. 4. 0

53,268. **2 Labial Pipes,** Figure, the open ones giving the tones, 1, 2, 3, 4, the closed ones the tones 1, 3, 5, 7; with directions for use 1. 12. 0

53,269. **Open Pipe,** of boxwood (Fr. phys. Techn., 6th Edn., II, Fig. 977), for showing that higher tones can be produced in a narrow pipe by intensified blowing; without wind chamber 0. 8. 0

53,270. **Cubic Pipe** with adjustable wall, Figure 0. 16. 0

53,271. **Cubic Labial Pipe,** open 0. 12. 0

53,272. **2 Closed Cubic Pipes,** of different size, Figs. A and B, for demonstrating the influence of the volume of air on the tone 0. 16. 0

53,273. **2 Covered Triangular Prismatic Labial Pipes,** for the same law 0. 16. 0

* Can be used with the Projection Apparatus.

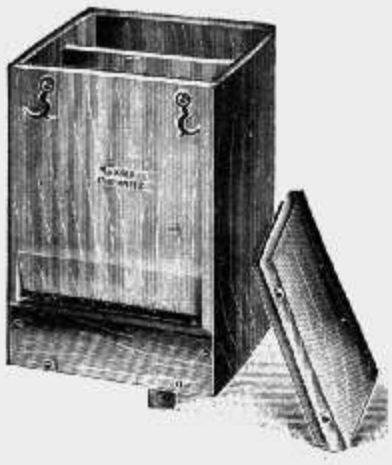
Cl. 5982, 5978, 1089, 1090, 5989, 5976, 5977.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



53 268. 1 : 10.



53 270. 1 : 5.



53 272 A. 1 : 10.



53 272 B. 1 : 10.



53 278. 1 : 10.



53 282. 1 : 10.

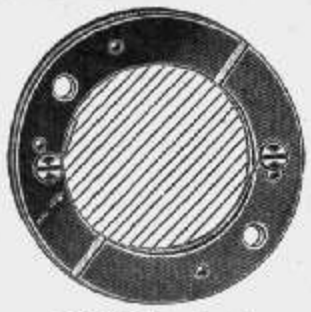


53 284. 1 : 10.

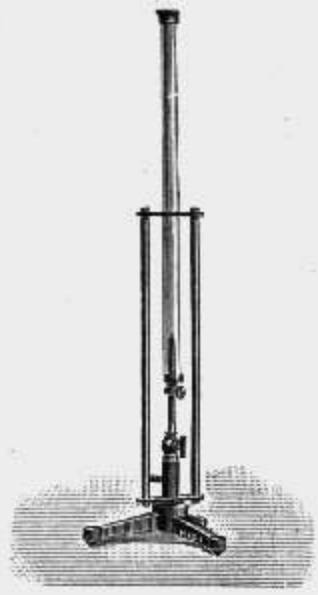
	£ s. d.
53,274. **3 Open Labial Pipes,** of same length and same air capacity, but of different tone; for explaining that the tone is also dependent on the shape of the pipe; one in the form of a truncated pyramid, the second of rectangular prismatic form, the third in the form of a pyramid trunk widening out upwards	1. 13. 0
53,275. **Tone Manometer,** after Grimsehl (Ztschr. f. d. phys. u. chem. U. **2**, 1888—89, p. 59), a U-shaped water manometer with valves for hanging in pipes	0. 6. 0
53,276. **Small Disc** with rotary suspension, for showing the motion of air in singing air-columns, after Grimsehl (Ztschr. f. d. phys. u. chem. U. **2**, 1888—89, p. 59); it is placed, horizontally, hung in the vibrating centre of a pipe	0. 4. 0
53,277. **Steam Pipe** (Bolte, Leitf. d. Phys., 2nd Edn., Fig. 109), for placing on the wind chest	1. 10. 0
53,278. **Reed Pipe,** Figure, with freely vibrating reed, tone varied by making the reed longer or shorter; with two resonators	0. 18. 0
53,279. — idem, **with restricted-motion reed**	0. 18. 0
53,280. **Free-vibrating Reed Pipe,** after Weber	3. 0. 0

This pipe is arranged in such manner as to render it possible to use reeds constructed of sheets of different thickness and material. The pipe rests in a glazed wind chest and carries its pipe, which can be interchanged by a whole series of others of different length; such a pipe is formed of two pipes sliding one in the other. If the tone of the pipe harmonises with that of the tube, and if the pipe is gradually lengthened, the tone is not lowered proportionally to this lengthening. The lowering takes place slowly at first and then more rapidly until the lower octave exactly is reached when the tube is drawn out double length. If now the tube be again increased by its own length the tone goes back first to the initial pitch attained, being finally lowered as in the preceding case — only, of course, by an interval of a fourth.

53,281. **Membrane Reed Pipe** (M. P. I, Fig. 777 and 778 [801 and 802])	0. 5. 0
53,282. **Reed Pipe** with Sound Trumpet, Figure, $c_{-1} = 64$ vibrations ($ut_1 = 128$ v. s.), powerful tone	1. 6. 0
53,283. — idem, $c_0 = 128$ vibrations ($ut_2 = 256$ v. s.)	1. 6. 0
53,284. **Horn with Reed,** c_1 (ut_3), Figure, after Dvořák, for experiments on the mechanical effects of sound (Ztschr. f. d. phys. u. chem. U. **6**, 1893, p. 186)	0. 4. 0
53,285. **Foghorn,** model for placing on the wind chest (Bolte, Leitfaden d. Phys., 2nd Edn., Fig. 109)	2. 5. 0



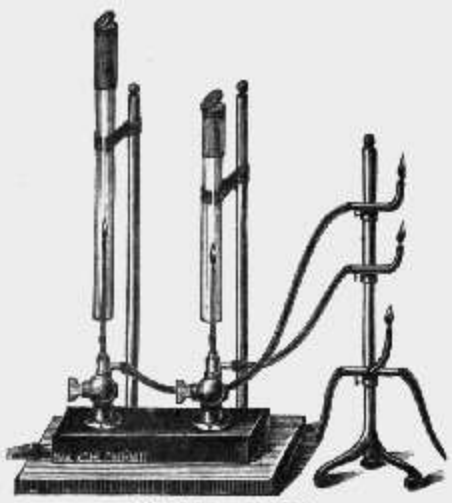
53 294 B. 1 : 1.



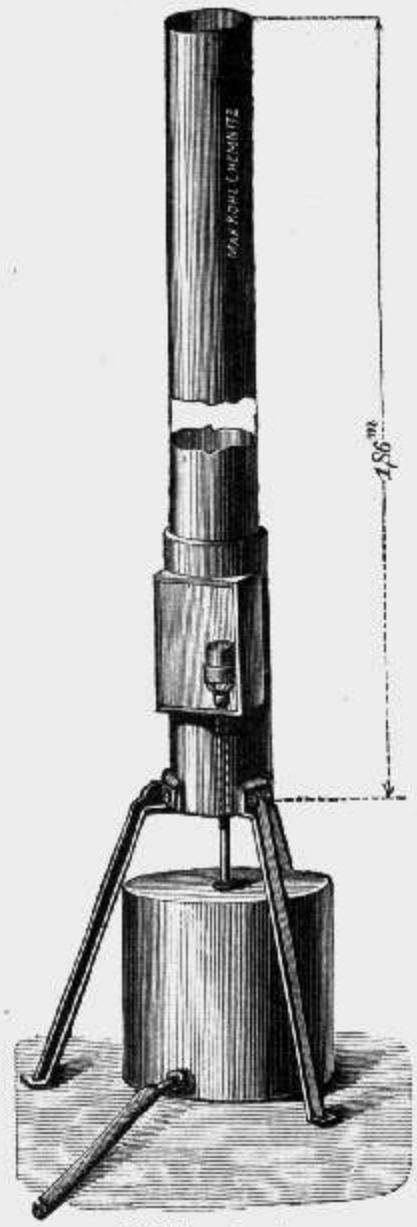
53 289. 1 : 11.



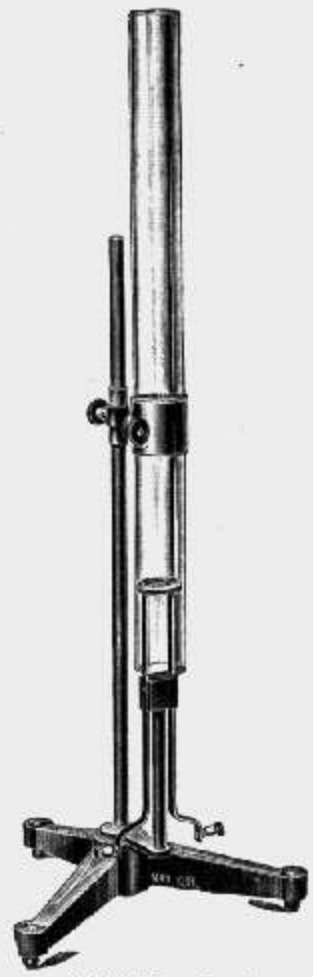
53 287. 1 : 10.



53 290. 1 : 20.



53 291. 1 : 8.



53 294 A. 1 : 8.

	£ s. d.
52,286. **Chemical Harmonica** (**Apparatus for singing Flames**), cf. Fig. 53,287 (W. D. Fig. 211 [197]), comprising 4 tubes tuned to give a chord, each provided with stopcock and with cap for covering the tubes so that each tone can be sounded singly	2. 16. 0
53,287. — idem, with covering flaps, Figure (W. D. Fig. 211 [197])	3. 4. 0
53,288. — idem, with only 2 tubes and covering caps	2. 0. 0
53,289. — idem, with 1 tube only, Figure	1. 6. 0
53,290. **Chemical Harmonica,** after Dr. Bresina, Figure (Carls Repertorium, **18,** 1882, p. 84, and Ztschr. zur Förderung des physik. Unterr., 1884, p. 36), with 2 flames, and 3 burners on stand for analysing the flames	3. 12. 0
53,291. **Gas Harmonica,** Figure (W. D. Fig. 213 [199]), **2 m high,** for showing the existence of overtones along with the fundamental tone, with burner for house gas and **6 conical open resonators** of sheet zinc for the overtones g_0, d_1, b_1, d_2, f_2 (sol_2, re_3, si_3, re_4, fa_4)	2. 10. 0
53,292. **Pyrophone** (W. D. Fig. 212 [198]), with **one** glass tube with two burners	0. 12. 0
53,293. **Tube for Rijke's experiment** (W. D. p. 269 [242]), on stand, with wire net and burner	0. 15. 0
53,294. **Electric Harmonica,** after Pflaum, Figs. A and B, for showing that the tone of the gas harmonica is not produced by successive explosions	2. 10. 0
The tone is produced by an incandescent platinum wire net, shown plainly in Fig. 53,294 B. As the net is provided with suitable pieces for connecting up to the current it can easily be interchanged.	
53,294 B. **Platinum Wire Netting alone,** Figure	0. 15. 0

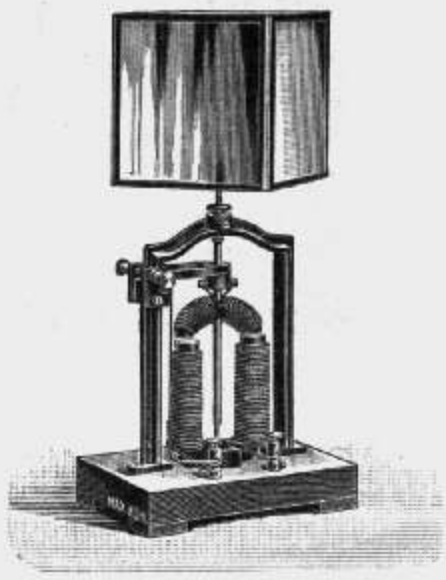
Cl. 1073, 1068, 1067, 1070, 1071, 1072.



61 490. 1 : 10.



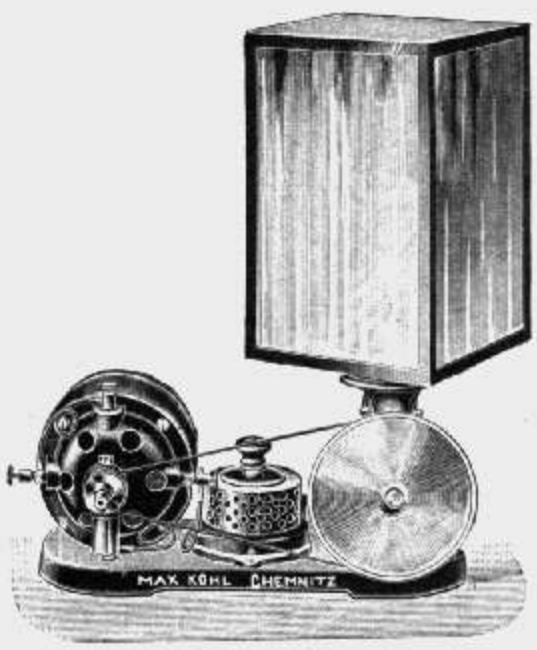
61 494. 1 : 8.



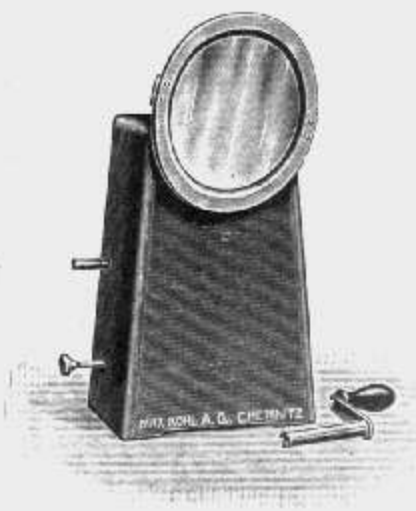
53 297. 1 : 6.



53 298. 1 : 5.



61 491. 1 : 7.



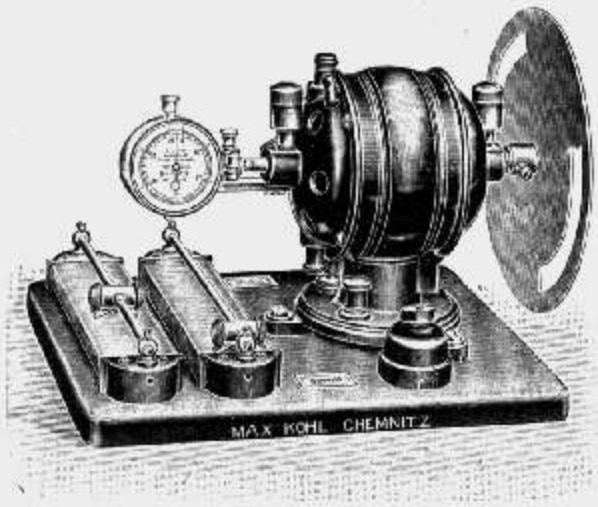
53 301. 1 : 7.

	£ s. d.
52,031. **Rotating Mirror Box (Cube Mirror)**, Fig. 52,031, p. 284, with mirrors 12 cm length and width, for placing on the whirling table, for demonstrating the flame images . .	0. 13. 0
61,490. — idem, **with toothed-wheel drive,** Figure	2. 10. 0
61,494. — idem, **with clockwork which can be regulated,** Figure . . . . . The speed can be regulated within very wide limits.	5. 10. 0
53,297. — idem, **with Electric Motor Drive,** Figure, for connecting up to **2 volts** and **8 amperes Direct Current** . . . . . The electric motor can be used also for explaining Ritchie's Top.	2. 4. 0
53,298. **Rotating Mirror Box,** larger, Figure, on stand, with mirror of 20 cm height and 12 cm width, for hand or cord drive	1. 0. 0
61,491. — idem, **driven by 110 volts Direct Current Motor,** Figure . . . . . If the motor is required for a different kind of current or voltage the price is altered accordingly.	6. 10. 0
61,493. — idem, **with Alternating Current Synchronous Motor** . . . . . When ordering, the network voltage and frequency (number of pole-changes per second) should be quoted.	7. 0. 0
52,032. **Rotating Mirror,** after Reichert, with circular mirror set obliquely; for placing on the whirling table (M. P. I, Fig. 648 [675])	0. 16. 0
53,301. — idem, on stand, **with clockwork,** Figure	2. 14. 0

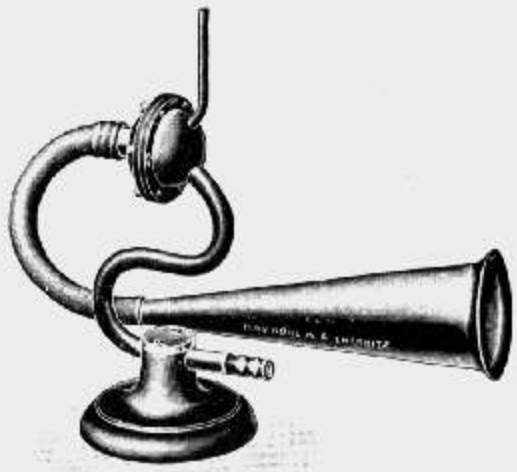
Cl. 6029, 3860, 1075, 1074, 3368, 5550.



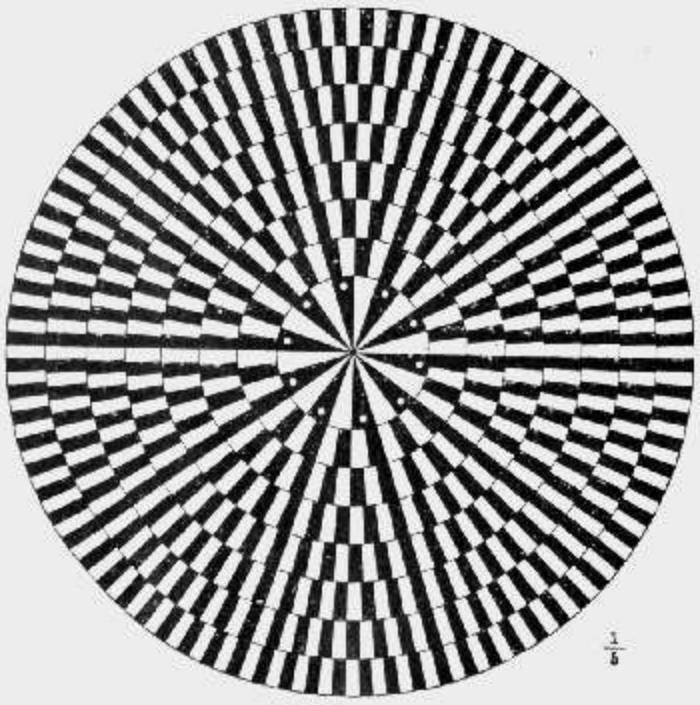
53 302. 1 : 9.



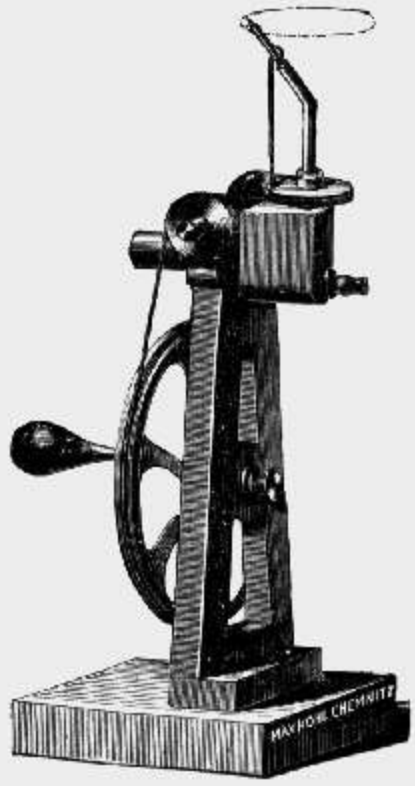
53 304. 1 : 6.



53 306. 1 : 4.



53 305. 1 : 5.



53 307. 1 : 4.

	£ s. d.
53,302. **Stroboscopic Disc,** after Töpler, **with clockwork drive,** Figure, for analysing oscillating planes, on stand	3. 0. 0
53,303. — idem, **for hand drive**	2. 0. 0
53,304. **Stroboscopic Disc,** with 110 volts Direct Current Electric Motor and Tachometer, Figure, with series and shunt regulator for obtaining a wide degree of regulation If it is necessary to have a motor for a different voltage, kindly mention this when ordering.	12. 0. 0
53,305. **Stroboscopic Disc,** after Samojloff, Figure, for analysing sounds before a large audience (M. P., 10th Edn., Vol. I, Fig. 825), for use in conjunction with gas flame Manometer No. 53,306, which should be used with acetylene for this experiment. The disc is placed on the whirling table (say, one with motor drive) and can also be used as a **Siren Disc** . . . . . The acetylene is generated from calcium carbide with the aid of a Kipp Apparatus, a smal gasometer being placed in front of the flame.	0. 12. 0
53,306. **Gas Flame Manometer,** after Weinhold, Figure, with rubber tubing and with resonator (W. D. Fig. 242 [228])	0. 10. 0
53,307. — idem, Figure, **with rotating burner and driving device,** can be used without rotating mirrors (W. D. Fig. 243 [229])	1. 16. 0

Cl. 3369, 3949, 5861, 4943, 1079.

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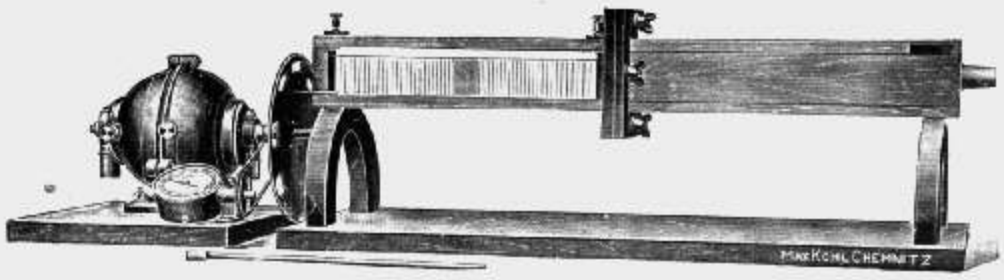
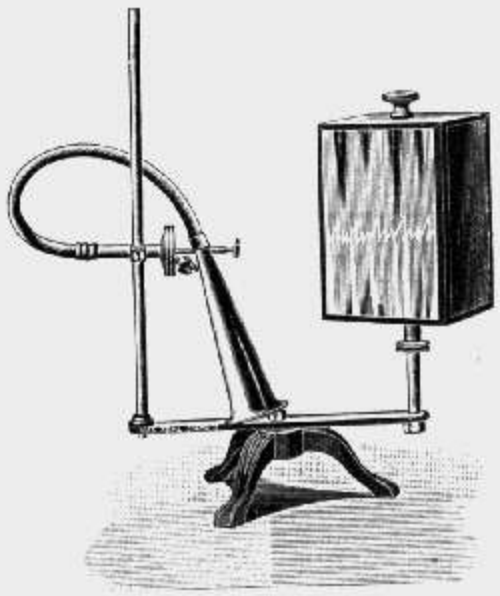
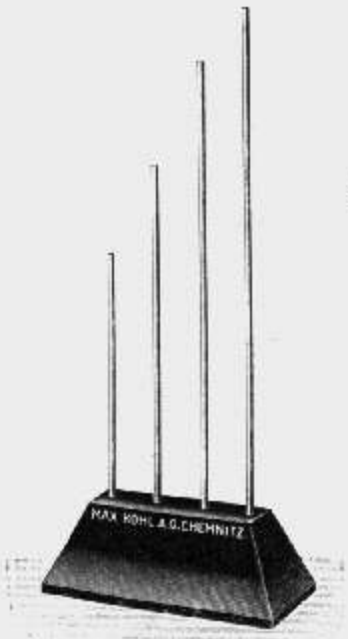
Max Kohl A. G. Chemnitz, Germany.



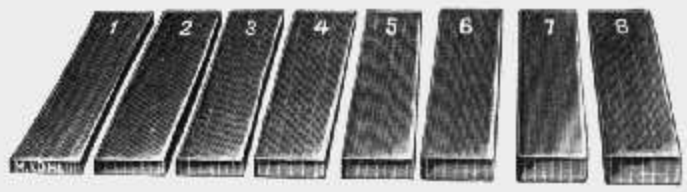
53 309, 53 304. 1 : 8.



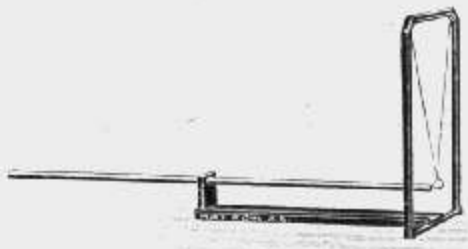
53 308. 1 : 8.



53 311. 1 : 9.



53 313. 1 : 6.



53 314. 1 : 16.

	£	s.	d.
52,033. **Gas Flame Manometer** after Weinhold, as No. 53,307, suitable for the whirling table	1.	4.	0
53,308. — idem, Figure, **with a rotating mirror;** the two mounted on one stand . .	2.	0.	0

The manometer is constructed in accordance with Figure 53,306.

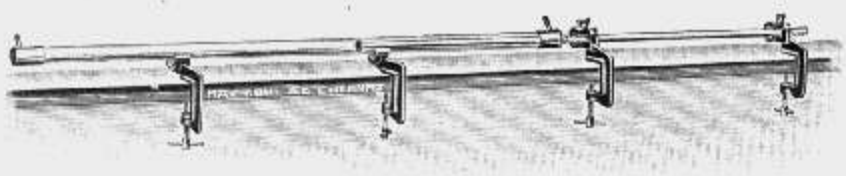
53,309. **Mach's Organ Pipe** for the stroboscopic demonstration of the vibrations of an air column, cf. Figure (M. P. I, p. 669 [739]), without stroboscopic disc or electric motor	2.	8.	0

The pipe has a membrane at the position of the nodal point corresponding to the fundamental tone; this membrane holds off the air current from the halves of the pipe, glazed on two sides, and situated between this nodal point and the end. A platinum wire is stretched in the interior of the pipe and connected with two external terminals, plainly visible in the Figure. If a small sponge, fixed on a glass rod and saturated with sulphuric acid is passed over the wire and the wire heated by an electric current, the vibrations can be observed from the vapours given off, by means of an intermittent light. The intermittent illumination is obtained with the Stroboscopic Disc No. 53 304 or with Tuning Fork No. 53 310.

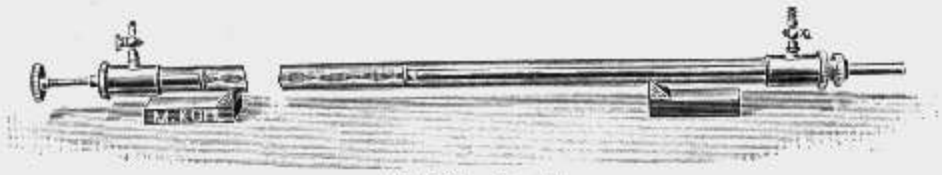
53,310. **Stroboscopic Tuning Fork** c_0 — 128 vibrations (ut_2 — 256 v. s.), with electric drive, with two diaphragms, on stand	4.	10.	0

Vibrating Bars, Velocity of Sound.

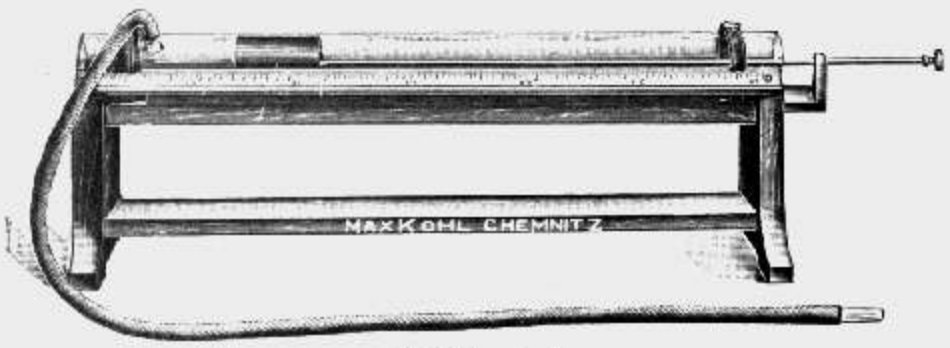
53,311. **Apparatus for the Longitudinal Vibration of Bars,** Figure (M. P. I, Fig. 761 [785])	0.	8.	0
53,312. **4 Wood Bars,** which sound a chord when thrown on the ground	0.	3.	0
53,313. **8 Wood Bars,** giving the gamut, Figure	0.	6.	0
53,314. **Apparatus for showing the Expansion and Contraction of a Longitudinally Vibrating Bar,** after Koenig (Tyndall, Schall [Sound], Fig. 82)	1.	16.	0



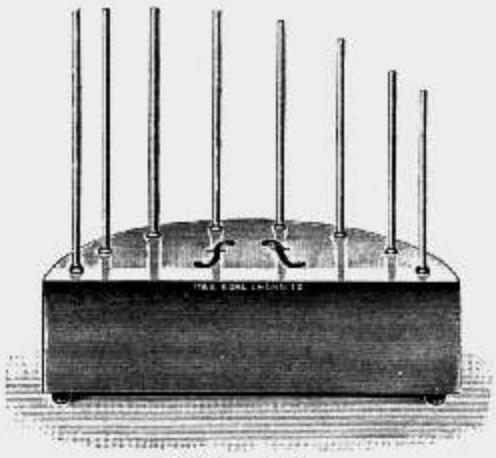
53 315 a. 1 : 20.



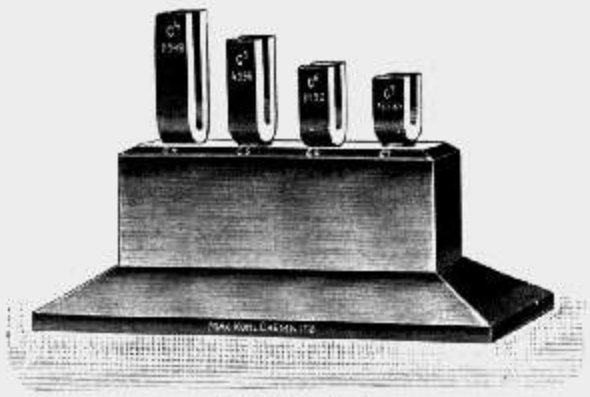
53 316. 1 : 10.



53 317. 1 : 8.



53 320. 1 : 6.



53 327. 1 : 3.

	£ s. d.
53,315. **Kundt's Dust Figure Apparatus,** for showing the longitudinal vibrations of bars and for determining the velocity of propagation of sound in air (W. D. Figs. 214—216 [200—202]), with 4 screw clamps and 2 glass tubes	1. 10. 0
53,315 a. — i d e m, F i g u r e, the glass tube with mounts and unions without stopcock, in order to enable them to be filled with gases	1. 16. 0
53,316. — i d e m, F i g u r e, the tube with mounts and stopcocks, but without screw clamps	1. 14. 0
53,317. **Apparatus** after Quincke, F i g u r e, for determining the Velocity of Sound by observing stationary vibrations; on wood stand (cf. W. u. E. Phys. Prakt. Fig. 87), with millimetre graduation on one side and plain two-colour centimetre graduation on the other side for measuring the length of the vibrating air column	1. 8. 0
It is advisable to provide for use with the apparatus Tuning Fork No. 53,318 or 53,319.	
53,318. **2 Suitable Tuning Forks for the above** c_2 and c_3 (ut_1 and ut_3), on resonance box . Each £ **1. 0. 0**	2. 0. 0
53,319. — i d e m, without resonance box, with handle . . . . . Each £ **0. 18. 0**	1. 16. 0
53,320. **8 Steel Bars** on one resonance box, F i g u r e, giving the scale, with violin bow, for producing transverse vibrations of rods	1. 6. 0

Cl. 9033, 1114, 3800, 1122, 1120.

Max Kohl A. G. Chemnitz, Germany.



53 326. 1 : 7.



53 328. 1 : 3.

Max Kohl A. G. Chemnitz, Germany.

Tuning Forks and Accessories.

£ s. d.

We give special attention to the manufacture of tuning forks. The forks are, in accordance with the suggestions of the **Physikalisch-Technische Reichsanstalt, Charlottenburg,** constructed of solid steel and calibrated against standard forks. The resonance boxes are prepared of suitable wood and each box is tuned to the tone of the fork.

If desired, and on payment of the necessary fees, we send the tuning forks and boxes to the Physikalisch-Technische Reichsanstalt for test and certificate. The fees are: for a standard fork $a_1 = 435$ vibrations, with box, **£ 0. 3. 6**; for a precision fork $a_1 = 435$ vibrations, with box, **£ 0. 5. 6**; transit charges extra. Only those forks having the tone $a_1 = 435$ compound vibrations ($la_3 = 870$ v. s.) are certified as **Precision Forks.** The test fees for forks having a different number of vibrations vary from those quoted above.

The number of vibrations are given in the following items as whole or compound vibrations, and, in addition (mostly in brackets) as half or simple vibrations, with the French abbreviation "v. s. = vibrations simples".

The physical pitch is based on the tone $c_1 = 2^8 = 256$ compound vibrations ($ut_3 = 2^9 = 512$ v. s.); the base of the International Pitch being the tone $a_1 = 435$ compound vibrations ($la_3 = 870$ v. s.).

53,321. **Tuning Fork $a_1 = 435$** compound vibrations ($la_3 = 870$ v. s.), with handle, without box 0. 4. 0

53,322. **Tuning Fork $c_1 = 256$** compound vibrations ($ut_3 = 512$ v. s.), large pattern, with handle, without resonance box 1. 0. 0

53,323. — i d e m, $c_2 = 512$ compound vibrations ($ut_4 = 1024$ v. s.) 0. 18. 0

53,324. — i d e m, $g_2 = 768$ compound vibrations ($sol_1 = 1536$ v. s.) 0. 18. 0

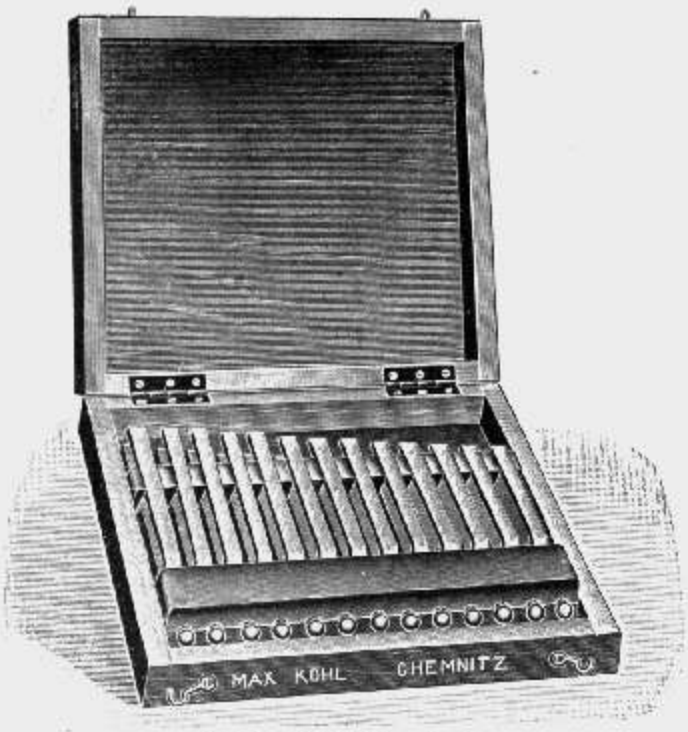
53,325. — i d e m, $c_3 = 1024$ compound vibrations ($ut_5 = 2048$ v. s.) 0. 18. 0

53,326. **12 Massive Forks with Stand,** after Koenig, F i g u r e (cf. Koenig, Quelques expériences d'acoustique, 1882, pp. 102 and 123), c_3, c_4, d_4, e_4, f_4, 11th harmonic of c_1, g_4, 13th harmonic of c_1, a_4, 14th harmonic of c_1, b_1, c_5 (ut_5, ut_6, re_6, mi_6, fa_6, 11th harmonic of ut_3, sol_6; 13th harmonic of ut_3, la_6, 14th harmonic of ut_3, si_6, ut_7) 28. 15. 0

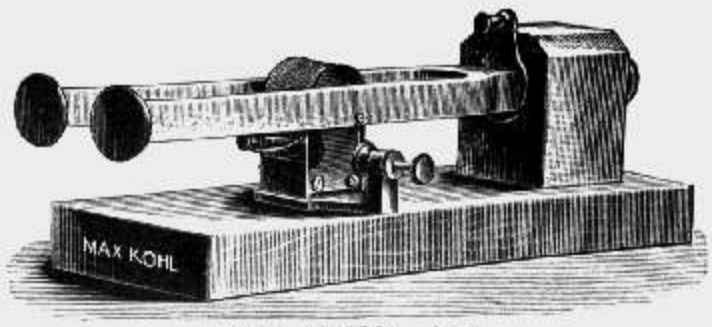
This set of tuning forks is used for showing that the vibrations of the first and second order become tones if they occur with sufficient intensity. The stand is arranged in such manner that two forks can be clamped for conveniently bowing or striking simultaneously.

53,327. **4 Tuning Forks,** c_4, c_5, c_6, c_7, (ut_6, ut_7, ut_8, ut_9), F i g u r e, for demonstrating the limit of audibility 2. 8. 0

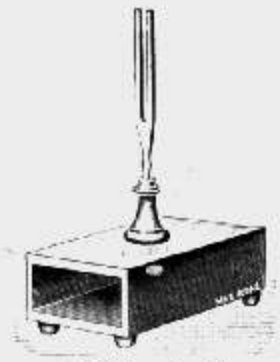
53,328. **Tuning Fork,** F i g u r e (W. D. Fig. 258 [244]), of 2000 compound vibrations, for proving Doppler's Theorem 1. 10. 0



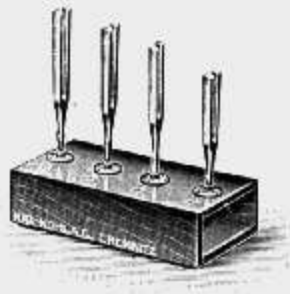
53 329 (53 330). 1 : 6.



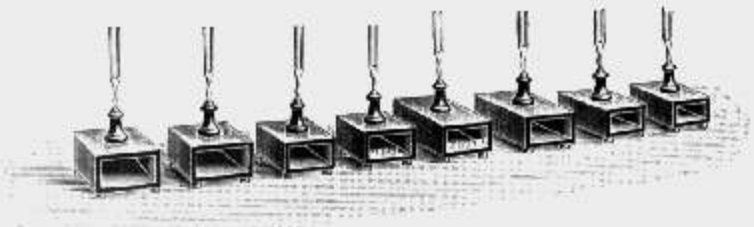
53 333 (53 334). 1 : 5.



53 335. 1 : 6.



53 337. 1 : 6.



53 338. 1 : 12.

		£ s. d.
53,329.	**13 Standard Tuning Forks in International Pitch,** Figure, in box, giving the chromatic scale c_1 to c_2 (ut_3 to ut_4), without resonance box, with box for containing	9. 0. 0
53,330.	— idem, **physical pitch**	9. 0. 0
53,331.	**8 Standard Tuning Forks in international Pitch,** same construction as above, giving the diatonic scale c_1 to c_2 (ut_3 to ut_4), without resonance box, with box for containing	6. 0. 0
53,332.	— idem, **physical pitch**	6. 0. 0
	Resonance Boxes increase the price of the preceding Forks Nos. 53,329—53,332 by £ **0. 6. 0** each.	
53,333.	**Tuning Fork with electromagnetic drive,** $c'_{-1}=64$ compound vibrations ($ut_1=128$ v. s.), Figure, large massive pattern, with steel mirrors and counterpoise, on wood base	6. 0. 0
53,334.	— idem, $c_0=128$ compound vibrations ($ut_2=256$ v. s.)	5. 0. 0
53,335.	**2 Small Tuning Forks,** Figure, $a_1=435$ compound vibrations ($la_3=870$ v. s.), singly on resonance boxes, one with two sliding weights	0. 18. 0
53,336.	**2 Small Tuning Forks** $c_2=512$ compound vibrations ($ut_4=1024$ v. s.), on resonance box, one with two sliding weights	0. 18. 0
53,337.	**4 Small Tuning Forks on one Resonance Box,** Figure, for the tones c_2, e_2, g_2 and c_3 (ut_4, mi_4, sol_4, ut_5)	0. 16. 0
53,338.	**8 Small Tuning Forks,** Figure, each on a resonance box, giving the diatonic scale from c_2 to c_3 (ut_4 to ut_5)	3. 12. 0
53,339.	**14 Tuning Forks on Resonance Boxes,** Figure, giving the first 14 overtones to $c'_{-1}=64$ compound vibrations ($ut_1=128$ v. s.)	17. 10. 0

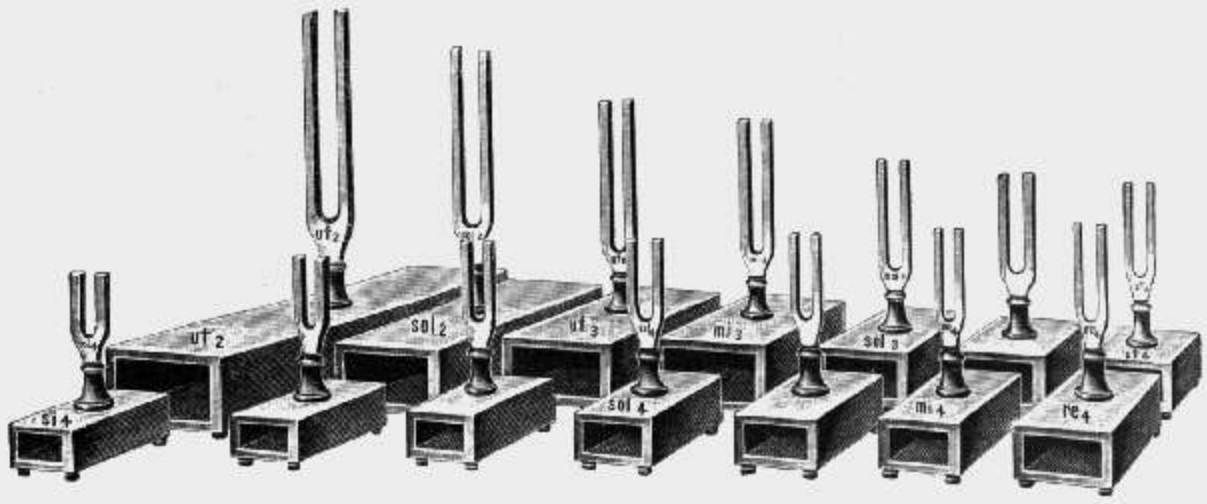
These tuning forks, like the overtone apparatus, serve for selecting easily the overtones when investigating sounds with resonators or with the Koenig Apparatus for splitting up sounds.

The individual forks are:

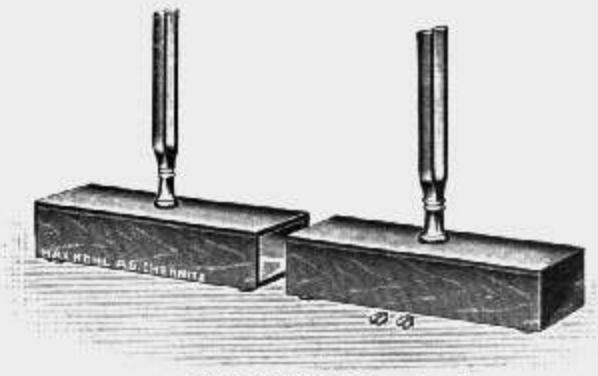
c_0	g_0	c_1	e_1	g_1	—	c_2	d_2	e_2	—	g_2	—	—	b_2	
128	192	256	320	384	448	512	576	640	704	768	832	896	960	Compound vibrations
256	384	512	640	768	896	1024	1152	1280	1408	1536	1664	1792	1920	v. s.
ut_2	sol_2	ut_3	mi_3	sol_3	—	ut_4	re_4	mi_4	—	sol_4	—	—	si_4	
2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	Partial Tone.

Cf. 3954, 1181, 1126, 5359, 3862.

Max Kohl A. G. Chemnitz, Germany.



53339. 1 : 10.



53340 (53341). 1 : 7.

53,340. **2 Tuning Forks $c_1 = 256$** compound vibrations ($ut_3 = 512$ v. s.), large pattern, on accurately adjusted resonance box, one with two sliding weights, for producing vibrations Figure . . . . . Together £ 2. 8. 0

These tuning forks have exactly the same pitch and are used for the experiment on co-vibration by resonance. The experiments succeed at a few metres distance if the open sides of the resonance boxes are turned towards each other and one fork is smartly struck repeatedly.

53,341. **2 Tuning Forks $a_1 = 435$** compound vibrations ($la_3 = 870$ v. s.), Figure, same pattern as No. 53,340 . . . . . Together 2. 4. 0

53,342. **2 Tuning Forks $c_2 = 512$** compound vibrations ($ut_4 = 1024$ v. s.), same pattern as No. 53,340 . . . . . 2. 2. 0

53,343. **4 Large Tuning Forks,** each on a resonance box, giving the major chord $c_1 = 256$ compound vibrations, c_1, g_1, c_2 ($ut_3 = 512$ v. s., mi_3, sol_3, ut_4) 4. 16. 0

53,344. — idem, with the **fundamental tones $c_0 = 128$** compound vibrations, e_0, g_0, c_1 ($ut_2 = 256$ v. s., mi_2, sol_2, ut_3) 6. 0. 0

53,345. **16 Tuning Forks on Resonance Boxes,** cf. Figures 53,340 and 53,341, very massive pattern, **Physical Pitch** 21. 5. 0

List No.	**53 345 a**	**53 346**	**53 347**	**53 348**	**53 349**	**53 350**	**53 351**	**53 352**
	$c_1 = 256$	$d_1 = 288$	$e_1 = 320$	$f_1 = 341^1/_3$	$g_1 = 384$	$a_1 = 426^2/_3$	$b_1 = 480$	$c_2 = 512$ vibrations
	$ut_3 = 512$	$re_3 = 576$	$mi_3 = 640$	$fa_3 = 682^2/_3$	$sol_3 = 768$	$la_3 = 853^1/_3$	$si_3 = 960$	$ut_4 = 1024$ v. s.
	£ 1. 10. 0	**1. 10. 0**	**1. 10. 0**	**1. 10. 0**	**1. 10. 0**	**1. 5. 0**	**1. 5. 0**	**1. 5. 0**

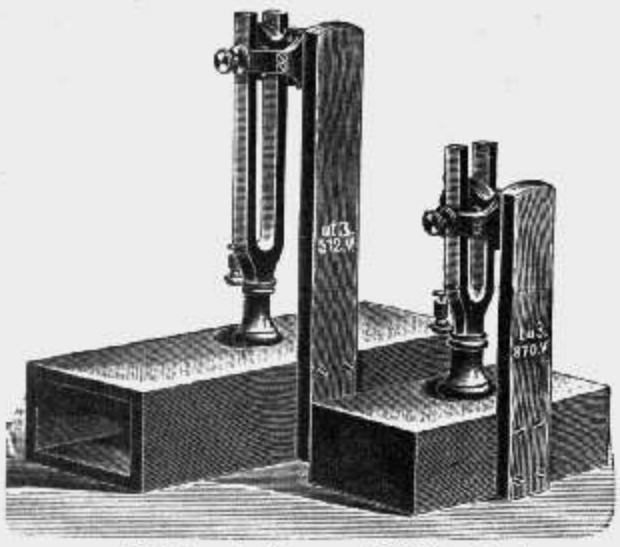
List No.	**53 353**	**53 354**	**53 355**	**53 356**	**53 357**	**53 358**	**53 359**	**53 360**
	$d_2 = 576$	$e_2 = 640$	$f_2 = 682^2/_3$	$g_2 = 768$	$a_2 = 853^1/_3$	$b_2 = 960$	$c_3 = 1024$	$c_4 = 2048$ vibrations
	$re_4 = 1152$	$mi_4 = 1280$	$fa_4 = 1365^1/_3$	$sol_4 = 1536$	$la_4 = 1706^2/_3$	$si_4 = 1920$	$ut_5 = 2048$	$ut_6 = 4096$ v. s.
	£ 1. 5. 0	**1. 5. 0**	**1. 5. 0**	**1. 5. 0**	**1. 5. 0**	**1. 5. 0**	**1. 5. 0**	**1. 5. 0**

These forks are accurately constructed in accordance with Standard Forks and with carefully tuned boxes.

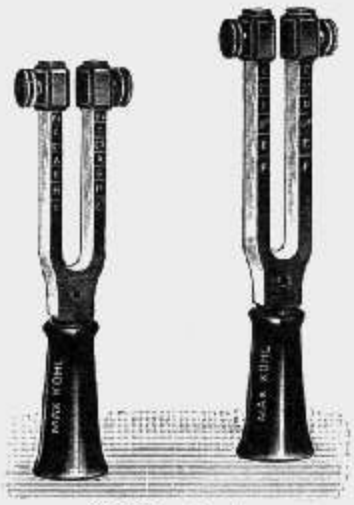
53,361. **13 Tuning Forks on resonance boxes,** cf. Figures 53,340 and 53,341, very massive pattern, in **International Tempered Pitch** 18. 10. 0

List No.	**53 361 a**	**53 362**	**53 363**	**53 364**	**53 365**	**53 366**
	$c_1 = 258.652$	$c\#_1 = 274.033$	$d_1 = 290.327$	$d\#_1 = 307.592$	$e_1 = 325.881$	$f_1 = 345.259$ vibrations
	$ut_3 = 517.305$	$ut\#_3 = 548.066$	$re_3 = 580.655$	$re\#_3 = 615.183$	$mi_3 = 651.763$	$fa_3 = 690.519$ v. s.
	£ 1. 10. 0	**1. 10. 0**	**1. 10. 0**	**1. 10. 0**	**1. 10. 0**	**1. 10. 0**

List No.	**53 367**	**53 368**	**53 369**	**53 370**	**53 371**	**53 372**	**53 373**
	$f\#_1 = 365.790$	$g_1 = 387.541$	$g\#_1 = 410.585$	$a_1 = 435$	$b\flat_1 = 460.866$	$b_1 = 488.271$	$c_2 = 517.305$ vibr.
	$fa\#_3 = 731.580$	$sol_3 = 775.082$	$sol\#_3 = 821.171$	$la_3 = 870$	$la\#_3 = 921.733$	$si_3 = 976.542$	$ut_4 = 1034.610$ v. s.
	£ 1. 10. 0	**1. 10. 0**	**1. 10. 0**	**1. 5. 0**	**1. 5. 0**	**1. 5. 0**	**1. 5. 0**



53381. 1 : 6. 53382. 1 : 6.



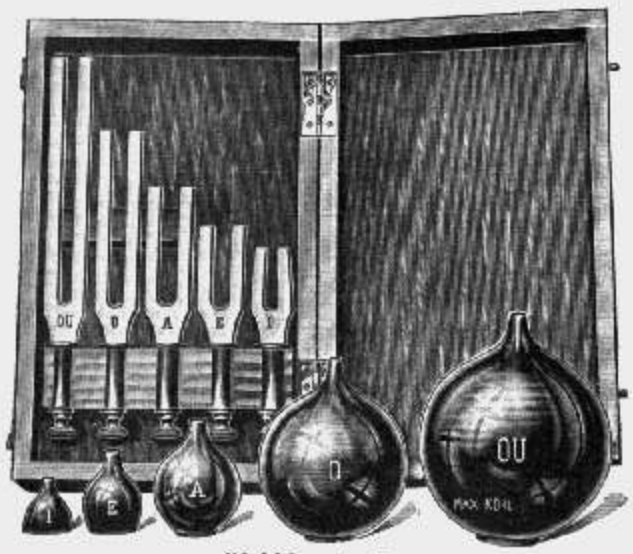
53383. 1 : 4.



53398. 1 : 12.



53404. 1 : 4.



53413. 1 : 5.



53414. 1 : 7.

Standard Forks on Resonance Boxes. £ s. d.

List No.	53 374	53 375	53 376	53 377	53 378	53 379	
	$c_0 = 128$	$c_1 = 256$	$a_1 = 435$	$c_2 = 512$	$c_3 = 1024$	$c_4 = 2048$	compound vibrations
	$ut_2 = 256$	$ut_3 = 512$	$la_3 = 870$	$ut_4 = 1024$	$ut_5 = 2048$	$ut_6 = 4096$	v. s.
	£ 2. 0. 0	1. 16. 0	1. 10. 0	1. 10. 0	1. 10. 0	1. 10. 0	

The Standard Forks are very specially and carefully constructed and finely polished to prevent oxidation.

53,380. **Containing Box** for one of the tuning forks Nos. 53,374—53,379 . . . . . 1. 0. 0

53,381. **Tuning Fork** $c_1 = 256$ compound vibrations ($ut_3 = 512$ v. s.), on Resonance Box, Figure, with detachable electromagnetic drive 2. 8. 0

53,382. — idem, $a_1 = 435$ compound vibrations, Figure ($la_3 = 870$ v. s.) 2. 6. 0

53,383. **2 Large Tuning Forks,** Figure, **with sliding weights,** on hollow wood base, for producing the chromatic scale c_1—c_2 (ut_3—ut_4), International Pitch 3. 0. 0

14 Tuning Forks with sliding weights, cf. Figure 53,383, for producing the tones and semitones from c_{-1} to g_3 (ut_1—sol_5), in International Pitch, for testing church bells for their overtones.

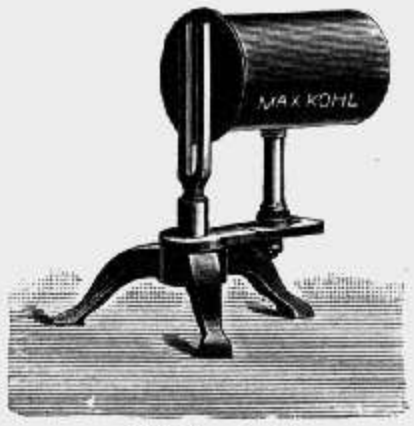
List No.	53 384	53 385	53 386	53 387	53 388	53 389	53 390
Range of Tone	c_{-1}—$d\flat_{-1}$	e_{-1}—$g\flat_{-1}$	$g\sharp_{-1}$—c_0	c_0—e_0	e_0—g_0	g_0—b_0	c_1—e_1
	ut_1—$re\flat_1$	mi_1—$sol\flat_1$	$sol\sharp_1$—ut_2	ut_2—mi_2	mi_2—sol_2	sol_2—si_2	ut_3—mi_3
£	2. 10. 0	2. 6. 0	2. 6. 0	2. 4. 0	2. 4. 0	2. 4. 0	2. 4. 0
List No.	53 391	53 392	53 393	53 394	53 395	53 396	53 397
Range of Tone	e_1—$g\sharp_1$	$g\sharp_1$—c_2	c_2—e_2	e_2—$g\flat_2$	$g\flat_2$—c_3	c_3—e_3	e_3—g_3
	mi_3—$sol\sharp_3$	$sol\sharp_3$—ut_4	ut_4—mi_4	mi_4—$sol\sharp_4$	$sol\sharp_4$—ut_5	ut_5—mi_5	mi_5—sol_5
£	2. 4. 0	2. 0. 0	2. 0. 0	2. 0. 0	2. 0. 0	2. 0. 0	2. 0. 0

For testing a church bell as regards its overtones, a fork is struck and placed with the hollow base on the edge of the bell. If the overtone is present the bell rings.

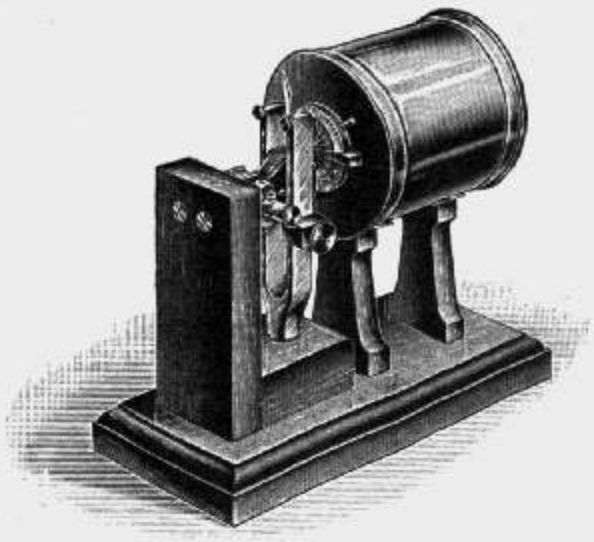
53,397 a. **Containing Case** for above, sufficient for 5 Forks 1. 8. 0

Cl. 1129/29 a, 1123, 1134, 3376, 1132, 3374.

Max Kohl A. G. Chemnitz, Germany.



53415. 1 : 8.



53417. 1 : 6.

53,398. **Large Tuning Fork** for 16—24 vibrations, c_{-3}—g_{-3} (ut_{-2}—sol_{-2}), Figure, for determining the limit of audibility of the deepest tones . . . . . £ 12. 0. 0

53,399. — idem, smaller 10. 0. 0

Tuning Forks with sliding weight for Bezold's continuous progression of tones, for testing the sensitivity of the ear to sound, Figure 53,404.

List No.	53 400	53 401	53 402	53 403	53 404	53 405
Compound vibrations	12—18	16—24	24—36	36—55	55—90	90—153
V. s.	24—36	32—48	48—72	72—110	110—180	180—306
Tone Compass	—	c_{-3}—g_{-3}	g_{-3}—d_{-2}	d_{-2}—a_{-2}	a_{-2}—$f\#_{-1}$	$f\#_{-1}$—$d\#_0$
	—	ut_{-2}—sol_{-2}	sol_{-2}—re_{-1}	re_{-1}—la_{-1}	la_{-1}—$fa\#_1$	$fa\#_1$—$re\#_2$
Pitch, unloaded	—	—	c_{-1}	g_{-1}	c	g
	—	—	ut_1	sol_1	ut_2	sol_2
£	4. 0. 0	3. 0. 0	2. 10. 0	2. 5. 0	2. 0. 0	1. 15. 0

These tuning forks sound without harmonics when the sliding weight is placed on same, and are used for qualitative and quantitative audibility testing from below the limit of audibility onwards; for the entire compass to the higher limit of audibility the entire continuous progression of tone (Bezold's) No. 53,473 is employed.

The prongs of these tuning forks are marked with the number of vibrations and the tones for the corresponding positions of the sliding weights.

List No.	53 406	53 407	53 408	53 409	53 410
Compound vibrations	153—217	217—307	307—435	435—615	615—870
V. s.	306—434	434—614	614—870	870—1230	1230—1740
Tone Compass	$d\#$—a	a—$d\#_1$	$d\#_1$—a_1	a_1—$d\#_2$	$d\#_2$—a_2
	$re\#_2$—la_2	la_2—$re\#_3$	$re\#_3$—la_3	la_3—$re\#_4$	$re\#_4$—la_4
Pitch, unloaded	c_1	g_1	c_2	g_2	c_3
	ut_3	sol_3	ut_4	sol_4	ut_5
£	1. 5. 0	1. 0. 0	1. 0. 0	1. 5. 0	1. 5. 0

The prongs of these forks are marked with the tones for the corresponding positions of the sliding weight.

53,411. **Drumstick** for striking Tuning Forks Nos. 53,406—53,410 . . . . . 0. 5. 0

53,412. **Tuning Fork** $b^{\flat}_1$ ($si^{\flat}_3$), for resonance of the oral cavity (W. D. p. 312 [285]) . . 0. 4. 0

53,413. **5 Tuning Forks** with resonators, Figure, sounding with the vowels a, e, i, o, u 7. 0. 0

53,414. **Tuning Fork with Resonator**, Figure, pitch a_1 with 435 compound vibrations (ut_3 = 870 v. s.), the tuning fork is marked with the nodal point (W. D. Fig. 217 [203]) 0. 15. 0

53,415. **Standard Fork with Resonator**, Figure, mounted together on iron base, c_1 = 256 compound vibrations (ut_3 = 512 v. s.) 5. 0. 0

53,417. **Tuning Fork with Electromagnetic Drive** and with sliding weights, for varying the pitch by reducing the size of the orifice, with resonator of variable pitch Figure 5. 0. 0

The tuning fork can be adjusted to the tones between $d\#_1$ and a_1 ($re\#_3$ and la_3). The pitch of the resonator is varied by an iris diaphragm placed in front of its aperture.



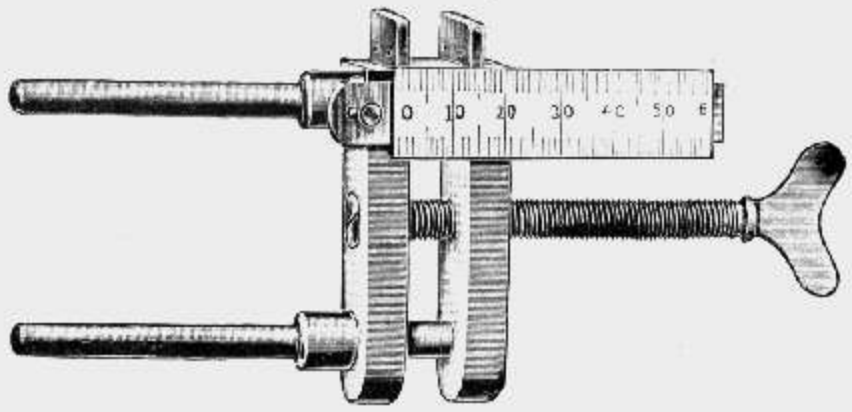
53418. 1 : 5.



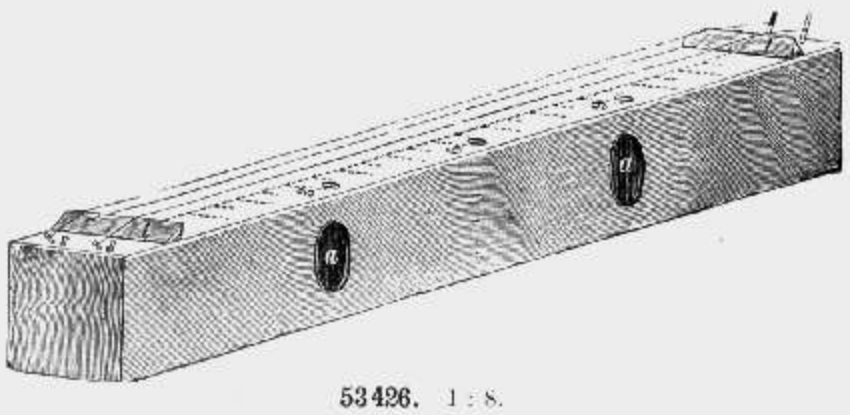
53420. 1 : 5.



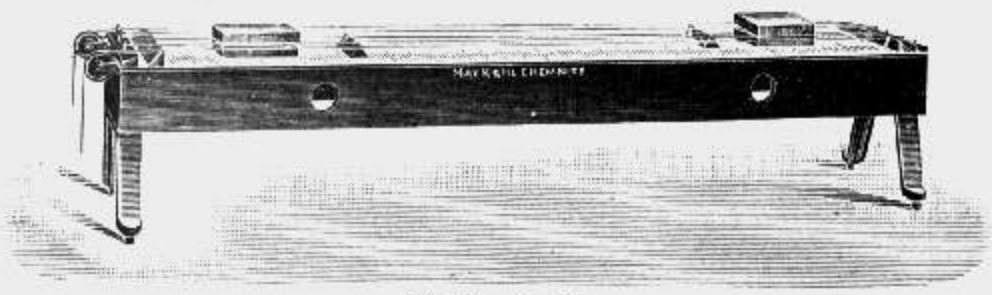
53421. 1 : 5.



53425. 2 : 3.



53426. 1 : 8.



53429. 1 : 12.

53,418. **Recording Tuning Fork** c_0 — 128 compound vibrations (ut_1 — 256 v. s.), with style, Figure . . . . . £ 0. 18. 0

Recording Tuning Forks with electric drive, chronographically, see p. 455.

53,419. **Shoe with Writing Point** for Fork No. 53,382 (M. T. Fig. 36) 0. 3. 0

53,420. **Ivory Hammer** for striking Tuning Forks, Figure 0. 9. 0

53,421. **Hammer** with rubber strikers, Figure 0. 9. 0

53,422. **Metal Drum Stick** with leather discs 0. 6. 0

53,423. **Cello Bow** 0. 4. 0

53,424. **Bass Fiddle Bow,** can be used for experiments with heavy tuning forks 0. 6. 0

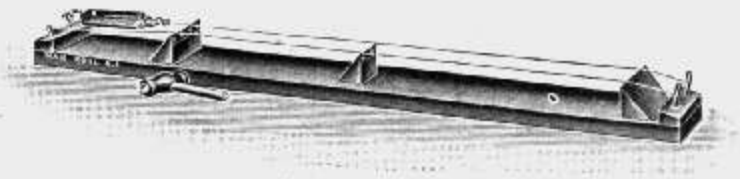
53,425. **Tuning Fork Exciter Clamp** after Dölger, Figure, to enable the tuning forks always to be vibrated to the same intensity, with screw adjustement, rule, and in box . . . 1. 15. 0

Vibrating Strings, Plates, Bells, etc.

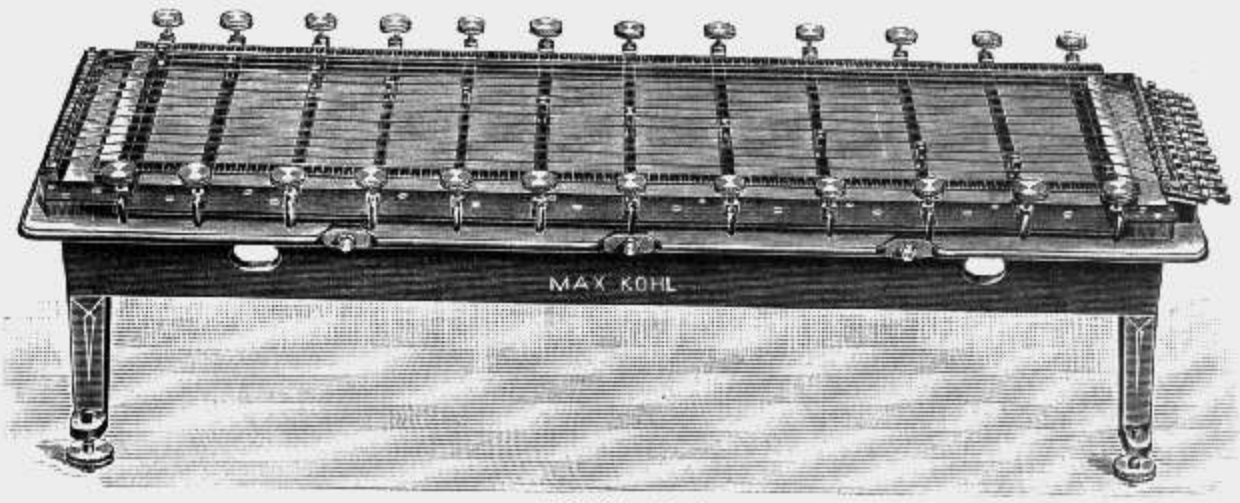
53,426. **Monochord,** Figure, useful string-length 1.2 m. with 3 strings, 2 with pegs and one with weight for stretching, with centimetre scale, movable bridge and damper clamp, of polished **mahogany** (only two strings are shown in illustration), without weights . 1. 12. 0

53,427. — idem, of alder wood, same size as above, simpler pattern 1. 4. 0

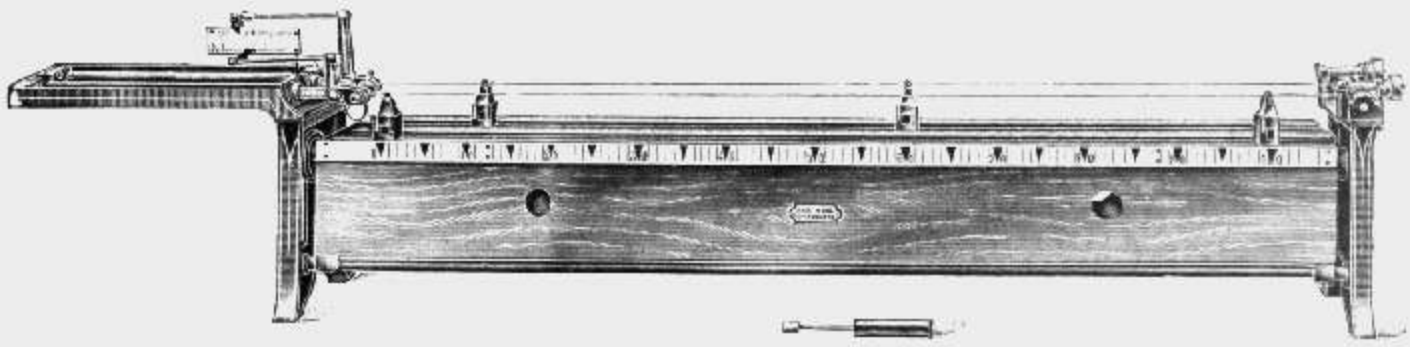
Cl. 1124, 3378, 4519, 5927, 1149. 1150.



53431. 1 : 15.

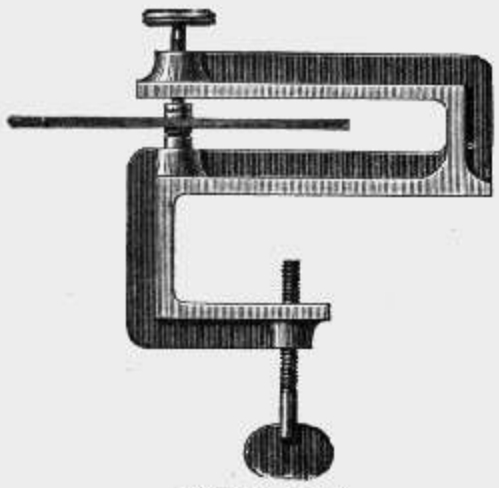


53434. 1 : 9.

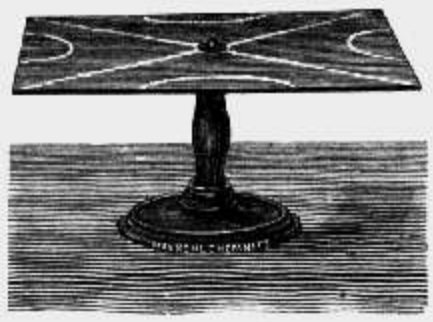


53436. 1 : 10.

	£ s. d.
53,428. **Monochord**, smaller and simpler, with two strings stretched from pegs	0. 15. 0
53,429. **Monochord with 4 Strings,** two stretched by pegs and two by weights, Figure, on iron legs	3. 0. 0
53,430. **4 Iron Weights with Hooks,** 20, 10, 5 and 1 kg, for stretching the centre strings (W. D. p. 279 [253])	1. 2. 0
If the above Monochords are desired to be divided in millimetres the price is increased by £ **0. 15. 0** each.	
53,431. **Monochord for School Use,** after Hahn, Figure (Hahn, Schülerübungen Fig. 155), with spring balance and striking hammer	0. 12. 0
53,432. **Tuning Fork** for above, with groove in the base of the fork handle, $e_1 = 256$ compound vibrations ($ut_3 = 512$ v. s.)	0. 10. 0
53,433. — idem, $d_1 = 288$ compound vibrations ($re_3 = 576$ v. s.)	0. 10. 0
53,434. **Polychord** after Antolik, Figure, with 12 strings, iron frame and stretching device	20. 0. 0
Two metal rails are arranged laterally on the iron frame of the Polychord, and clamps can be slipped along the rails. Each clamp has a compression check with the aid of which the lengths vibrating can be shortened to any extent. The length is read off on two metal rules. The apparatus can be used advantageously for forming musical scales. See: Tonleitersystem von Prof. Dr. Karl Antolik, Pressburg, and Ztschr. f. d. phys. u. chem. U. **4**, 1890/91, p. 177).	
53,435. **10 Riders of Aluminium Wire,** after Antolik, for the Monochord	0. 1. 0
53,436. **Monochord** after Zahlbruckner, Figure, with two strings, with tension indicators. Can be used also as a **Tensile Apparatus** to 50 kg pull, for metal wires, etc. With 4 bridges	17. 0. 0
The two metal strings are connected at one end with spring dynamometers for 50 kg tension and at the other end with stretching devices actuated by worm gearing. The tensive forces exerted on the dynamometers can be read off on a scale. In order to render the measurements accurate the bridges are lifted by wedges only when the strings are stretched. A plain centimetre scale is fitted on the side of the resonance box for showing the position of the bridges.	



53 438. 1 : 4.



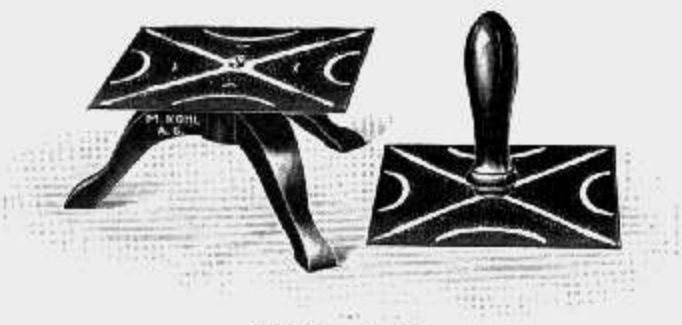
53 441 A. 1 : 6.



53 441 B. 1 : 6.



53 443 and 53 441 C. 1 : 9.



53 445. 1 : 6.



53 452. 1 : 3.

	£ s. d.
53,437. **Apparatus for showing the position of the Nodes on the opposite sides of a longitudinally vibrating Horse Hair**	0. 6. 0
53,438. **Apparatus for Chladni's Figures,** Figure, consisting of one iron clamp, one rectangular and one round glass slab 28 cm diameter, in box with sand and case of resin (W. D. Fig. 220 [206])	1. 2. 0
53,439. — idem, with **two Metal Discs** of 28 cm diameter or length of side respectively	1. 8. 0
53,440. **Black Board** for No. 53,438, for showing the dust figures in air plates (W. D. p. 285 [258])	0. 1. 0
53,441. **Chladni's Sound Figure Disc,** of metal, Figures A and B, see also Figures 53,443 and 43,441 C, with heavy iron base, round, rectangular or triangular, 30 cm diameter or length of side . . . . . Each	1. 0. 0
53,153. **Mirror on Stand,** Figure 51,153, p. 206 (M. T. p. 9), for rendering the sound figures more visible	1. 8. 0
53,443. **Tube with Stand for Chladni's Discs,** for Hopkins's Experiment on Resonance, Figure 53,443, without sound figure disc	0. 18. 0
53,444. **Sound Figure Disc with Resonance Tube** for Hopkins's Experiment, fitted together on massive base	1. 16. 0
53,445. **2 Metal Discs of same shape,** Figure, one with foot, the other with handle . . These plates are of the same pitch. If the one with the handle is bowed and held above the other, the latter shows the same figure by resonance.	1. 10. 0
53,446. **Brass Plate** with steel rod attached for concentric nodal lines (M. P. I, Fig. 736 [760])	0. 12. 0
53,447. **Square Paper Membrane,** 30 cm side, on support with wind tube	1. 16. 0
53,449. **Round Paper Membrane** of 30 cm diameter, for above	0. 6. 0

Cl. 1155, 1154, 1156, 5994, 5998, 5040.



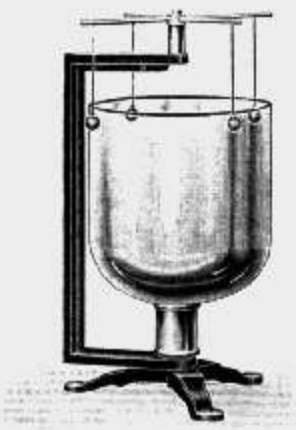
53 453. 1 : 6.



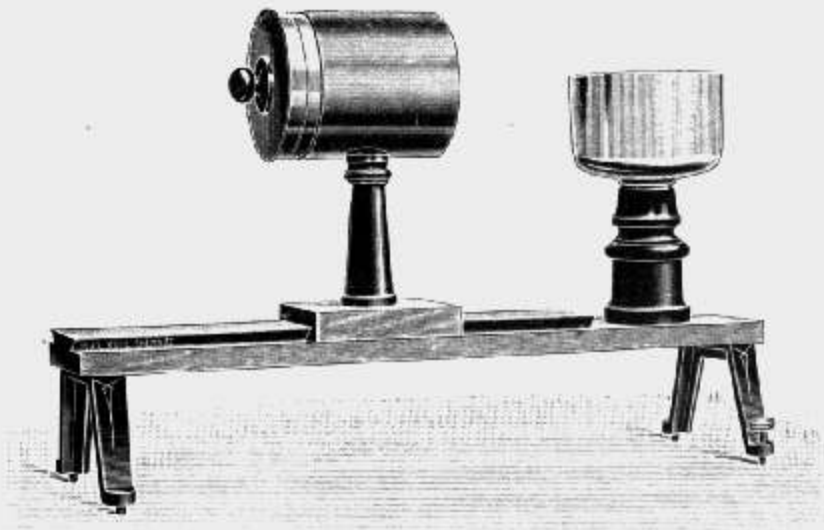
53 454. 1 : 9.



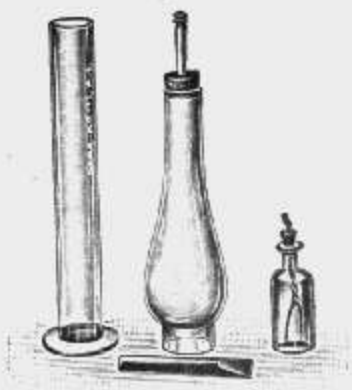
53 456. 1 : 7.



53 455. 1 : 12.



53 458. 1 : 10.



53 459. 1 : 8.

Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
53,450. **Triangular Paper Membrane** for preceding, length of side 30 cm	0. 6. 0
53,451. **3 Small Paper Membranes,** round, rectangular and triangular, for preceding . . .	0. 10. 0
53,452. **Powder Spray,** Figure, for powdering the colour figure discs	0. 5. 0
With the aid of the above the discs can be coated quite evenly with lycopodium.	
53,453. **Apparatus for showing the Vibration of Liquid Films,** Figure, with three metal plates of round, rectangular, and triangular aperture	1. 2. 0
53,454. **Glass Bell** on wood base, Figure, for showing the nodes	0. 4. 0
The bell is filled with water and when sounded shows the vibration-nodes by a rippling of the liquid.	
53,455. **Glass Bell with 4 Pendulums** in contact with its periphery, Figure, **on stand** .	1. 4. 0

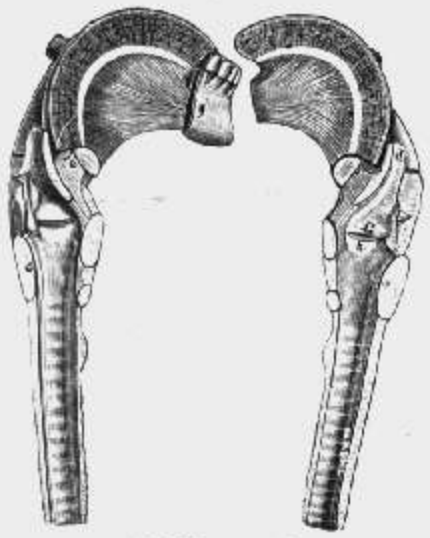
Resonance Phenomena. Organs of Human Speech and Hearing.

* 53,456. **2 Tuning Forks, one with small pendulum,** Figure, on resonance box, $c_1 = 256$ ($ut_3 = 512$ v. s.), for showing the resonance of this tuning fork when the other, of the same pitch, is struck (Ztschr. f. d. phys. u. chem. U. **7**, 1894, p. 272)	2. 12. 0
53,457. **Cylindrical Glass,** 1 m high, for showing resonance (M. P. 9th Edn. I, Fig. 663) . .	0. 8. 0
The cylindrical glass is filled with water to such height that the air column above corresponds to a tuning fork set into vibration and held over a glass; use can be made, say, of a_1 (ut_3).	
53,458. **Resonance Apparatus** after Savart, Figure (M. P. I, Fig. 638 [665])	2. 4. 0
The glass bell is made to sound by stroking with a violin bow and the resonator tube (in two parts) is varied until resonance takes place.	
53,459. **Resonance Apparatus** after Drenteln, Figure, consisting of a tall glass cylinder, forming the source of sound, a lamp glass, closed on one side, as resonator, a brass tube for blowing the cylinder and a small lamp (Ztschr. f. d. phys. u. chem. U. **7**, 1894, p. 273)	0. 6. 0
By blowing aside cork dust or lycopodium, spread on the inner edge of the glass resonator, or by blowing out the lamp, resonance is shown, when the cylindrical glass is blown with the blowing tube, after its tone is tuned to the tone of the resonator by filling with water.	

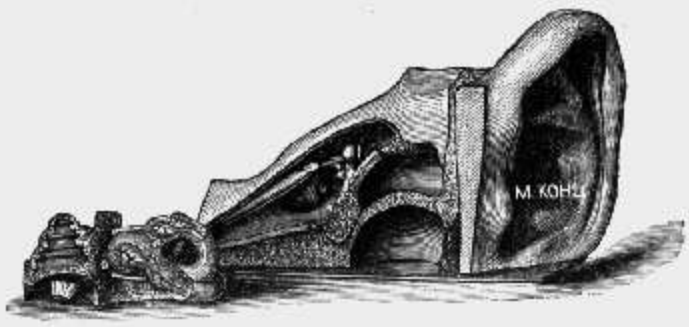
* Can be used with the Projection Apparatus.

Resonators for Sound Analysis, etc. see p. 449—451.

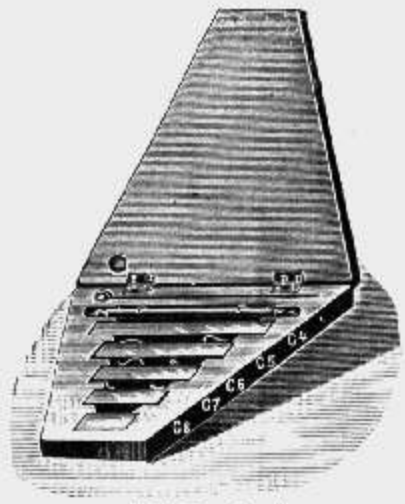
Cl. 6031, 5792, 4974, 6000, 1046, 5859.



53462. 1 : 3.



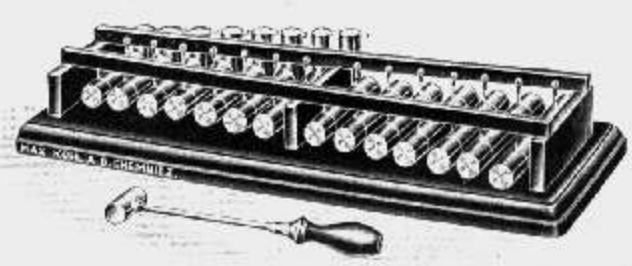
53464. 1 : 4.



53469. 1 : 9.



53463. 1 : 4.



53471. 1 : 7.

	£ s. d.
Membrane Pipe serving as model of the Larynx: see No. 53,281 (cf. W. D. Fig. 225 [211])	0. 5. 0
53,461. **Model of Larynx,** after Bock, simple	0. 6. 0
53,462. — idem, with hyoid bone, Figure	0. 18. 0
53,463. — idem, with view of the pharyngeal space and nasal cavity, Figure . . .	0. 15. 0
53,464. **Model of Ear,** Figure, can be taken entirely apart, very carefully constructed, five times actual size	0. 12. 0
53,465. — idem, ten times actual size	0. 15. 0
53,468. **4 Steel Bars,** c_4, c_5, c_6, c_7 (ut_6, ut_7, ut_8, ut_9), for testing the upper limit of audibility, in case (M. P. I, Fig. 679 [705])	1. 4. 0
53,469. **5 Steel Bars,** c_4, c_5, c_6, c_7, c_8 (ut_6, ut_7, ut_8, ut_9, ut_{10}), Figure, for the same purpose, with suspension and steel hammer	1. 10. 0
53,470. **10 Steel Cylinders,** c_5, e_5, g_5, c_6, e_6, g_6, c_7, e_7, g_7, c_8 (ut_7, mi_7, sol_7, ut_8, mi_8, sol_8, ut_9, mi_9, sol_9, ut_{10}), for testing the upper limit of audibility, with steel hammer, cf. Fig. 53,471	3. 10. 0
53,471. **22 Steel Cylinders,** from c_5 to c_8 (ut_7—ut_{10}), for the same purpose, Figure, with steel hammer	7. 0. 0
4 Tuning Forks for showing the upper limit of audibility, see Fig. 53,327, p. 435	2. 8. 0

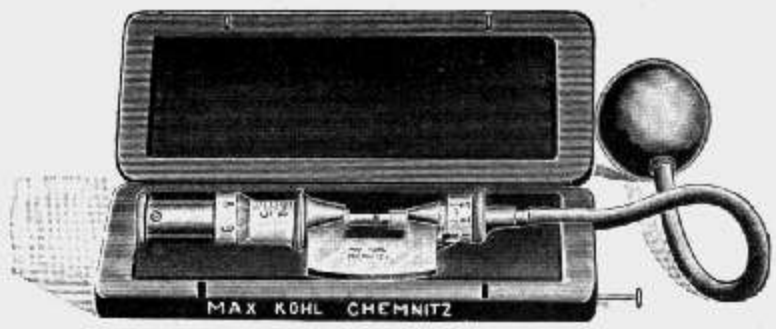
Large Tuning Forks for showing the lower limit of audibility: see Nos. 53,398—53,400, p. 439.

Cl. 1192, 1194, 1118, 1193, 6901.

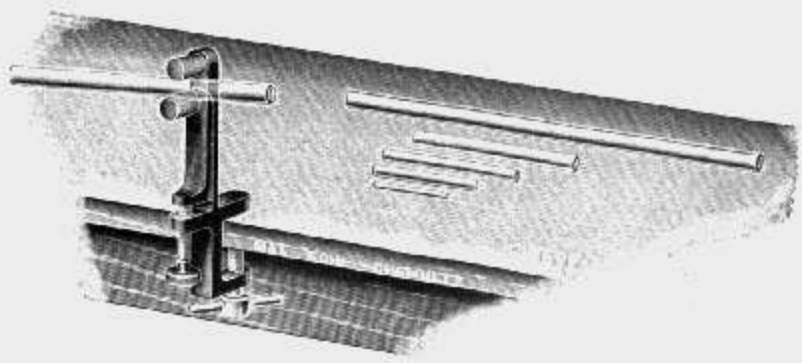
Max Kohl A. G. Chemnitz, Germany.



53473. 1 : 8.



53479. 1 : 3.

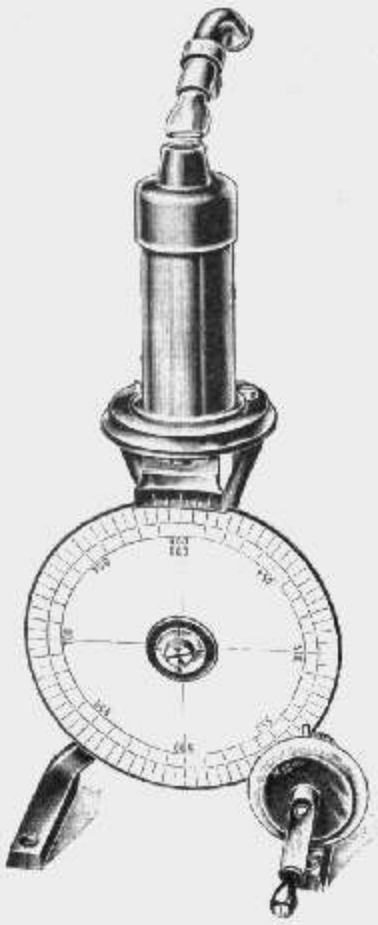


53480. 1 : 6.

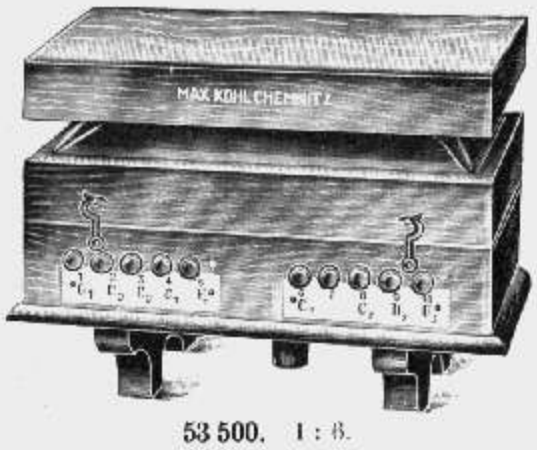


53478. 1 : 2.

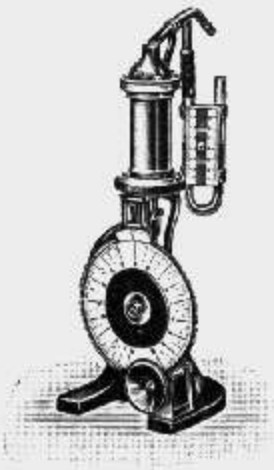
	£ s. d.
53,473. **Bezold's Continuous Progression of Sounds Apparatus,** Figure, for investigating the tone-sensitivity of the ear, consisting of 10 tuning forks with sliding weights Nos. 53,401 to 53,410, for the compass e_{-3}—a_2 (ut_{-2}—la_4), 1 drum stick No. 53 411 for the forks, each one pipe Nos. 53,476 and 53,477 for compass e_2—a_4 (mi_4—la_6) and a Galton's Whistle No. 53,479 of compass a_4 (la_6) onwards to beyond the limit of audibility; the whole in box, the Galton Whistle being contained in a separate case	22. 10. 0
Further particulars as to the individual tuning forks are given on p. 439 and for the pipes, below.	
53,474. **Additional Series of unloaded Tuning Forks** for the tones g_3, c_4, g_4, c_5 (sol_5, ut_6, sol_6, ut_7), with drum stick and case	4. 15. 0
53,475. **Further complementary series,** comprising a loaded tuning fork No. 53,400 for 12—18 compound vibrations, and unloaded forks a_0, a_1, and a_2 (la_2, la_3, la_4)	4. 0. 0
53,476. **Pipe for the Higher Tones** of Bezold's Continuous Tone Progression, large, for the tones between e_2 and a_3 (mi_4 and la_5)	2. 5. 0
53,477. — idem, **small,** for the tones between a_3 and a_4 (la_5 and la_6)	1. 15. 0
53,478. **Galton's Whistle,** Figure, for producing the highest tones and for demonstrating the higher limit of audibility, simple pattern	0. 16. 0
53,479. — idem, new improved pattern, Figure, for the tones from a_4 (la_6) to beyond the limit of audibility (3480—30,000 compound vibrations), in case	2. 15. 0
53,480. **Dust Figure Apparatus** for Galton's Whistle, Figure, consisting of screw clamp and 6 different glass tubes	0. 10. 0



53 485. 1 : 4.



53 500. 1 : 6.



53 486. 1 : 7.



53 492. 1 : 4.

Tonometric Apparatus and Resonators.

£ s. d.

Tone Variators after Prof. Stern, Figures 53,485, 53,486, cf. also Fig. 53,506, the tone being varied steadily and uniformly (Ztschr. f. Psychologie und Physiologie der Sinnesorgane, Vol. **30**, 1902, p. 422).

List No.	**53,481**	**53,482**	**53,483**	**53,484**	**53,485**	**53,486**	**53,487**	
Size	1	2	3	4	5	6	7	
Compass From	100	150	200	300	400	500	600	compound
Compass To	165	300	400	600	800	1000	1200	vibrations
£	**8. 0. 0**	**7. 10. 0**	**6. 10. 0**	**6. 0. 0**	**6. 0. 0**	**6. 0. 0**	**6. 0. 0**	

The apparatus is suitable for demonstration purposes and for tuning, for psychological investigations and practical investigations by otologists.

The tone variators are brass flasks with zinc cap and blowing tube. The flasks have an adjustable bottom which is raised by a spiral shaped disc in such manner that equal angles of rotation of the disc correspond to approximately the same variations in periodicity. The periodicities can be read off direct on the dial. In addition to the values of the periodicities, the musical tones in International Pitch are given on the dial.

Calibration is made by means of the blowers listed under Nos. 53,229 and 53,230, these blowers supplying a very uniform pressure. It is advisable to use such a blower for the tone variators so that a uniform pressure may be introduced into the apparatus. For observing the pressure when blowing every tone variator is provided with a pressure gauge on the scale of which is marked the pressure at which the tone variator is adjusted.

The formation of a progression of tones from the single flasks can be introduced at the wish of the customer. It is advisable to select the flasks so that the successive compasses of tone partially overlap, since it is necessary in a number of experiments to sound two similar or closely adjoining tones simultaneously.

An accurate description is appended to each apparatus.

Tone Variators after Prof. Stern, **simple pattern**, Figure, suitable for demonstration purposes only.

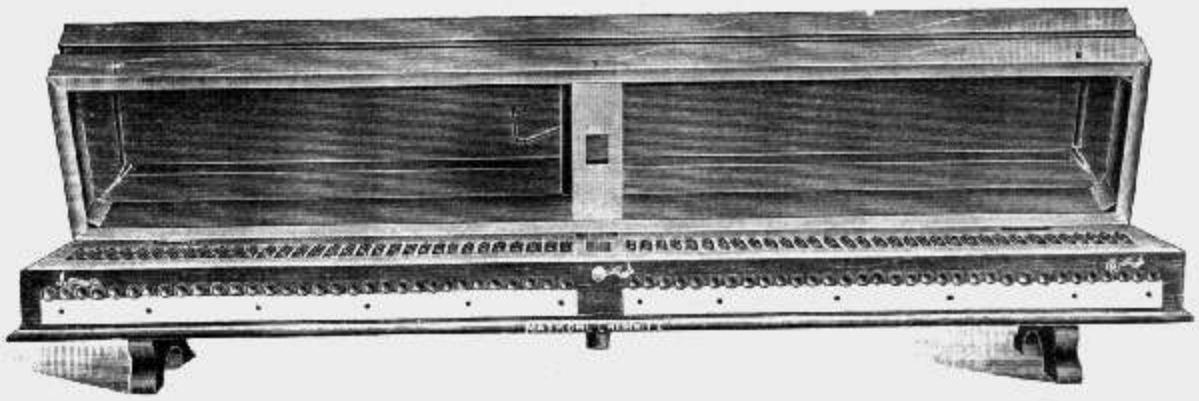
List No.	**53,488**	**53,489**	**53,490**	**53,491**	**53,492**	**53,493**	**53,494**	
Size	8	9	10	11	12	13	14	
Compass From	100	150	200	300	400	500	600	compound
Compass To	165	300	400	600	800	1000	1200	vibrations
£	**6. 0. 0**	**5. 10. 0**	**4. 10. 0**	**4. 0. 0**	**4. 0. 0**	**4. 0. 0**	**4. 0. 0**	

In this apparatus the bottom of the pipe is not displaced by a spiral, but by rack and pinion. An excentrically operated pointer indicates the number of vibrations on the scale.

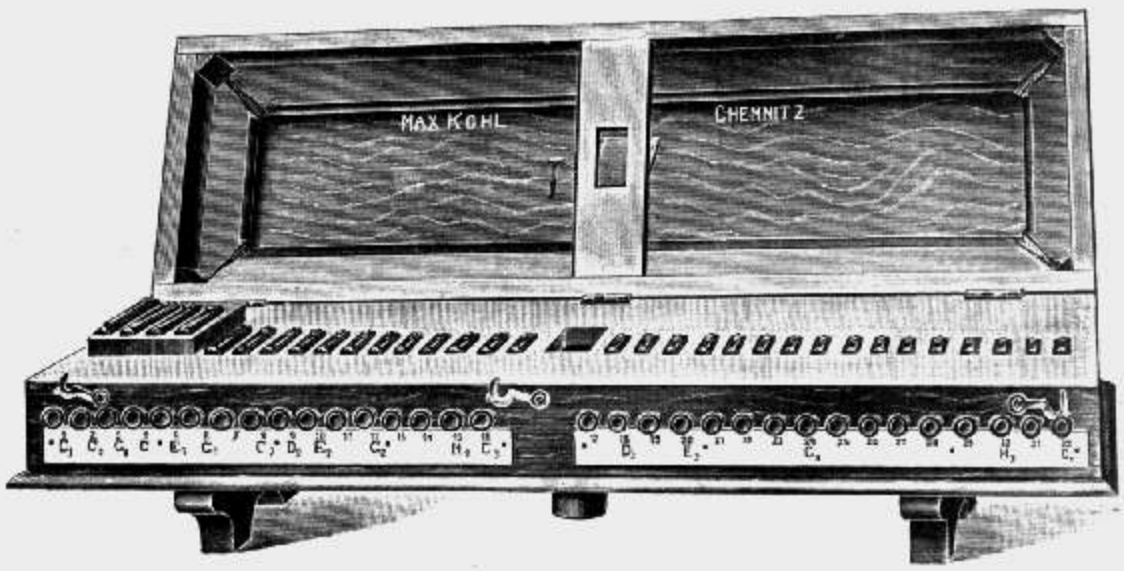
53,495. **Tonometer** No. 1 of 33 tones: **Fundamental Tone $c_0 = 128$** compound vibrations to $c_1 = 256$ ($ut_2 = 256$ v. s. to $ut_3 = 512$ v. s.), each succeding tone about four compound vibrations higher than the preceding 9. 0. 0

The Tonometers and Overtone Apparatus fit all our Blowing Tables.

Please observe also the Bezold's Continuous Tone-Progression Apparatus, No. 53,473, also the single tuning forks and pipes for same. Cl. 1109, 1112, 5819, 1112a.

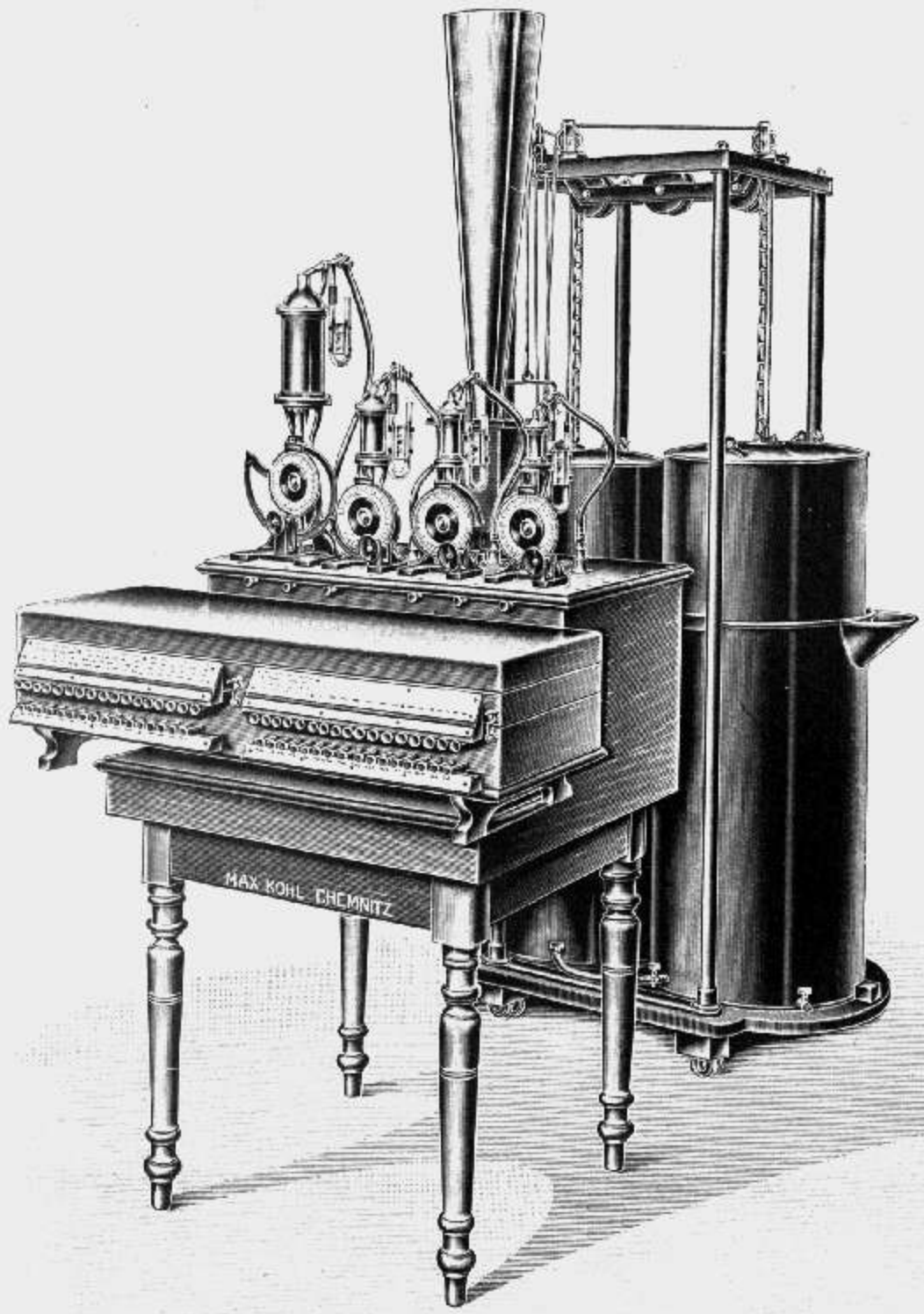


53 497. 1 : 10.



53 501. 1 : 6.

	£ s. d.
53,496. **Tonometer No. 2** of 65 tones: **Fundamental tone** $c_0 = 128$ to $c_1 = 256$ compound vibrations ($ut_2 = 256$ v. s. to $ut_3 = 512$ v. s.) each succeeding tone about two compound vibrations higher than the preceding	15. 0. 0
53,497. **Tonometer No. 3** of 65 tones, Figure: **Fundamental Tone** $c_1 = 256$ to $c_2 = 512$ compound vibrations ($ut_3 = 512$ v. s. to $ut_4 = 1024$ v. s.), each succeeding tone about four compound vibrations higher than the preceding	15. 0. 0
53,498. **Tonometer No. 4** of 129 tones: **Fundamental Tone** $c_1 = 256$ to $c_2 = 512$ compound vibrations ($ut_3 = 512$ v. s. to $ut_4 = 1024$ v. s.), each succeeding tone about two compound vibrations higher	22. 10. 0
53,499. **Tonometer** of 129 tones: **Fundamental Tone** $c_2 = 512$ to $c_3 = 1024$ compound vibrations ($ut_1 = 1024$ v. s. to $ut_5 = 2048$ v. s.), each succeeding tone about four vibrations higher	22. 10. 0
53,500. **Overtone Apparatus,** Figure (W. D. Fig. 224 [210]), consisting of 9 reed pipes with wind chest and wind regulator, for the 1st to 9th overtone of $c_{-1} = 64$ compound vibrations ($ut_1 = 128$ v. s.)	4. 4. 0
Resonators for above: see pp. 450 and 451.	
53,501. — idem, Figure, the first 32 overtones of $c_{-1} = 64$ compound vibrations ($ut_1 = 128$ v. s.) to $c_4 = 2048$ ($ut_6 = 4096$ v. s.) with wind chest and air regulation	9. 0. 0
If desired we also supply overtone apparatus for other fundamental tones.	
53,502. **Interval Apparatus** after Stumpf, with 20 tones in the compass of an octave and fundamental tone of 400 compound vibrations (800 v. s.)	7. 10. 0
In addition to the fundamental tone (1 : 1; 400 compound vibrations) the apparatus has: chromatic second (25 : 24; 416.66), minor second (16 : 15; 426.66), major second (9 : 8; 450), Pythagorean minor third (32 : 27; 474.1), tempered minor third (363 : 305; 476), pure minor third (6 : 5; 480), pure major third (5 : 4; 500), tempered major third (635 : 504; 504), Pythagorean major third (81 : 64; 506.25) pure fourth (3 : 4; 533.33) augmented fourth (45 : 32; 562.5), tempered fifth (2655 : 1772; 599.3), perfect fifth (3 : 2; 600), perfect minor sixth (8 : 5; 640), perfect major sixth (5 : 3; 666.66), natural seventh tone „i“ (7 : 4; 700), minor seventh (9 : 5; 720), major seventh (15 : 8; 750), and octave (2 : 1; 800).	



53506 (53230, 53231, 53503, 53482, Tone Variator 275 550, 53485, 53487, 53282). 1 : 12.

53,503. **Interval Apparatus and Tonometer** after Prof. Ebbinghaus, cf. Figure 53,506 (the box-shaped apparatus in the foreground of the table), **with 22 interval tones** within an octave, having the fundamental tone of 400 compound vibrations (800 v. s.) **with 28 tones for tone-measuring** at corresponding intervals between 30 and 1600 compound vibrations (60 and 3200 v. s.) and **with 16 tones for tone-measuring** between the fundamental tone of 400 compound vibrations (800 v. s.) and its major second . . | £ s. d. 18. 0. 0

The following reed pipes are fitted for **demonstrating the intervals:** fundamental tone (1 : 1; 400 compound vibrations), chromatic second (25 : 24; 416.66), minor second (16 : 15; 426.66), major second (9 : 8; 450), augmented second $^{15}/_{16} \cdot {}^{5}/_{4}$: 1; 468.75), Pythagorean minor third (32 : 27; 474), tempered minor third (363 : 305; 476), perfect minor third (6 : 5; 480), perfect major third (5 : 4; 500), tempered major third (635 : 504; 504), Pythagorean major third (81 : 64; 506.25), perfect fourth (4 : 3; 533.33), augmented fourth ($^{9}/_{8} \cdot {}^{5}/_{3}$: 1; 562.5), tempered fifth (2656 : 1772; 599.3), perfect fifth (3 : 2; 600), perfect minor sixth (8 : 5; 640), perfect major sixth (5 : 3; 666.66), natural seventh (7 : 4; 700), seventh ($^{4}/_{3} \cdot {}^{4}/_{3}$: 1; 711.1), minor seventh (9 : 5; 720), major seventh (15 : 8; 750) and the octave (2 : 1; 800).

The reed pipes mentioned above can be used in part **for tonometric purposes;** for this special purpose the apparatus has reeds with 30, 40, 50, 60, 70, 80, 90, 100, 120, 125, 150, 160, 200, 240, 250, 300, 320, 360, 400, 480, 500, 600, 800, 900, 960, 1000, 1200, 1600 compound vibrations.

Cl. 4139.

Max Kohl A. G. Chemnitz, Germany.

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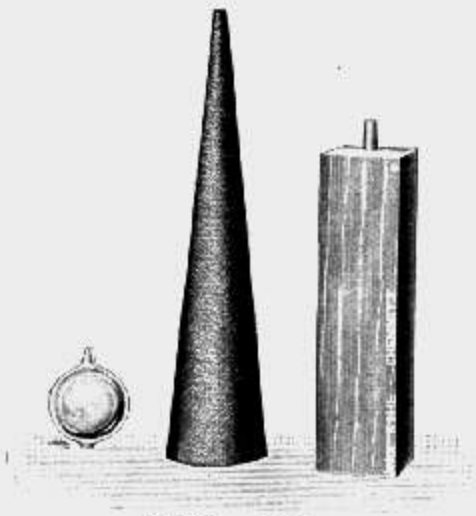


53 507. 1 : 7.



53 508. 1 : 6.

Also with 404, 408, 412, 416, 420, 424, 428, 432, 436, 438, 440, 442, 444, 446, 448, 449 compound vibrations. £ s. d.

As blower for this apparatus the most suitable to use is the blowing table for constant pressure, No. 53,229, or the Whipple Double Blower, No. 53,230, with wind chest and Table No. 53,231.

53,504. **Triad Apparatus,** after Prof. Stumpf, Berlin, for demonstrating the major and minor triad at four different positions 9. 0. 0

With this apparatus it is possible to demonstrate the major triad (4 : 5 : 6) and the minor triad (10 : 12 : 15) in four different pitches, and to determine by this means the pitch which forms the most perfect harmony. The chords are based on a frequency of 100. Number of vibrations: (a) 100, 120, 125, 150; (b) 200, 240, 250, 300; (c) 400, 480, 500, 600; (d) 800, 960, 1000, 1200; as complements for the difference-tones and overtones: (e) 80, 160, 640, 720; (f) 700, 900, 1100.

53,505. **Triad Apparatus of 24 Massive Tuning Forks** on Resonance Boxes 30. 0. 0

Frequencies: 100, 120, 125, 150; 200, 240, 250, 300; 400, 480, 500, 600; 800, 960, 1000, 1200; 1600, 1920, 2000, 2400; 3200, 3840, 4000, 4800.

53,506. **Acoustic Apparatus** after Prof. Ebbinghaus. Figure, comprising Whipple Double Blower No. 53,230, a Wind Chest with Table No. 53,231, and Interval Apparatus and Tonometer after Ebbinghaus No. 53,503, one each Tone Variator after Stern for 150—300 compound vibrations No. 53,482, for 275—550 compound vibrations (by special arrangement), for 400—800 compound vibrations No. 53,485, for 600—1200 vibrations No. 53,487, and a Reed Pipe with sound horn and deep tone c_{-1} = 64 compound vibrations (ut_1 = 128 v. s.) No. 53,282 . . . . . 74. 6. 0

As to the individual apparatus, kindly refer to the text under the List Nos. given.

53,507. **3 Resonators,** Figure, of different shape (spherical, conical, and prismatic), of different material (glass, pasteboard, wood) and of different pitch (g_1, e_1, c_1; sol_3, mi_3, ut_3) 0. 12. 0

53,508. **Resonance Tube on Base,** can be closed at one end, Figure 1. 8. 0

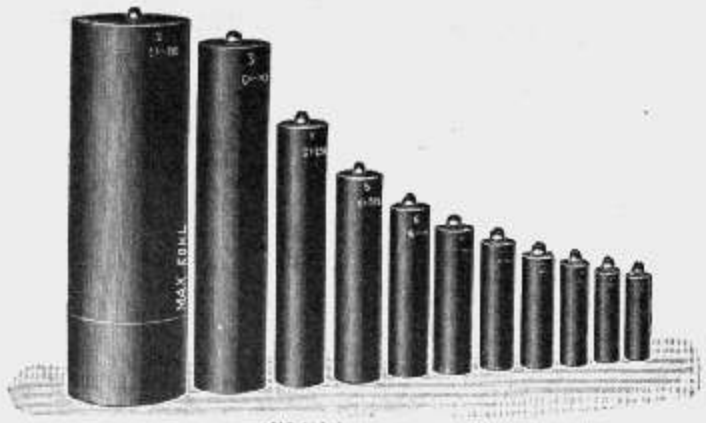
With this resonance tube, which replaces the labial pipe, it is explained that when the pipe is open the overtones are the even quadruples of the fundamental tone, and when the pipe is closed, that the overtones are the odd quadruples of the fundamental tone, and that the fundamental tone of the open pipe is the octave of the fundamental tone given by the covered pipe of equal length. The open pipe vibrates therefore in a half wave, the covered pipe in a quarter wave.

The tube is tuned in such manner that when closed on one side it gives the fundamental tone c_1 (ut_3) clearly and resonantly. For this purpose the tuning fork c_1 (ut_3) is struck smartly and held in front of the free aperture. Even with tuning fork g_2 (sol_4) (the overtone with thrice the number of vibrations) the tube resonates clearly, while it does not resonate with fork c_2 (ut_4), the octave of the fundamental tone. This, however, becomes the case when the resonator tube is opened so that it corresponds to the open labial pipe, which gives a tone twice as high as the covered pipe of the same length.

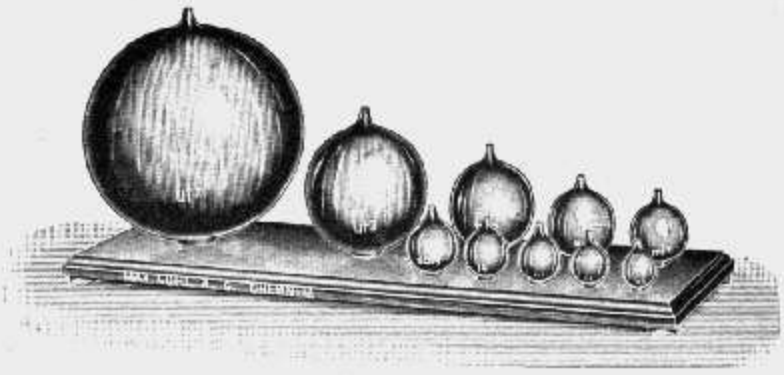
53,509. **Tuning Fork for above,** c_1 = 256 compound vibrations (ut_3 = 512 v. s.), with handle 1. 0. 0

53,510. — idem, c_2 = 512 compound vibrations (ut_4 = 1024 v. s.), with handle 0. 18. 0

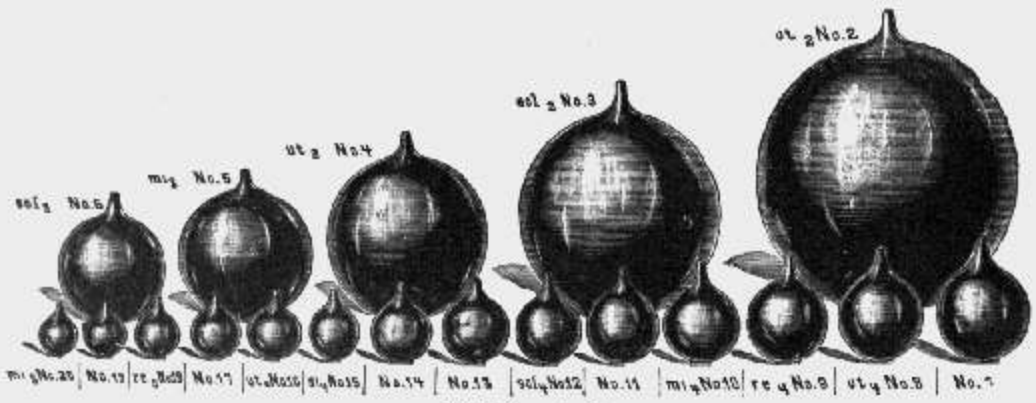
53,511. — idem, g_2 = 768 compound vibrations (sol_4 = 1536 v. s.), with handle 0. 18. 0



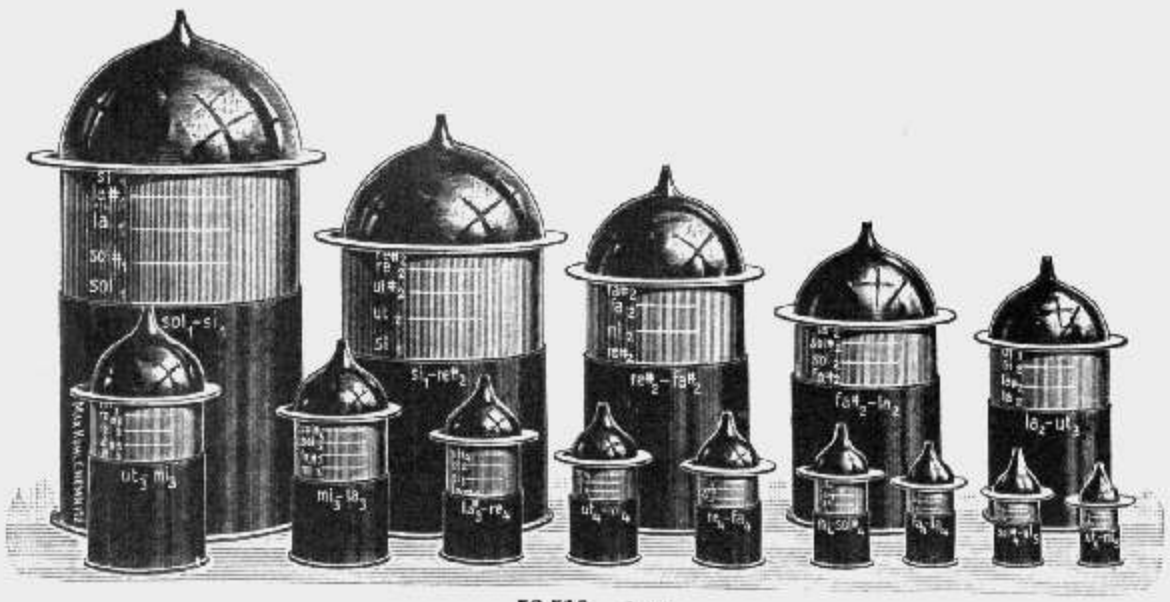
53 514. 1 : 10.



53 517. 1 : 10.



53 516. 1 : 7.



53 518. 1 : 6.

53,282. **Reed Pipe,** Figure 53,282, p. 429, with sound horn, $c_{-1} = 64$ compound vibrations ($ut_1 = 128$ v. s.), deep tone . . . . . £ 1. 6. 0

53,512. **9 Resonators for above, spherical, open,** of sheet zinc, accurately adjusted, from 2nd to 10th overtone of c_{-1} (ut_1) 1. 10. 0

53,513. — idem, **closed** 1. 12. 0

53,514. **11 Cylindrical Resonators,** of pasteboard, Figure, covered, for the 2nd to 12th partial tone of c_{-1} (ut_1) 1. 0. 0

53,515. **15. Resonators for Pipe No. 53,282, conical,** covered, from 1st to 15th overtone (2nd to 16th partial tone) of c_{-1} (ut_1) 2. 5. 0

53,516. **19 Resonators for Pipe No. 53,282,** after Helmholtz, Figure, spherical, for the first 19 overtones of $c_{-1} = 64$ compound vibrations ($ut_1 = 128$ v. s.), guaranteed accurate in tone and well constructed, on board, with wood handles 7. 10. 0

The resonators are constructed of stout sheet brass and accurately adjusted.
In view of its bulky nature the fundamental tone is not included in the set.

53,283. **Reed Pipe** with Sound Horn, cf. Figure 53,282, p. 429, $c_0 = 128$ compound vibrations ($ut_2 = 256$ v. s.), with deep tone 1. 6. 0

Cl. 5311, 5445, 1107, 5033.

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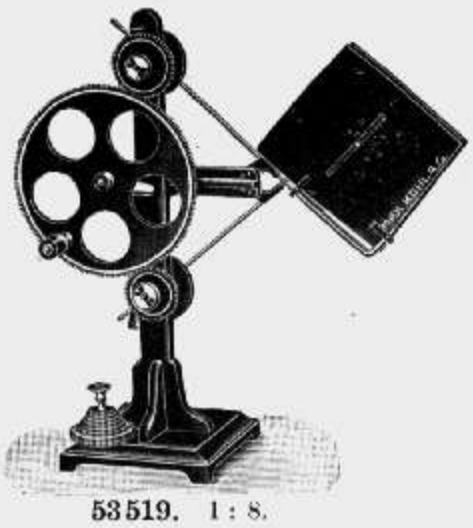
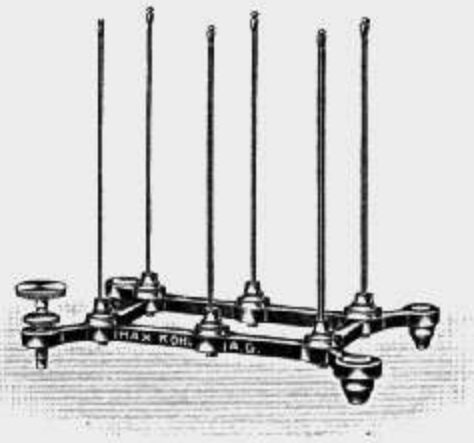


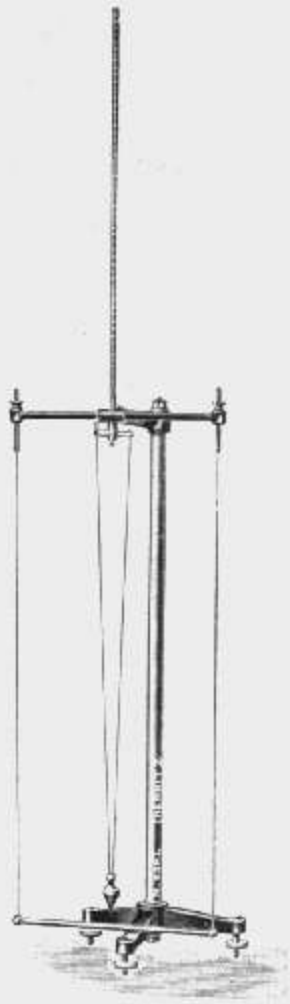
53519. 1 : 8.



53521. 1 : 8.



53522. 1 : 8.



53523. 1 : 12.

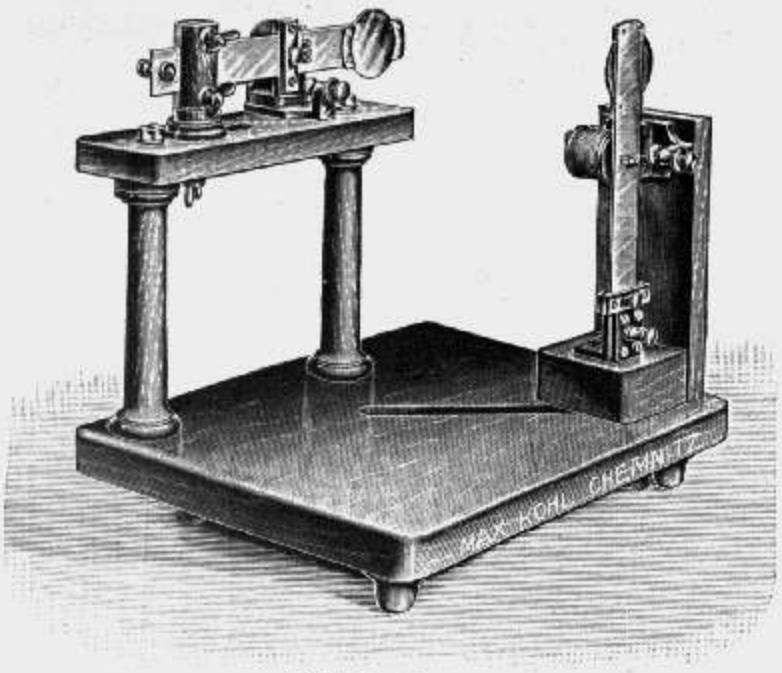
Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
53,517. **10 Resonators for preceding,** after Helmholtz, Figure, spherical, in perfect tone, for fundamental tone $c_0 = 128$ compound vibrations ($ut_2 = 256$ v. s.) and its first nine overtones, on board, with wood pegs	5. 0. 0
In this set of resonators the fundamental tone c_0 (ut_2) (first partial tone) is not included.	
53,518. **14 Universal Resonators** after König, Figure, consisting of two cylinders sliding one in the other, with graduation, to be employed for all tones from g_{-1} (sol_1) to e_3 (mi_5), the tones of the chromatic scale being indicated singly	18. 0. 0
The compass of the individual resonators is as follows: (1) g_{-1} to b_{-1} (sol_1 to si_1); (2) b_{-1} to d^+_0 (si_1 to re^+_2); (3) d^+_0 to $f^\#_0$ (re^+_2 to fa^+_2); (4) $f^\#_0$ to a_0 (fa^+_2 to la_2); (5) a_0 to c_1 (la_2 to ut_3); (6) c_1 to e_1 (ut_3 to mi_3); (7) e_1 to a_1 (mi_3 to la_3); (8) ais_1 to d_2 (la^+_3 to re_4); (9) c_2 to e_2 (ut_4 to mi_4); (10) d_2 to f_2 (re_4 to fa_4); (11) e_2 to g^+_2 (mi_4 to sol^+_4); (12) f_2 to a_2 (fa_4 to la_4); (13) g^+_2 to c_3 (sol^+_4 to ut_5); (14) c_3 to e_3 (ut_5 to mi_5).	

Demonstration of Lissajous Curves.

* 53,519. **Apparatus for Demonstrating the Lissajous Curves** by Crank Motion, Figure, for projection as well as for drawing the curves on blackened glass plates (Fr. phys. Techn. I, 2, Fig. 3393 [I, 494]; W. D. Fig. 234, 220), with wheels for obtaining the ratios 20, 24, 30, 36, 40, 48, 50, 59 and 60 : 60	4. 4. 0
53,520. **Kaleidophone** after Wheatstone, simple, one steel bar with spherical mirror on metal base (M. P. I, Fig. 704, 728)	0. 10. 0
53,521. **Kaleidophone** (Wheatstone's), Figure, with 6 rods having spherical metal mirrors, on iron stand with levelling screw, for producing 6 phases (M. P. I., Fig. 706 [730])	2. 10. 0
When struck, the differently shaped rods give directly the corresponding Lissajous curves. The figures shine well and large on the ceiling under incident light.	
53,522. **Universal Kaleidophone,** after Melde, Figure, with adjustable metal strips and spherical metal mirror (M. P. I., Fig. 707 [731]), with screw clamp	1. 10. 0
52,124. **Double Pendulum** after Airy, Fig. 52,124 A and B, pp. 296 and 297	1. 0. 0
53,523. **Pendulum Apparatus** for obtaining the vibration curves of Wheatstone and Lissajous, Figure (Eisenlohr, Lehrb. d. Phys., Fig. 181)	1. 16. 0

* Can be used with the Projection Apparatus.



53 524. 1 : 5.



53 528. 1 : 7.

	£ s. d.
* 53,524. **Apparatus for Demonstrating the Lissajous Figures** by means of vibrating springs with mirrors, F i g u r e, with electromagnetic drive in order to maintain the vibrations to any length of time	4. 16. 0
53,525. — i d e m, without electromagnetic drive	2. 0. 0
* 53,526. — i d e m, after Pfaundler, with two vibrating steel springs and crossed gaps (M. P. I, Fig. 702 [726]), one spring with variable time of vibration	1. 4. 0
53,528. **Electric Glow Lamp** with straight Filament, F i g u r e, on stand, with shielding chimney and small hole, for use with preceding apparatuses or with the following Tuning Fork Apparatuses	0. 18. 0
The working voltage should be quoted when ordering. If this is not given we supply the lamp for **110 volts.**	
53,529. **Tuning Fork Apparatus** for subjectively and objectively demonstrating the Lissajous Curves (W. D. Fig. 236 [222]), with two massive tuning forks $c_0 = 128$ compound vibrations (ut$_2$ = 256 v. s.), one fork with sliding weights, with glass mirrors, on polished wood stand	5. 0. 0
53,530. **The same Apparatus,** F i g u r e, both forks with electromagnetic drive	8. 0. 0
53,531. **The same Apparatus,** with thoroughly well ground steel mirrors, without electromagnetic drive	6. 0. 0
53,532. — i d e m, with steel mirrors and with electromagnetic drive for both forks . .	9. 0. 0

Tuning Forks for above for demonstrating the curves (Lissajous) of varions phase-differences (M. P. I. Fig. 719).

						(a) With Steel Mirror	(b) With Glass Mirror
53,533.	Phase Differences,	1 : 2,	$c_1 = 256$	Compd Vib.,	ut$_3$ = 512 v. s.	£ 1. 16. 0	£ 1. 10. 0
53,534.	,,	1 : 3,	$g_1 = 384$	,,	sol$_3$ = 768 v. s.	£ 1. 16. 0	£ 1. 10. 0
53,535.	,,	2 : 3,	$g_0 = 192$	,,	sol$_2$ = 384 v. s.	£ 1. 16. 0	£ 1. 10. 0
53,536.	,,	3 : 4,	$f_0 = 170^2/_3$	,,	fa$_2$ = $341^1/_3$ v. s.	£ 1. 16. 0	£ 1. 10. 0
53,537.	,,	3 : 5,	$a_0 = 213^1/_3$	,,	la$_2$ = $426^2/_3$ v. s.	£ 1. 16. 0	£ 1. 10. 0
53,538.	,,	4 : 5,	$e_0 = 160$	,,	mi$_2$ = 320 v. s.	£ 1. 16. 0	£ 1. 10. 0
53,539.	,,	5 : 6,	a $_1 = 106^2/_3$	,,	la$_1$ = $213^1/_3$ v. s.	£ 2. 0. 0	£ 1. 14. 0

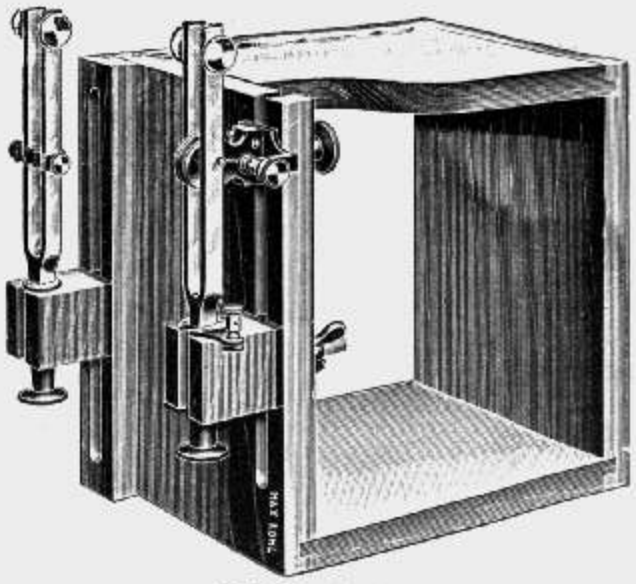
The forks listed give together with one of the forks $c_0 = 128$ compound vibrations (ut$_2$ = 256 v. s.) of the Apparatus No. 53,529—53,532, the phase differences mentioned.

	£ s. d.
53,540. **2 Tuning Forks on Stands,** mounted vertically and the Forks provided with glass mirrors, for demonstrating the figures, by means of sunlight, on the wall (M. P. I, Fig. 808 [832])	5. 0. 0
* 53,541. **Tuning Fork Apparatus for subjective and objective Demonstration** of the Lissajous Curves, F i g u r e, with case for the tuning forks	13. 0. 0
On an iron stand are fitted two tuning forks $e_0 = 128$ compound vibrations (ut$_2$ = 256 v. s.), one in a horizontal and the other in a vertical position. The Tuning Forks have limbs 250 mm long and give	

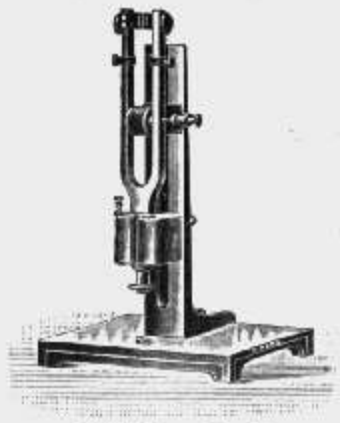
* Can be used with the Projection Apparatus.

Cl. 3890, 3875.

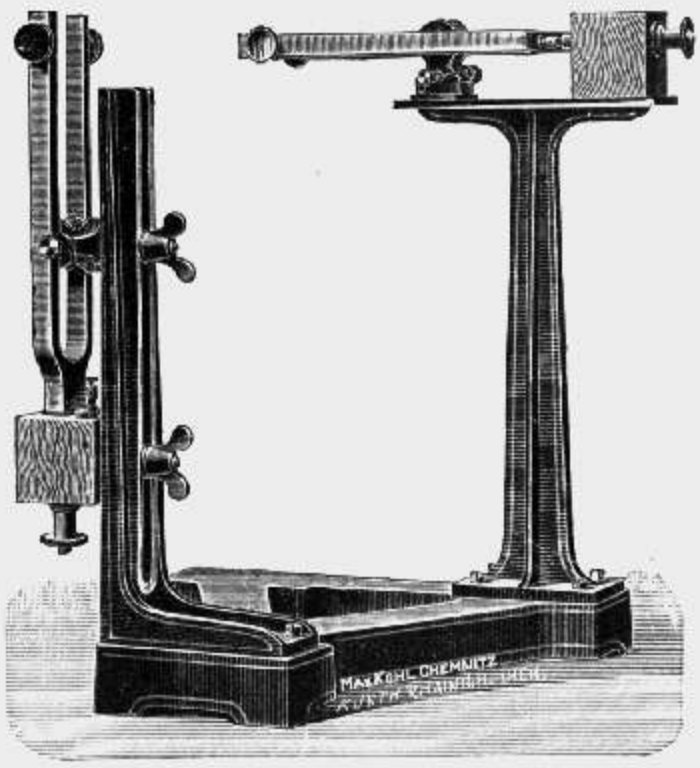
Max Kohl A. G. Chemnitz, Germany.



53 530. 1 : 6.



53 542 A. 1 : 10.



53 541. 1 : 6.

53 542 B. 1 : 10.

large vibrations. They are provided with steel mirrors and adjusted at 20° C. Both forks have electro-magnetic drive. £ s. d.

By means of two sliding weights one fork can be put out of tune for producing tremors.

By aid of the Projection Lantern and a Lens the curves can be very beautifully projected on to a screen.

* 53,542. — i d e m, **with arrangement, in addition, to enable compound parallel vibrations to be objectively demonstrated,** with two diaphragms on one fork and a string support on the other, one Stand, Fig. A, and a Lath on which a catgut cord is to be stretched, Figure B 15. 0. 0

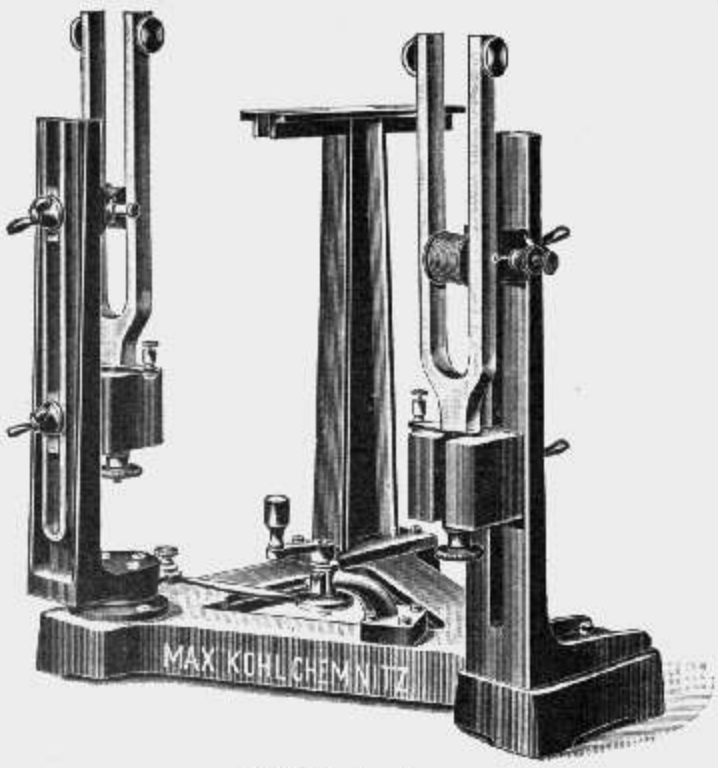
The five following very beautiful experiments can be carried out with the apparatus:

(1) Subjective observation of the Lissajous Curves (M. P. I, Fig. 688 [712]);
(2) Objective demonstration of the Lissajous Curves on the screen by means of the Projection Lantern;
(3) Objective demonstration of the sine curves produced by compound parallel vibrations (M. P. I, Fig 808 [832]);
(4) Observation of the Vibrations of a Fork by Mach's Stroboscopic Method (M. P. I, p. 668 [738]);
(5) Observation of the vibrations of string by the same method (M. P. I, p. 670 [740]).

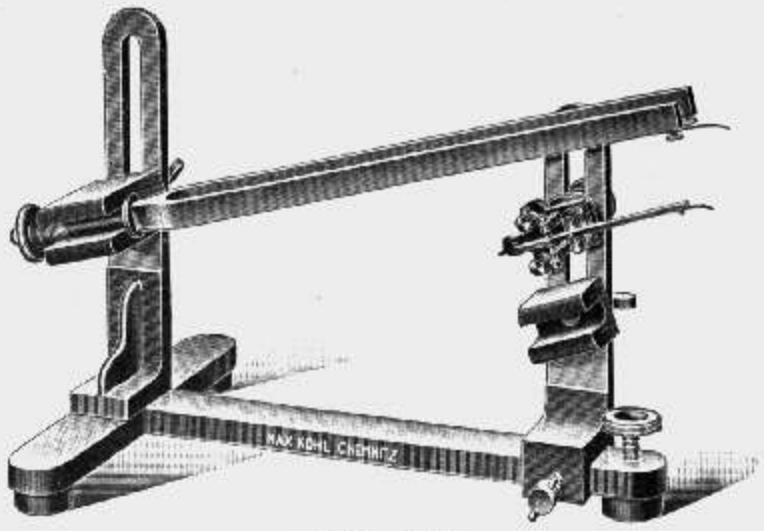
Complete description is appended to the apparatus.

Stroboscopic Disc driven by Electric Motor, for observing the condition of vibration — see under No. 53,304, p. 432 . . . . . 12. 0. 0

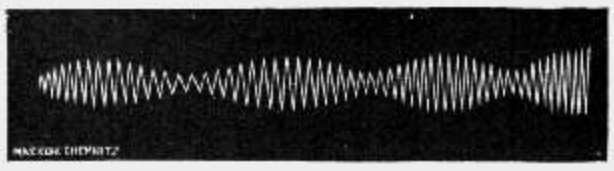
* Can be used with the Projection Apparatus.



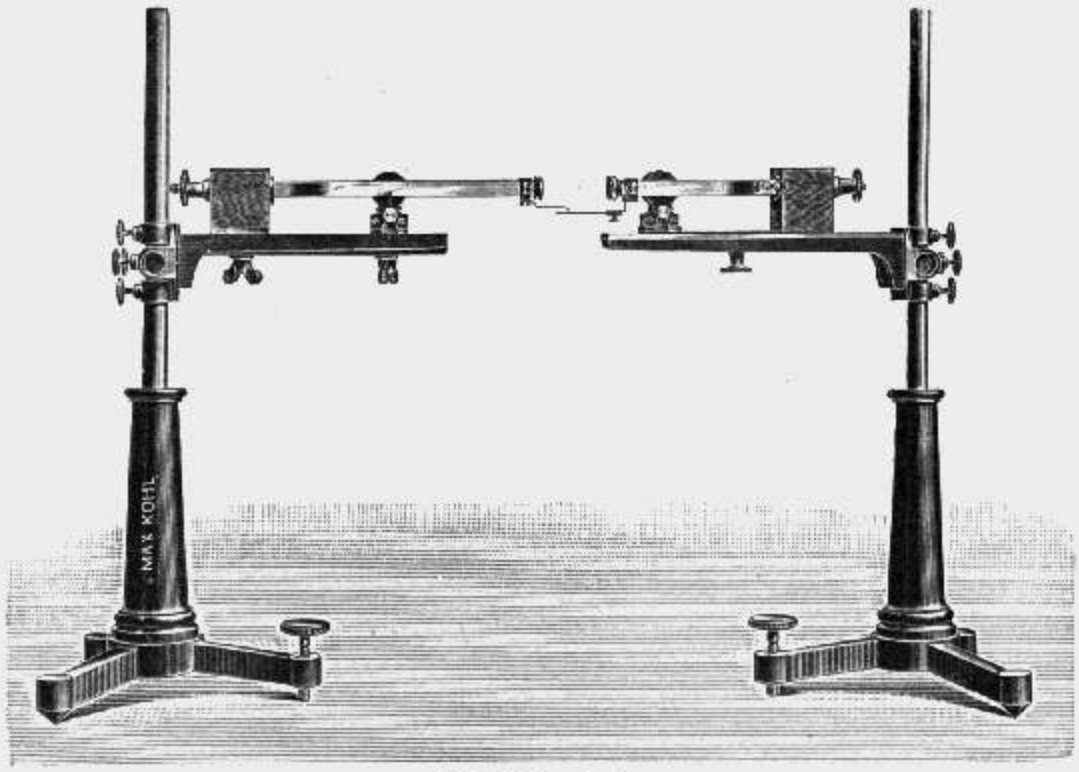
53 543. 1 : 7.



53 560. 1 : 5.



53 544 B.



53 544 A. 1 : 8.

53,543. **Tuning Fork Apparatus** as No. 53,592, Figure, **new Model,** with fork-holder capable of reciprocal rotation . . . . . £ 15. s. 0. d. 0

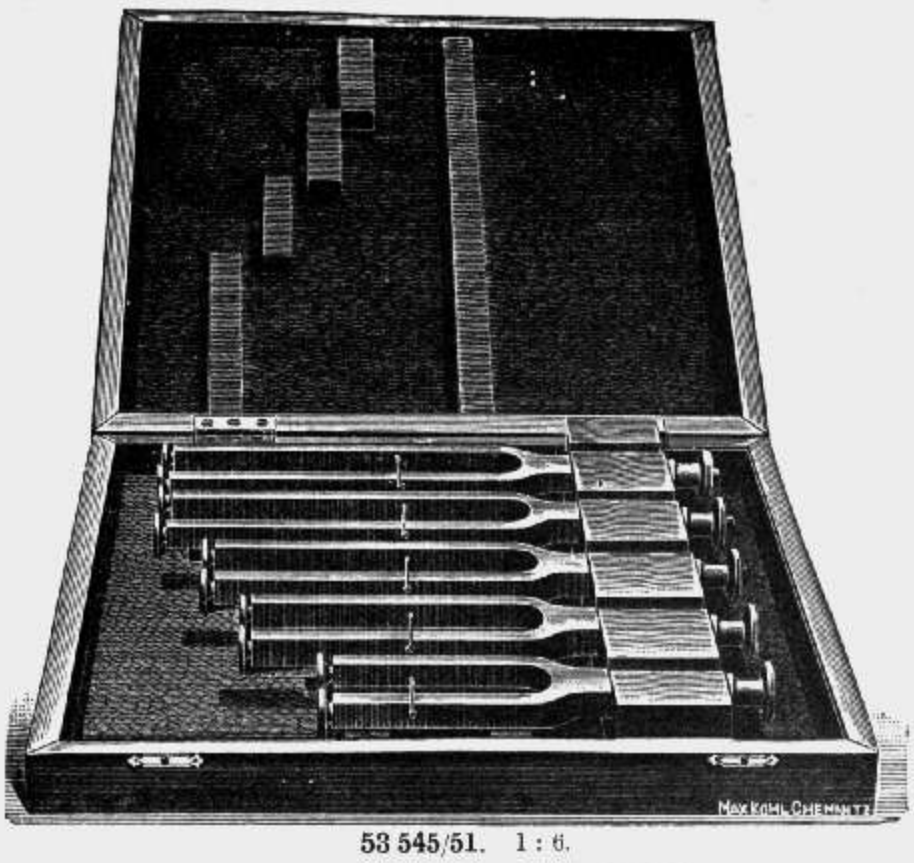
* 53,544. **Large Tuning Fork Apparatus,** Figures A and B, for subjective and objective Demonstration of the Lissajous Curves, and for the graphical demonstration of the vibrations of two Tuning Forks (M. P. I, Figs. 806 and 807 [830 and 831]), with two forks, two sliding weights, one cramp with glass plate, one style, two counterpoises and a case for the tuning forks 18. 0. 0

The apparatus consists of two very massive tall stands to which the tuning forks are fixed. One of the forks is movable on a sliding carriage. Both forks are provided with electromagnetic drive and carry steel mirrors. The forks are very massively constructed and are tuned to $c_0 = 128$ compound vibrations ($ut_2 = 256$ v. s). The vibrations of the fork can be placed parallel and perpendicular to each other. A sooted glass plate and style can be clamped on the forks. The curves obtained can be projected direct. For obtaining different curves the forks listed on the next page are employed.

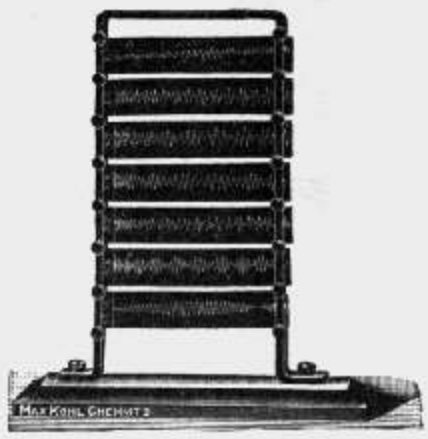
* Can be used with the Projection Apparatus.

Cl. 1168, 3377, 1142, 1141.

Max Kohl A. G. Chemnitz, Germany.



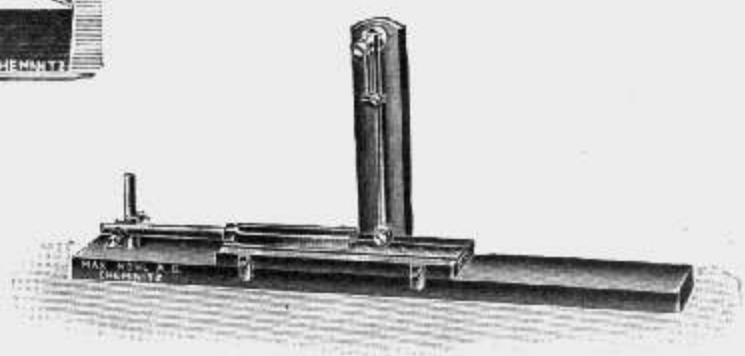
53 545/51. 1 : 6.



53 552. 3 : 10.



53 553/58. 1 : 6.



53 559. 1 : 10.

Tuning Forks, Figure, for the preceding apparatuses for demonstrating the Lissajous Curves with various phase differences (M. P. I, Fig. 695 [719]), very large and massive pattern.

					(a) With Steel Mirror	(b) With Glass Mirror
53,545.	Phase Difference	1 : 2, $c_1 = 256$	Compd. Vib.,	$ut_3 = 512$ v. s.	£ 2. 8. 0	£ 2. 2. 0
53,546.	,,	1 : 3, $g_1 = 384$	,,	$sol_3 = 768$ v. s.	£ 2. 6. 0	£ 2. 0. 0
53,547.	,,	2 : 3, $g_0 = 192$	,,	$sol_2 = 384$ v. s.	£ 2. 12. 0	£ 2. 6. 0
53,548.	,,	3 : 4, $f_0 = 170^2/_3$	,,	$fa_2 = 341^1/_3$ v. s.	£ 2. 14. 0	£ 2. 8. 0
53,549.	,,	3 : 5, $a_0 = 213^1/_3$	,,	$la_2 = 426^2/_3$ v. s.	£ 2. 10. 0	£ 2. 4. 0
53,550.	,,	4 : 5, $e_0 = 160$	,,	$mi_2 = 320$ v. s.	£ 2. 14. 0	£ 2. 8. 0
53,551.	,,	5 : 6, $a_{-1} = 106^2/_3$	,,	$la_1 = 213^1/_3$ v. s.	£ 3. 0. 0	£ 2. 14. 0

The Tuning Forks together, listed above, give, with fork $c_0 = 128$ compound vibrations ($ut_2 = 256$ v. s.) of Apparatuses Nos. 53,541—53,544, the phase differences indicated.

If desired we supply suitable boxes for 2, 3, 4, 5, 6 and 7 forks at prices of **£ 0. 14. 0, £ 0. 16. 0, £ 0. 18. 0, £ 1. 0. 0, £ 1. 2. 0** and **£ 1. 4. 0.**

	£ s. d.
* 53,552. **7 Tuning Fork Curves on Stand,** Figure, for the Projection Lantern	1. 0. 0

The curves are taken with Tuning Fork Apparatus No. 53,544 and show the phase differences 1 : 2, 2 : 3, 3 : 4, 3 : 5, 4 : 5, 5 : 6, and 35 : 36.

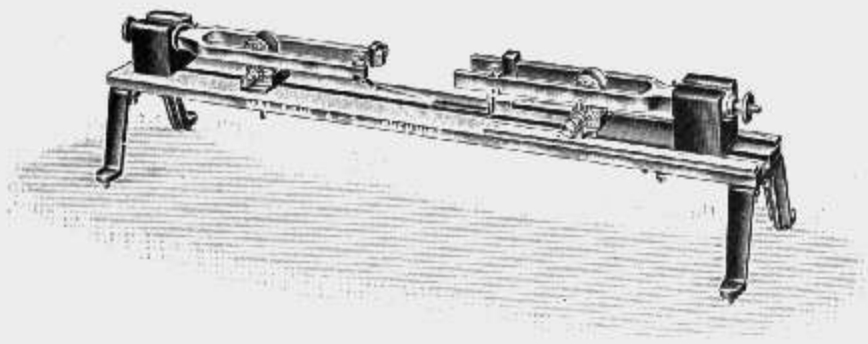
Recording Tuning Forks, Drums and Vibrographs.

Chronographic Tuning Forks for phonautographic purposes, Figure, with style and electromagnetic drive, accurately adjusted at 20 ° C.

List No.	**53,553**	**53,554**	**53,555**	**53,556**	**53,557**	**53,558**
Compd. Vib. per second	50	100	200	250	500	1000
V. s.	100	200	400	500	1000	2000
£	**5. 0. 0**	**4. 0. 0**	**4. 0. 0**	**4. 0. 0**	**4. 0. 0**	**4. 10. 0**

53,559. **Recording Device for Determining the Frequency of a Tuning Fork,** for Students' Use, after Hahn, Figure, with pendulum, 1 tuning fork c_1, 1 tuning fork d_1, 3 glass plates, 1 blackening lamp, 1 striking hammer (Hahn, Schülerübungen, Fig. 152)	1. 10. 0
53,560. **Stand for fixing Vibrating Bodies,** Figure on p. 454, with tuning fork of 50 vibrations and electric signal, to be used in conjunction with the cylinder of the Phonautograph (No. 53,571)	9. 0. 0

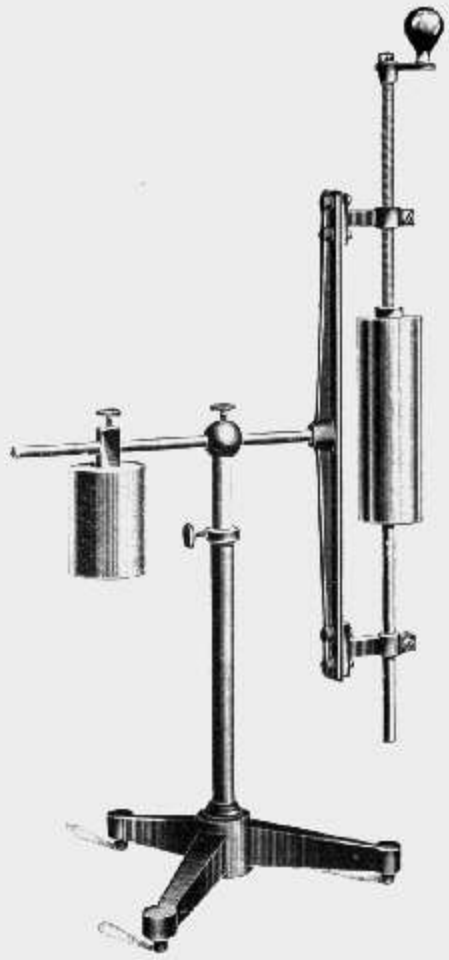
* Can be used with the Projection Apparatus.



53564. 1 : 11.



53568. 1 : 7.



53567. 1 : 7.

53,561. **2 Tuning Forks with Recording Device on Wood Stand,** $c_0 = 128$ compound vibrations ($ut_2 = 256$ v. s.), one fork fixed, the other movable and provided with sliders for graphically demonstrating the vibrations of two tuning forks (M. P. I, Figs. 806 and 807 [830 and 831]) . . . . . £ 6. 0. 0

By means of the sliders one fork can be altered in relation to the other by 4 : 5.

53,562. **Forks for above** with different number of vibrations . . . . . Each 1. 10. 0

53,563. **2 Tuning Forks with Recording Device, large pattern, on Iron Stand,** cf. Figure 53,564 with two forks, $c_0 = 128$ compound vibrations ($ut_2 = 256$ v. s.) 10. 0. 0

53,564. — idem, **with electromagnetic drive** for both forks, Figure 13. 0. 0

53,565. **Forks for above,** of different frequency . . . . . Each 2. 0. 0

53,567. **Vibrograph** after Duhamel, Figure, for determining graphically the frequencies of tuning forks (Pisko, Die neueren Apparate der Akustik, Fig. 11) 3. 0. 0

53,568. **Recording Drum with Clockwork,** Figure, can be used vertically and horizontally; speed variable from 40—$^1/_2$ mm per second by friction; the drum can be moved along the axis and easily removed 6. 0. 0

53,569. — idem, with electric contact 6. 10. 0

53,570. **Phonautograph** after König, with tuning fork stand, Figure (M. P. I, Fig. 668 [694]). Price without forks 11. 0. 0

The tuning forks to use are the chronographic forks with electromagnetic drive, Nos. 53,553—53,558.
The tuning fork curves can also be taken on sensitied paper and fixed permanently in accordance with Nimführ's process (Drudes Annalen der Physik, IV., 1906, Vol. 19, p. 647).

53,571. **Phonautographic Cylinder alone,** on iron stand, see Figure 53,570; without baseplate, tuning fork stand or tuning forks 9. 0. 0

53,572. **Membrane Phonautograph** after Scott and König (with comparison tuning forks), (Pisko, neuere Apparate Fig. 23) 25. 0. 0

A tuning fork of $c_1 = 256$ compound vibrations ($ut_3 = 512$ v. s.) with style is placed in front of the movable cylinder. Behind the fork is a parabolic funnel, closed with a membrane, the latter also

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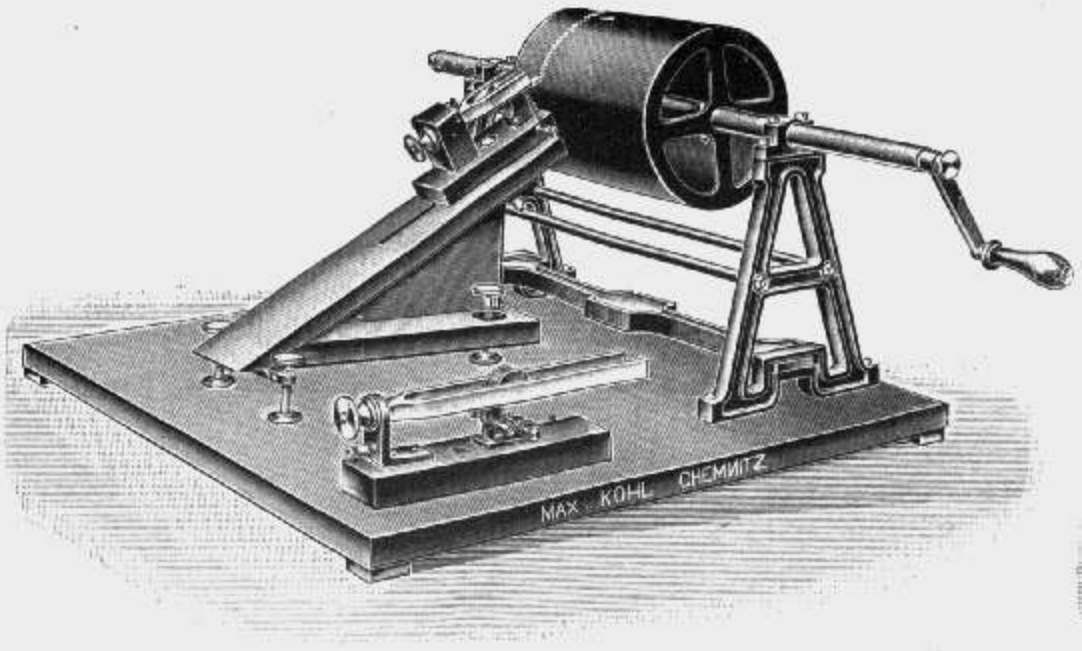
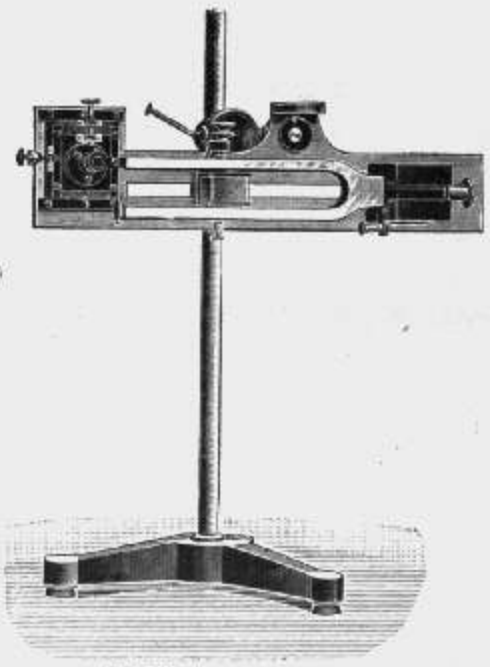
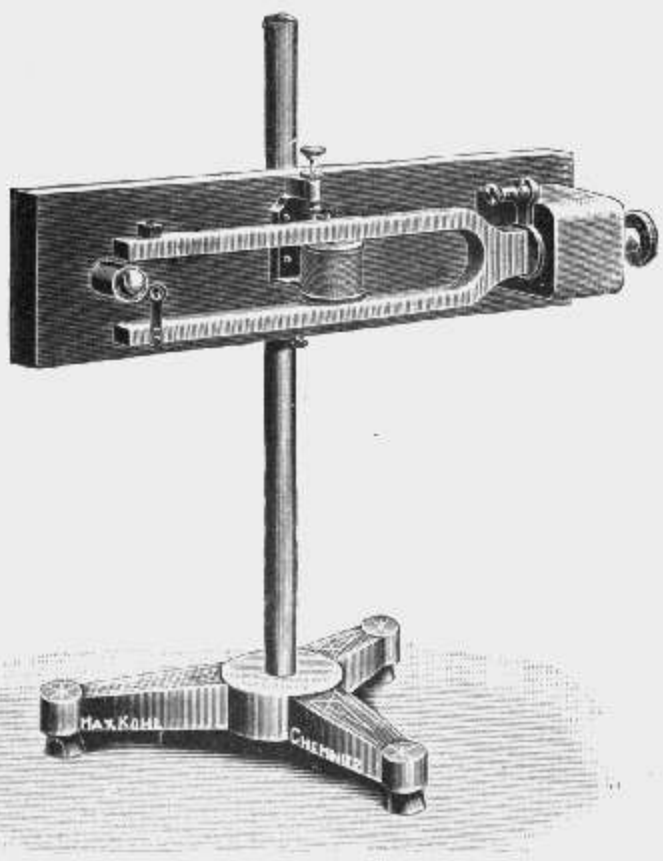


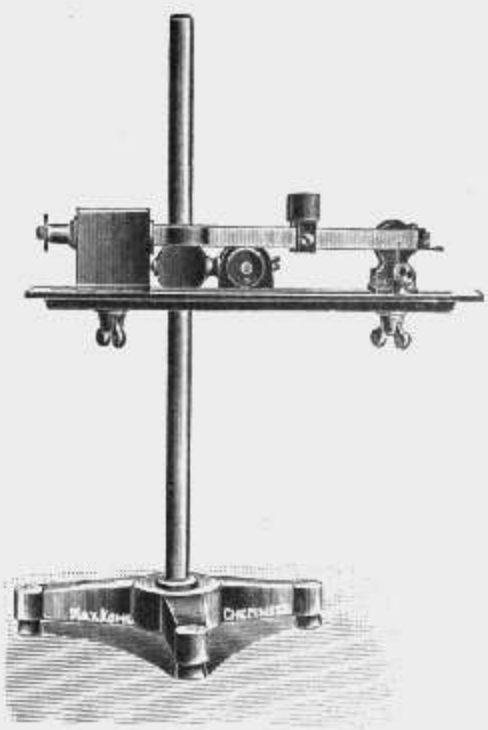
53 570. 1 : 14.



53 575 A. 1 : 8.



53 574. 1 : 6.



53 575 B. 1 : 8.

having a style. The vibrations of a tone acting on the membrane are recorded along with the curve of the fork having a known frequency, thus rendering it possible to determine the vibrations of a tone. For tuning forks with other frequencies: see Nos. 53,553—53,558. | £ s. d.

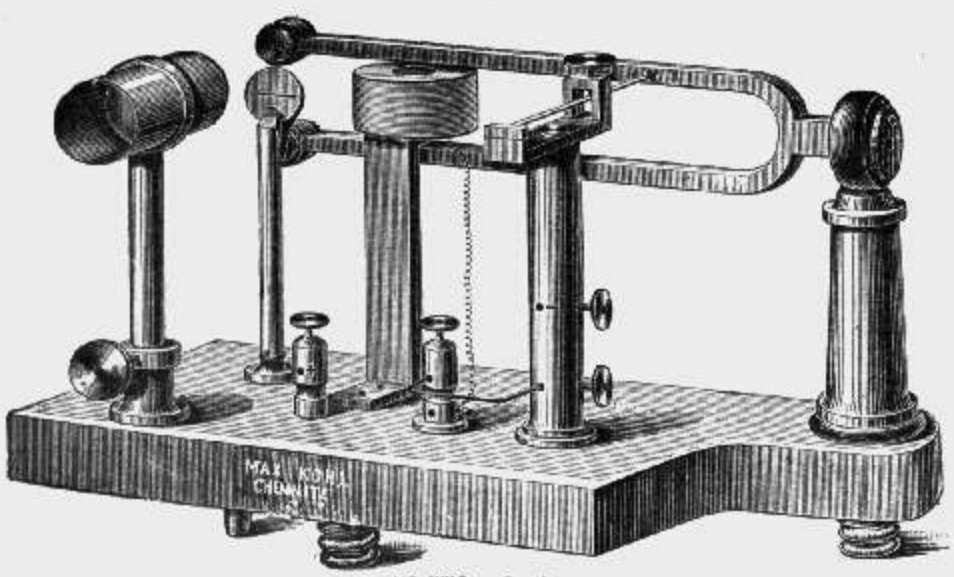
53,573. **Phonautograph** after Scott, without tuning forks (M. P. I, Fig. 804 [828]) . . . . | 21. 0. 0

53,574. **Vibration Microscope** after von Helmholtz, Figure (Lissajous's Improved **Comparator**), with a very massive tuning fork $c_0 = 128$ compound vibrations ($ut_2 = 256$ v. s.), with electromagnetic drive for permanently maintaining the vibrations and with two sliders for varying the pitch (M. P. I, Fig. 701 [725]) . . . . . | 7. 10. 0

53,575. — idem, Figures A and B, **with two stands and five massive tuning forks,** each provided with objective, steel mirror and slider . . . . . | 33. 0. 0

All tuning forks are arranged for working with electromagnets; the two electromagnets and the forks can be adjusted; the eyepiece also is adjustable vertically and horizontally by micrometer screws.

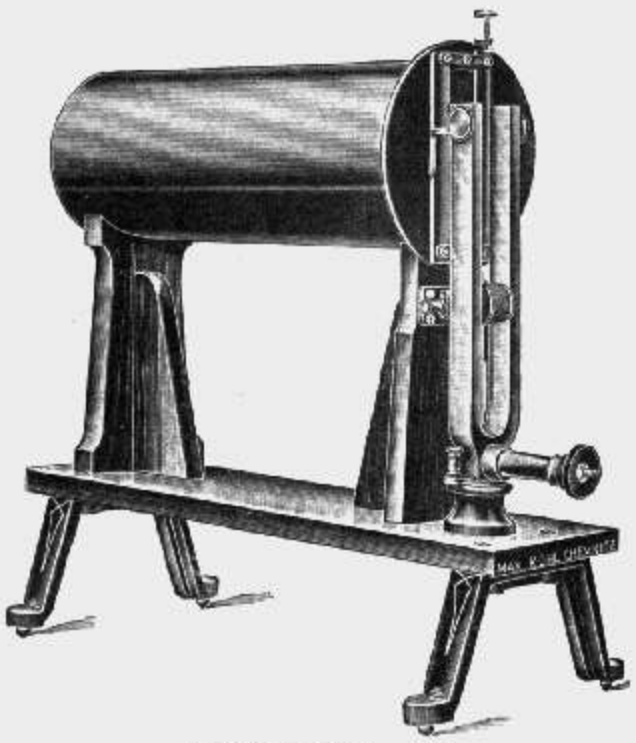
Cl. 3380, 1170, 1169, 1171.



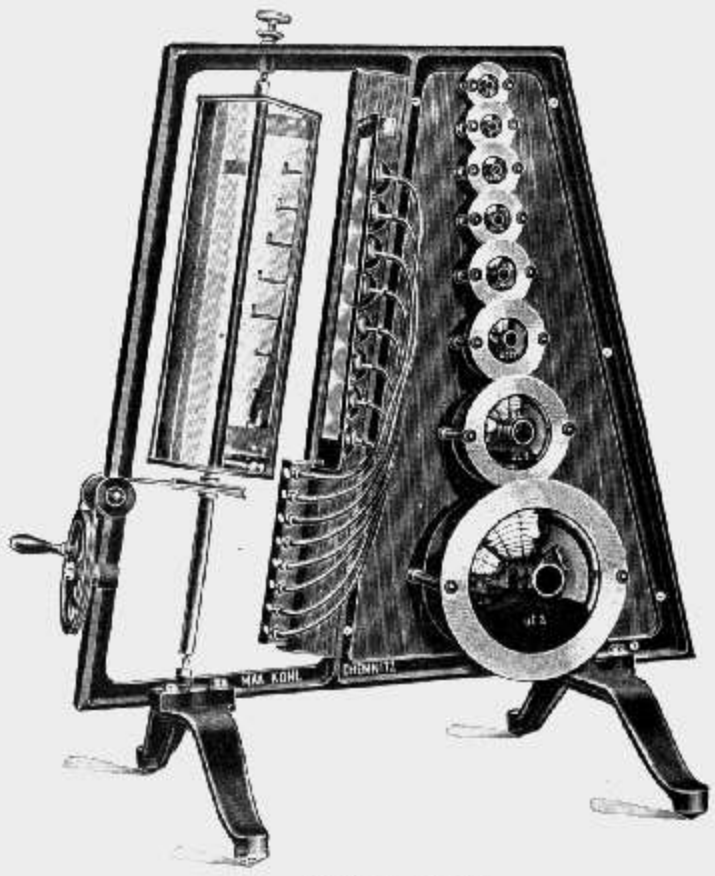
53 576. 2 : 5.



53 584. 1 : 18.



53 577 (53 578). 1 : 8.



53 583. 1 : 11.

	£ s. d.
53,576. **Vibration Microscope,** after Weinhold, Figure (W. D. Fig. 239 [225]); can be used at same time as a Töpler Vibroscope	6. 0. 0
* 53,577. **2 Massive Tuning Forks on Stand** for the tone $c_0 = 128$ compound vibrations ($ut_2 = 256$ v. s.); the pitch of one can be varied by filling with mercury; both with steel mirror and large resonator, Figure (Pogg. Ann. d. Phys. u. Chemie, Vol. 157, 1876, p. 621), for producing any phase differences and impact tones, also for Lissajous's Figures . . .	27. 10. 0
One of the two tuning forks has both limbs bored out and is provided at the yoke with a screw press by means of which mercury can be forced into the limb. In this manner the frequency can be altered by 8 compound vibrations (= 16 v. s.). The resonator of each fork is provided with a gap which can be increased or decreased by means of a screw so as to suit its tone to that of the fork. The forks have electro-magnetic drive.	
53,578. **Variable Tuning Fork $c_0 = 128$** compound vibrations **alone** ($ut_2 = 256$ v. s.), Figure, on stand and with variable resonator	19. 5. 0
53,579. **2 Tuning Forks with Resonators,** same pattern as No. 53,577, but **smaller,** for the tone $c_1 = 256$ compound vibrations ($ut_3 = 512$ v. s.)	21. 0. 0
53,580. **Variable Tuning Fork $c_1 = 256$** compound vibrations ($ut_3 = 512$ v. s.), **alone,** on stand with variable resonator	15. 10. 0

* Can be used with the Projection Apparatus.

Cl. 1172, 5814, 1173, 3381.

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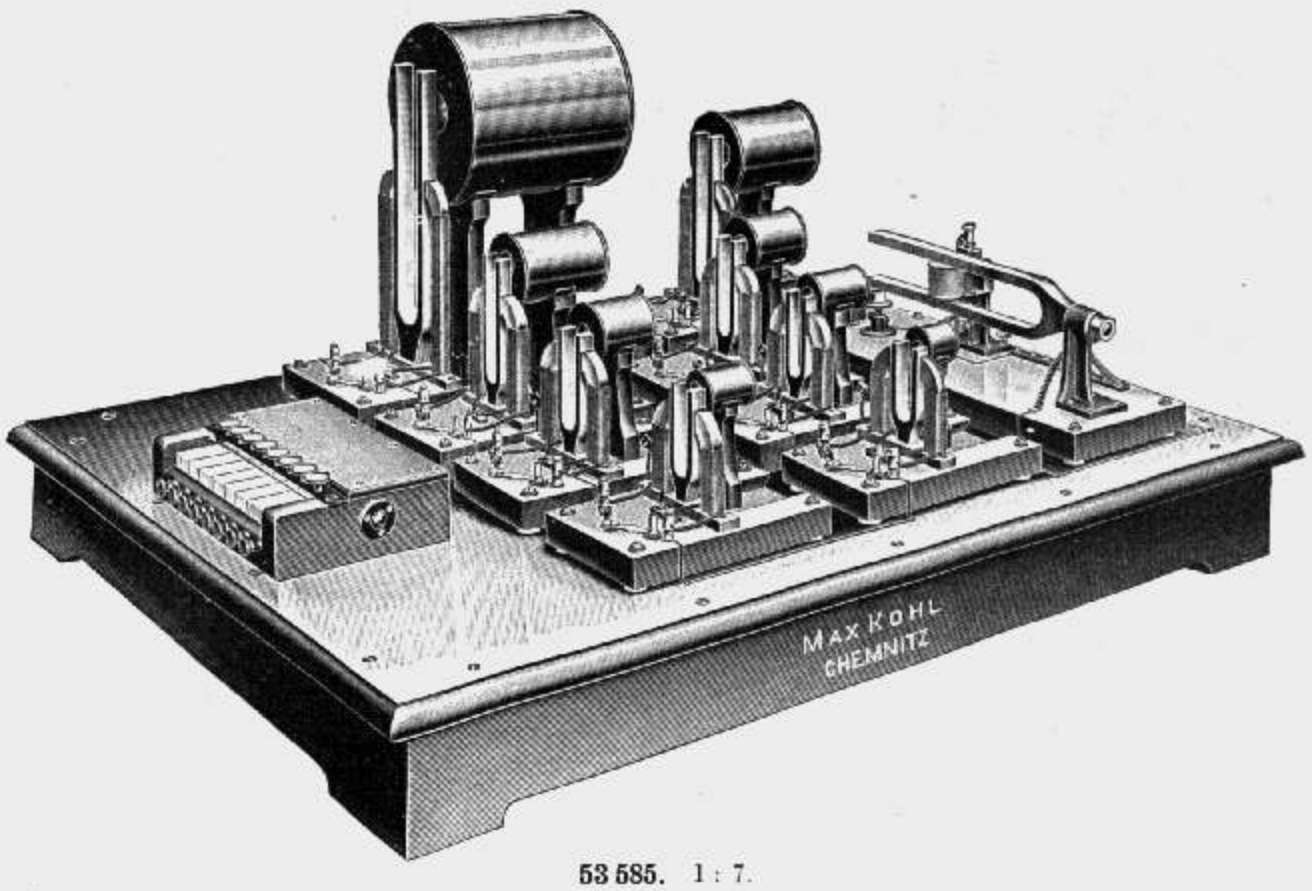

53 585. 1 : 7.

	£	s.	d.
53,581. **2 Tuning Forks with Resonators,** same pattern as No. 53,577, for tone $g_0 = 192$ compound vibrations ($sol_2 = 384$ v. s.)	25.	0.	0
53,582. **Variable Tuning Fork** $g_0 = 192$ compound vibrations ($sol_2 = 384$ v. s.) **alone,** on stand and with variable resonator	18.	0.	0
53,583. **Sound Analysis Apparatus** after König, Figure, for fundamental tone $c_0 = 128$ compound vibrations ($ut_2 = 256$ v. s.), with **8 spherical Resonators** for tones c_0, c_1, g_1, c_2, e_2, g_2, 7, c_3 (ut_2, ut_3, sol_3, ut_4, mi_4, sol_4, 7, ut_5), and 8 gas-flame manometers, on stand with rotating mirror (M. P. 1, Fig. 822 [847])	15.	0.	0
53,283. **Reed Pipe with Sound Horn,** Figure 53,282, p. 429, fitting above apparatus, for tone $c_0 = 128$ compound vibrations ($ut_2 = 256$ v. s.), very full tone	1.	6.	0
53,584. **Sound Analysis Apparatus** after König, **larger,** Figure, with **arbitrary fundamental tone and 14 Universal Resonators** (see No. 53,518), for the 46 tones $g_{-1} = 96$ to $e_3 = 1280$ compound vibrations ($sol_1 = 192$ to $mi_3 = 2560$ v. s.); lowest arbitrary fundamental tones g_{-2} (sol_{-1}) (Pogg. Ann. 146, p. 189)	30.	0.	0

The apparatus is built into a massive frame and is provided with hand-driven rotating mirror the mechanism of which is so arranged as to run absolutely silently. The 14 Universal Resonators can be regulated in such manner that the highest tone of the larger always reaches the deepest tone of the smaller. They can therefore be set for any fundamental tone. The deepest arbitrary fundamental tone is $g_{-2} = 48$ compound vibrations ($sol_{-1} = 96$ v. s.). The resonators are connected with manometric flames. The latter are protected from air currents by mica strips, which entirely obviate any breaking or spurting of the flame.

For suitable Reed Pipe see No. 53,282, p. 429.

53,339. **14 Tuning Forks on Resonance Boxes,** Figure 53,339 on p. 437, giving the first 14 overtones of $c_{-1} = 64$ compound vibrations ($ut_1 = 128$ v. s.), for comparing with the resonators	17.	10.	0
53,585. **Vowel Apparatus** after von Helmholtz, with **8 harmonic tones,** Figure, for demonstrating sounds of different timbre, and more especially the vowels of the human voice (H. Helmholtz, Die Lehre von den Tonempfindungen, 4th Edn., Brunswick, 1877, pp. 194 et seq.)	60.	0.	0

The apparatus consists of 8 tuning forks forming the first harmonic tones of the fundamental tone c_0 (ut_2) and which are fixed between electromagnets. The electromagnets are traversed by a current rendered intermittent by an interrupting tuning fork making 128 compound vibrations (256 v. s.). Each tuning fork possesses a resonator which can be closed by a flap; the resonators can be opened more or less by means of a keyboard. When the resonators are closed the tuning forks are scarcely audible, but they sound immediately with the desired intensity when the corresponding keys on the keyboard are depressed. The interrupter circuit can be regulated by a resistance appended to the apparatus. The point of interruption itself is provided with massive platinum contact. Each electromagnet can be cut out singly; by using corresponding additional resistance it is possible to obviate any variations in the current conditions.

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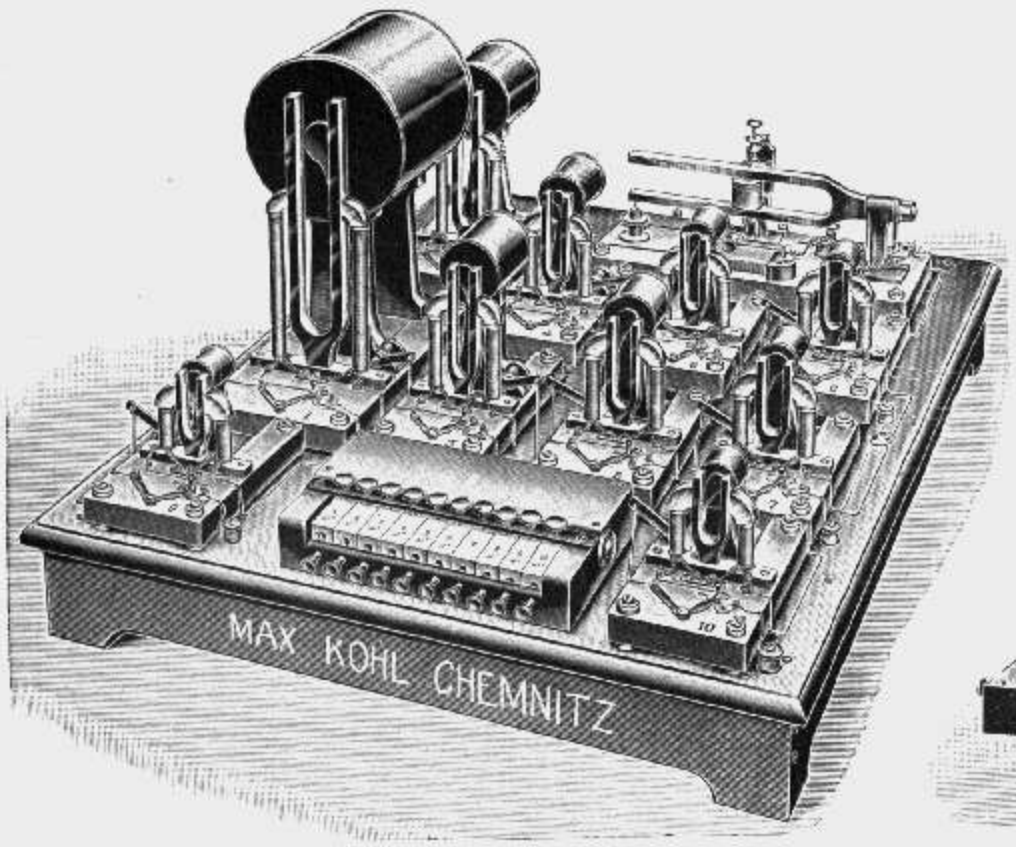
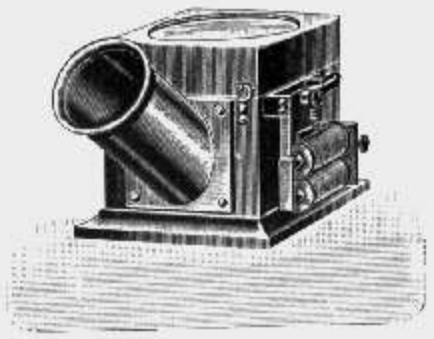
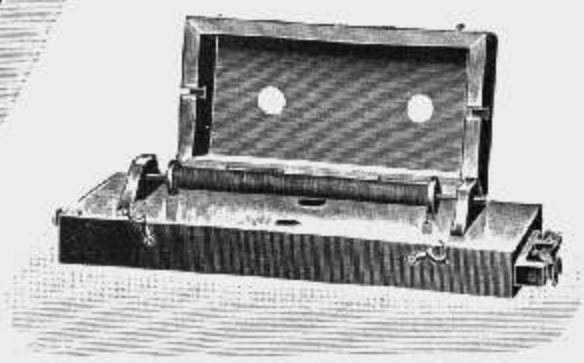


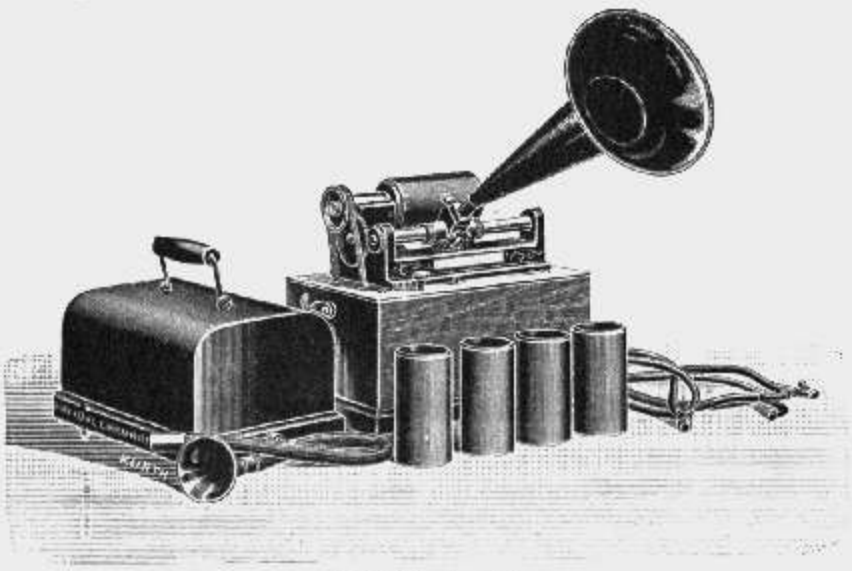
53 586. 1 : 8.



53 587 A. 1 : 4.



53 587 B. 1 : 4.



53 588. 1 : 10.



53 589. 1 : 10.

53,586. **Vowel Apparatus** after von Helmholtz, as No. 53,585, but **larger.** Figure, with **10 harmonic tones** . . . . . £ s. d. 70. 0. 0

53,587. **Telephone** after Ph. Reis, consisting of transmitter (Fig. 53,587 A) and receiver (Fig. 53,587 B) 4. 0. 0

Between the transmitter and receiver — called by Reis himself the reproducing apparatus — a battery is so inserted that both are traversed in series by the current. The strength of the current should be such that the armature of the small magnet on the transmitter is attracted; 3 to 4 Bunsen cells or accumulators are sufficient for the purpose according to the distance between both stations.

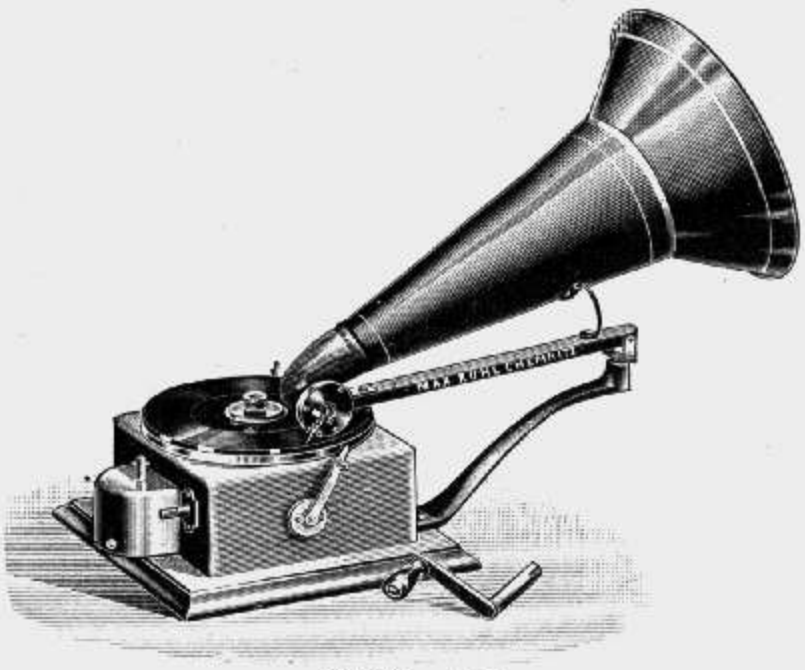
Further Telephones see Section "**Electricity**".

53,588. **Large Edison Phonograph for Wax Cylinders,** Figure, with recorder and reproducer for speeches, musical selections, etc., with clockwork in base, with one recording and one reproducing membrane, and one sound horn 6. 2. 0

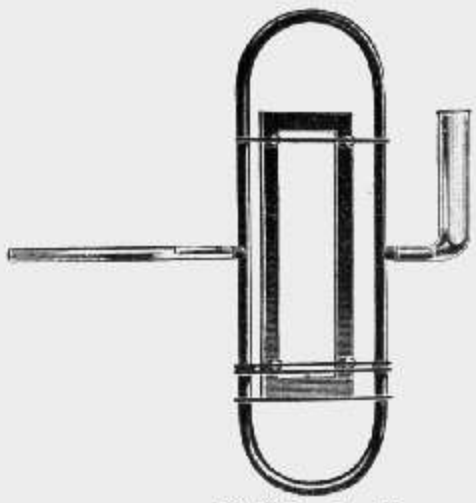
Given in with the phonograph are 1 blank record and 1 record with musical selection. The apparatus can be set into action without any previous knowledge or special skill, both for recording and reproducing speeches, songs, etc. The reproduction is so loud that it is possible to hear each word plainly, even in songs, in a large room 10 × 10 m. Each cylinder can be used many hundreds of times.

Cl. 1177, 3671, 1178, 1179, 4542.

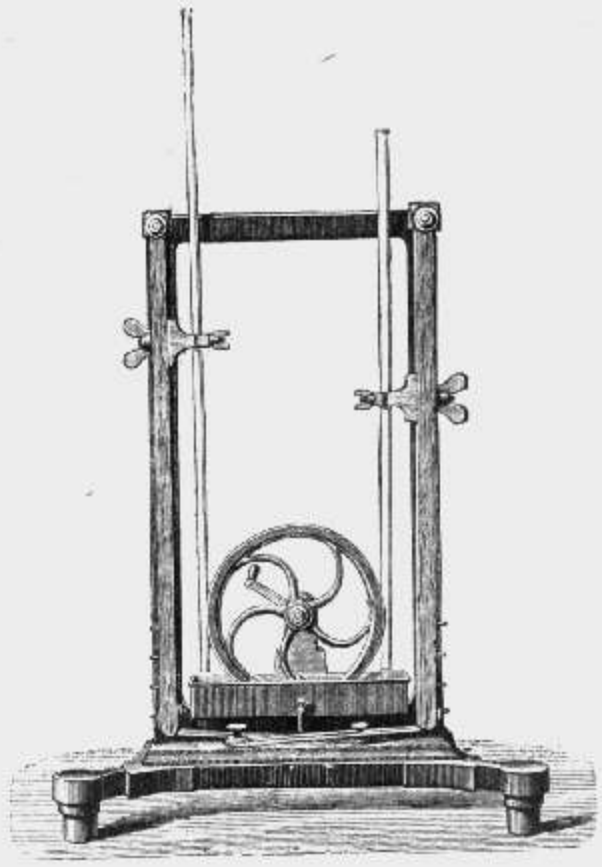
Max Kohl A. G. Chemnitz, Germany.



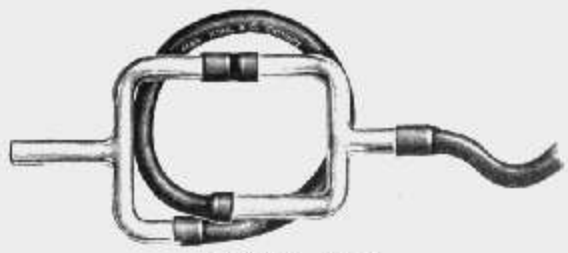
53 592. 1 : 7.



53 595. 1 : 11.



53 594. 1 : 11.



53 597. 1 : 5.

	£ s. d.
53,589. **Small Edison Phonograph,** similar in construction to preceding, Figure, with open clockwork, with one recording and one reproducing membrane, one sound horn, with oak containing case	3. 2.0
53,590. **Wax Cylinder,** suitable for above phonographs, blank	0. 1.0
53,591. — idem, with music, speech or song	0. 1.0
53,592. **Gramophone with Clockwork,** Figure, for reproducing instrumental music, songs and speeches	6. 0.0
53,593. **Ebonite Disc,** suitable for above Gramophone, with instrumental music, song or speech, as desired	0. 3.0
Telegraphone after Paulson: see section on **"Electricity".**	
53,594. **Tone Impact Apparatus** after König, Figure	20. 0.0

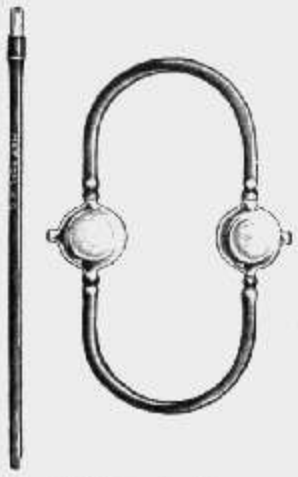
The apparatus has an iron frame upon which a wheel covered with cloth can move. Four clamps can be moved on two movable spring arms, these clamps taking glass tubes. These bars are clamped on the cloth covered wheel; and as soon as the wheel, whose lower part is immersed in water, is set into motion, impact tones of high intensity occur (Wied. Ann. **12**, p. 351, 1881).

53,595. **Sound Interference Tube,** Figure (W. D. Figs. 253, 254 [239, 240]), of metal, with adjustable closing bows	1. 10.0

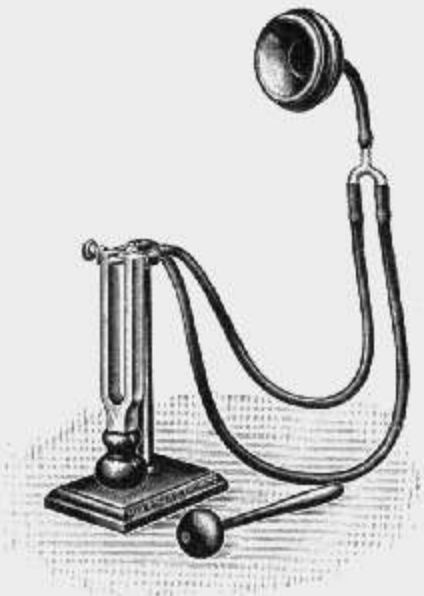
The apparatus should be used with the exciter rod and the clamps of the Kundt Dust Figure Apparatus No. 53,315. If this apparatus is not available, No. 53,596 should be ordered.

53,596. — idem, with Dust Figure Exciter Tube, for the tone $a_1 = 435$ compound vibrations ($la_3 = 870$ v. s.)	2. 5.0
53,597. — idem, after Quincke, Figure, of glass with rubber tubing (M. P. I, Fig. 789 [813])	0. 5.0
53,598. — idem, after Nörrenberg (M. P. I, Fig. 788 [812]), of wood, for building into a wall	0. 18.0

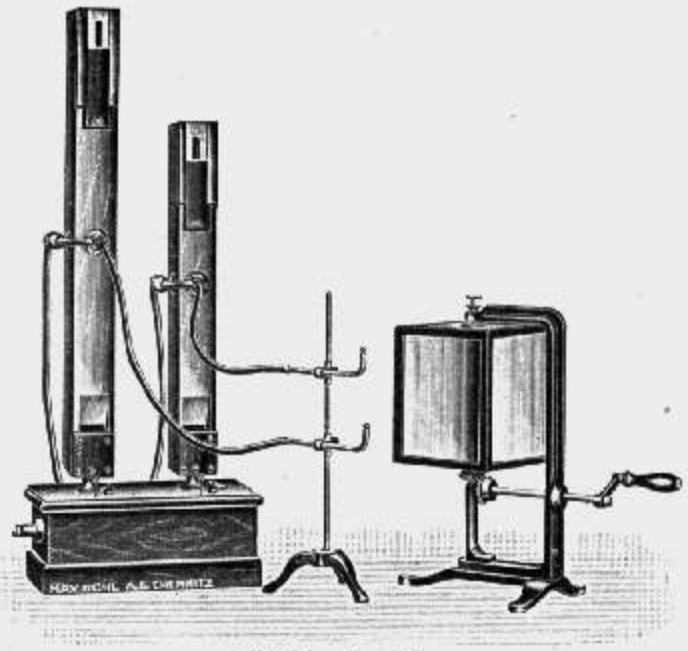
Cl. 1181, 5176, 1182, 5548.



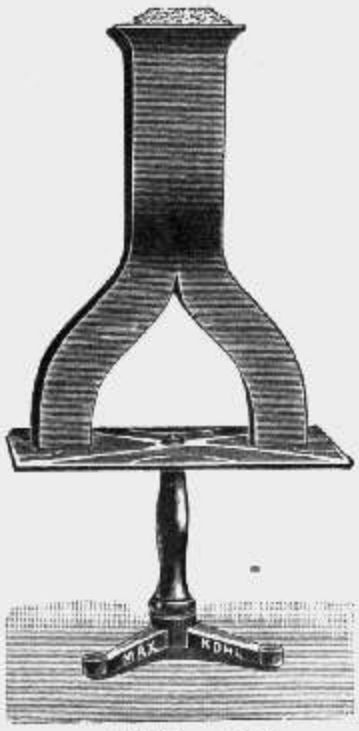
53 599. 1 : 8.



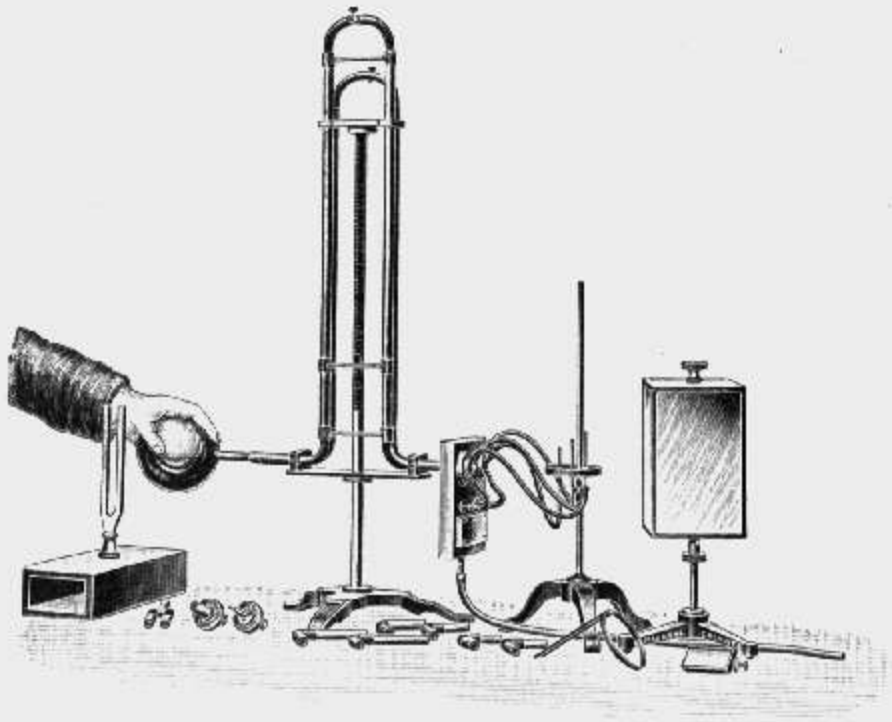
53 600. 1 : 5.



53 601. 1 : 10.



53 602. 1 : 7.



53 603, 53 339, 53 517, 53 298. 1 : 12.

53,599. **Sound Interference Apparatus** after Drenteln, Figure, consisting of two tuned glass resonators with three attachments, two india-rubber tubes each 35 cm long, and one ditto 70 cm long (Ztschr. f. d. phys. u. chem. U., **7**, p. 273) . . . . . £ 0. 6. 0

The glass cylinder with blowing tube and small lamp No. 53,459 should be used in conjunction with this apparatus.

53,600. **Sound Interference Apparatus with Tuning Fork and Receiver Membrane,** Figure, with two indiarubber tubes and drum-stick (Fr. phys. Techn. II, 2, Fig. 3088) . . . 0. 18. 0

53,601. **Apparatus for Comparing Two Tones of Pipes** by König's Manometric Flame Method, Figure (Pogg. Ann. **146,** 1872, p. 166) 10. 0. 0

The apparatus consists of a wind chest with two valves, 5 pipes (c_1, c_1, e_1, g_1, c_2 [ut_3, ut_3, mi_3, sol_3, ut_4]), 1 stand for 2 manometer flames and a rotating mirror on stand No. 61,490.

53,602. **Fork-shaped Tube,** Figure (M. P. I, Fig. 787 [811]), **for demonstrating the interference of sound waves** by the aid of Chladni's Sound Figure Disc.

Price without Sound Figure Disc 0. 15. 0

53,603. **Sound Interference Apparatus** after König, Figure, with three manometer flames and one small mirror (cf. Pogg. Ann. 1872, Vol. 146, p. 195) 11. 0. 0

The apparatus consists of a stand with tube, the latter being divided at the ends into two arms, one of which can be lengthened at will, and a stand with three gas flame manometers. If the innermost gas flame is replaced by a small mirror the upper edge of which reaches to half the height of the gas flame,

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53 604. 1 : 7.



53 605. 1 : 6.



53 608. 1 : 5.

and the eye is directed in such manner that the directly visible upper part of the one flame appears to form the direct continuation of the reflected lower part of the other flame, the image is not disturbed when the tubes of the apparatus are of the same length. If, however, the tube lengths are not equal, phase differences occur between the two flames and the two visible halves will appear to be laterally displaced relatively to each other. Tuning fork, resonator and rotating mirror on base are not included in the price. £ s. d.

51,730. **Spark Chronograph** after v. Beetz, Figure 51,730, p. 249 . . . . . 7. 10. 0

53,604. **Tuning Fork Clock** after Niaudet, Figure, with tuning fork making 64 compound vibrations (128 v. s.) (Kœnig, Quelques expériences d'acoustique, p. 173) 48. 0. 0

For very accurate determinations of the frequencies of standard forks by comparing the tuning fork clock with a standard clock at different temperatures. The fork is set into vibration and replaces the pendulum of the clock in that it regulates the motion of the clock by means of the escapement; the clock can be also used as a **Vibration Microscope.**

53,605. **Phonic Wheel** after La Cour, Figure, for accurately determining the frequencies of tuning forks and for similar purposes 7. 10. 0

A toothed armature with 20 teeth moves in front of the poles of a horse-shoe shaped multipolar electromagnet. The electromagnet is periodically excited by means of a tuning fork with electromagnetic drive, which opens and closes the circuit. The axis is provided with a counting mechanism which permits of the number of rotations being read off. Exhaustive information as to the manipulation and method of employing the Phonic Wheel may be found in the original work: „Das phonische Rad von Paul La Cour", published by Quandt and Händel, Leipsig, 1880.

The phonic wheel can be driven with a fork making up to 128 compound vibrations (256 v. s.).

53,606. **Tuning fork for above,** $c_0 = 128$ compound vibrations ($ut_2 = 256$ v. s.), with electromagnetic drive for maintaining the vibrations 4. 10. 0

Mechanical Effects of Sound.

53,607. **Acoustic Apparatus** after Dvořák (Ztschr. f. d. phys. u. chem. U., **6**, p. 186), being a selection from the individual apparatus, Nos. 53,608—53,610 and 53,613—53,623, listed below 5. 17. 0

The smaller apparatus are placed in a containing box.

The Figure Nos. in brackets relate to Dvořák's article (loc. cit.).

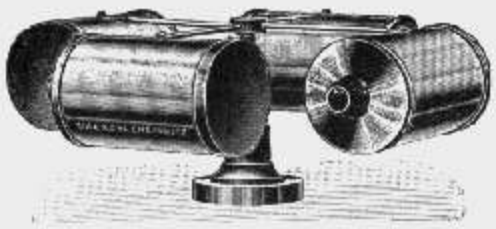
The experiments are very interesting.

53,608. **Device for Acoustic Attraction and Repulsion,** Figure (Fig. 1) 0. 3. 0

53,609. **Device for Acoustic Attraction and Repulsion for Gases** which are lighter than Air (Fig. 2) 0. 3. 6



53 610. 1 : 5.



53 612. 1 : 3.



53 615 and 53 617. 1 : 5.



53 619. 1 : 5.

	£ s. d.
53,610. **Acoustic Reaction Wheel.** Figure (Fig. 5), tuned to the tone g_1 (sol_3), with glass resonators, without glass vessel	0. 6. 0
53,611. — idem, tuned to g_1 (sol_3), with **spherical Aluminium Resonators**	1. 0. 0
53,612. — idem, tuned to c_2 (ut_4), Figure, consisting of 4 aluminium Resonators joined by a light aluminium cross-piece, on stand	1. 16. 0
A tuning fork c_2 (ut_4) with resonance box is necessary for working this apparatus.	
53,613. **Resonator with 4 Apertures** (Fig. 4)	0. 7. 0
53,614. **Glass Cylinder for the Acoustic Reaction Wheel** (Fig. 5)	0. 4. 0
53,615. **Stand with Steel Pivot** for setting up the rotating bodies, Figure, adjustable	0. 4. 0
53,616. **Reed Pipe** (Fig. 7)	1. 4. 0
The horn without reed, No. 53,622, is inserted into the aperture of the same.	
53,617. **Small Paper Wheel (Wind Wheel)**, Figure (Fig. 8)	0. 2. 6
53,618. **Glass Resonator**, arranged to float (Fig. 3)	0. 6. 0
53,619. **Resonator for Tone g_1** (sol_3) with stand, Figure (Fig. 8)	0. 10. 0
53,620. **Massive Tuning Fork g_1** (sol_3), with resonance box	1. 2. 0
53,621. **Sound Radiometer**, consisting of four perforated sheets of paper fixed on a wood cross (Ztschr. f. Instrumentenkunde, **3**, 1883, p. 130)	0. 6. 0
53,284. **Horn, with Reed, g_1** (sol_3) (Fig. 6), see Figure 53,284, p. 429	0. 4. 0
53,622. **Horn without Reed, g_1** (sol_3) (p. 186 and Fig. 6)	0. 3. 0
53,623. **Phonometer** (cf. Fig. 9), on stand and with tilting board	0. 12. 0

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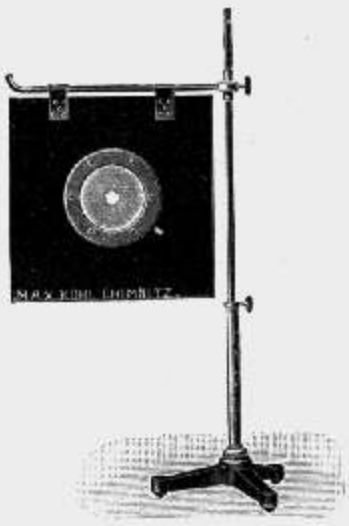
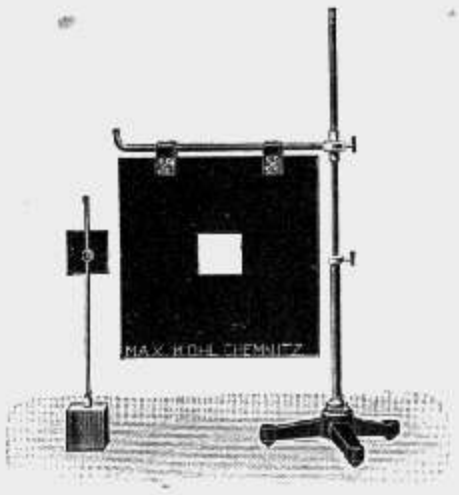
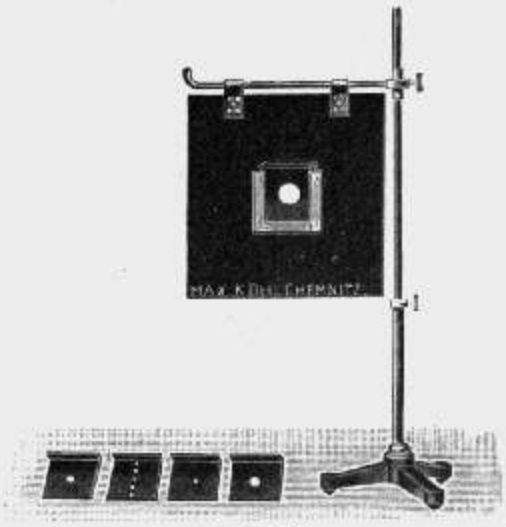


53 624 A.



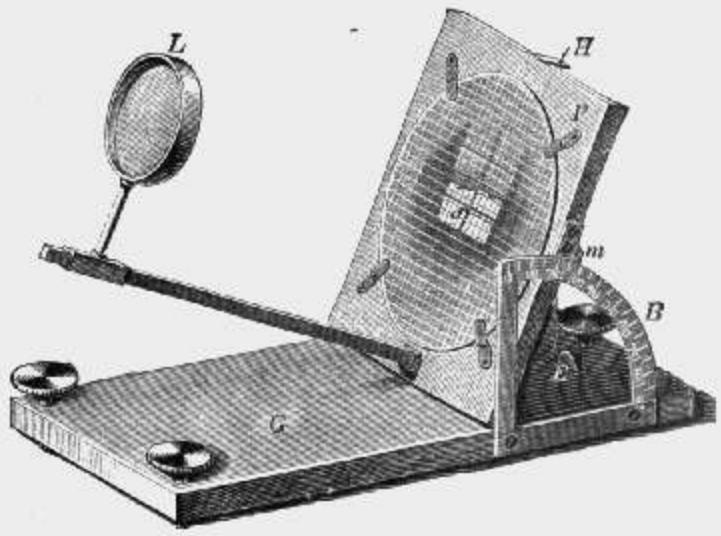
53 624 B.



53 624 C.



53 626. 1 : 11.



53 629. 1 : 2.

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Optics.

Propagation and Intensity of Light.

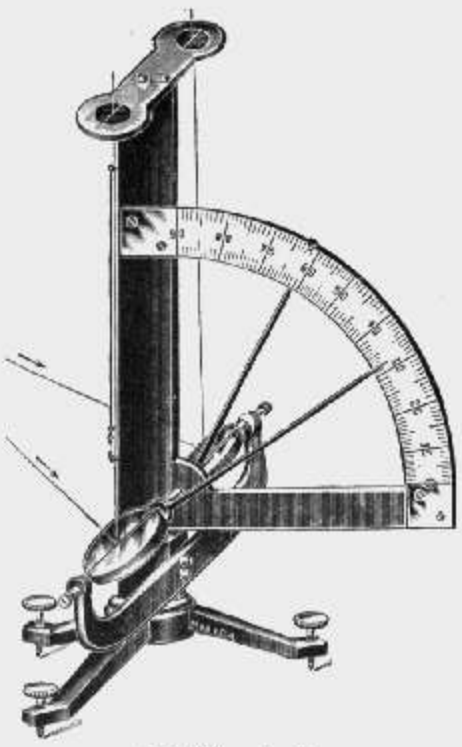
	£ s. d.
53,624. **1 Photometer Screen,** Fig. A; 1 white screen with centimetre net, 1 screen with square centre-piece cut away, Fig. B; 1 screen with 5 diaphragms for inserting, Fig. C; 2 dull white screens, of metal, with eyes for hanging and with 3 stands (M. T., p. 167 and Fig. 121)	3. 0. 0
51,028. **Projection Screen** with Stand for raising and lowering (M. T., Fig. 122)	0. 16. 0
53,625. **Sal-ammoniac Vapour Apparatus** (M. T., Fig. 123)	0. 3. 0
53,626. **Apparatus for Demonstrating the Rectilinear Propagation of Light,** Figure (W. D., Fig. 260 [246])	0. 16. 0

The apparatus consists of a paper screen on metal stand, a large pasteboard diaphragm screen, and a stand (see above figure) with three small paraffin lamps, arranged triangularly.

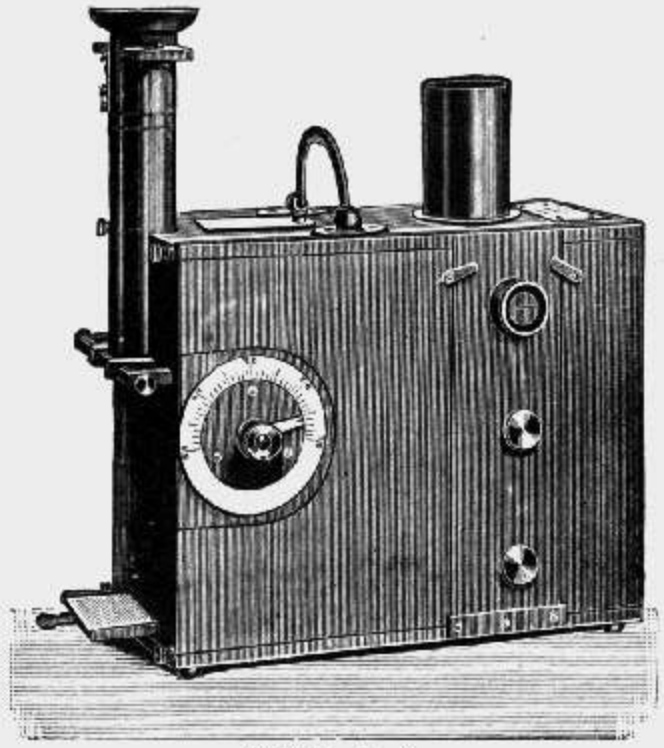
Measurement of the Velocity of Light after Fizeau and Foucault. Cf. Auxiliary Apparatus to Rosenberg's Universal Optical Apparatus No. 53,866.

53,627. **Apparatus** after Grimsehl **for Determining the Ratio of the Velocity of Light in Air and Water** (Phys. Ztschr. **7**, 1906, p. 472, Fig. 1)	2. 5. 0
53,628. — idem, for **air** and **glass** (Phys. Ztschr. **7**, 1906, p. 473, Fig. 2)	1. 16. 0
53,629. **Light-Angle-Measurer** after Weber, Figure, for determining the luminosity of places (Ztschr. für Instrumentenkunde **4**, 1884, p. 343), can be folded up	4. 10. 0

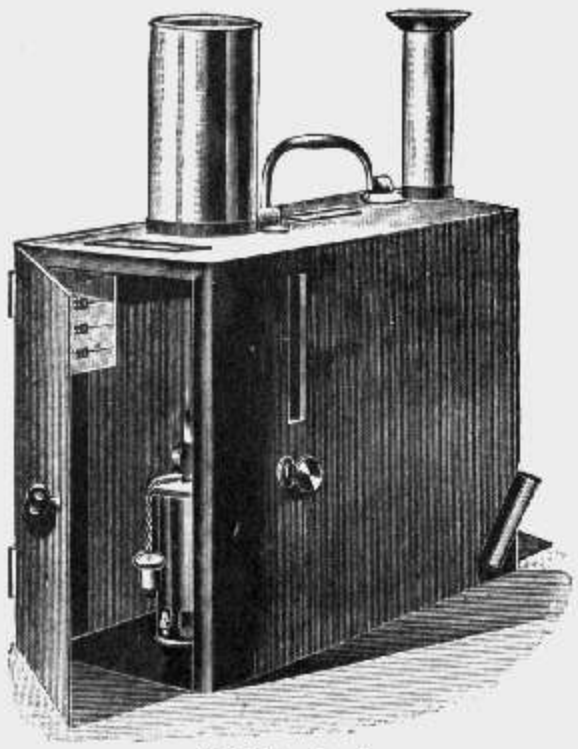
This apparatus is used for measuring the angle from which the open sky is visible from the place being investigated, and the angle of elevation at which the light falls upon the place.



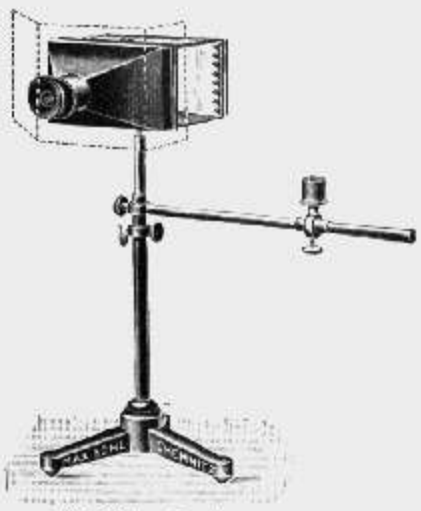
53 630. 1 : 3.



53 631. 1 : 5



53 633. 1 : 6.



53 637. 1 : 4.



53 639. 1 : 8.

53,630. **Aperture Goniometer** after Gotschlich, Figure, for the same purpose, giving simultaneously the upper and central angle of incidence . . . . . £ 2. 4.0

The apparatus consists of a stand with graduated arc in the centre of which are two rotary mirrors. The axes of rotation of the mirrors are indicated by engraved lines. Two pointers are connected with the mirrors and show the predominating inclination on the graduated arc. By means of a spectacle-shaped sighting arrangement with fine threads a sight is taken of the mirror, which is adjusted in such manner that the engraved axis of the one mirror falls in a line with the upper edge of the window, while the axis of the other is made to coincide with the ridge of the opposite house. The portion of the arc situated between the two pointers is equal to half the angle of aperture.

53,631. **Photometer** after Wingen, Figure, for directly determining the luminosity of workplaces in metric candles (range 10—50 metric candles) 2. 0.0

The area to be investigated is compared by observing with a red glass with a rotary surface inside the apparatus, this latter surface being illuminated by a small benzene lamp, the height of flame of which can be regulated. By rotating the comparison area relatively to this lamp, an external pointer is actuated, and permits the luminous value of the area investigated to be read off on a scale direct in metric candles.

53,632. **Carrying Case** for above, lock-up, with handle 0. 10. 0

Cl. 1205, 5930, 5929, 3672, 1209.

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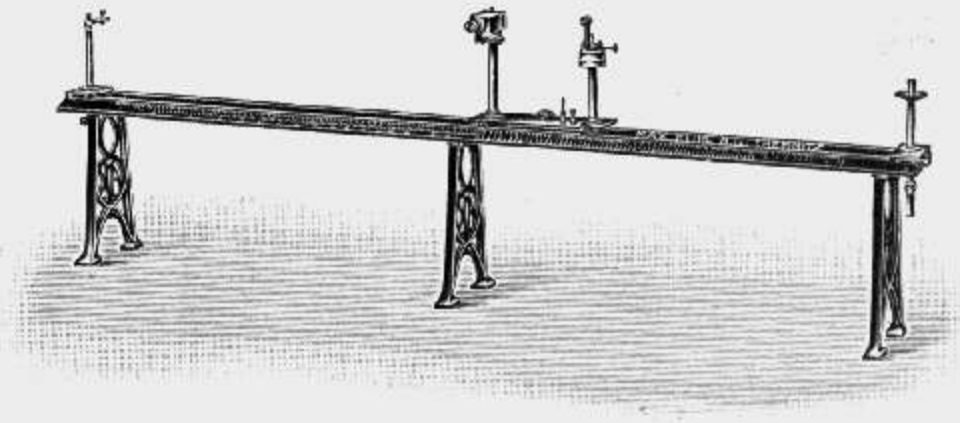
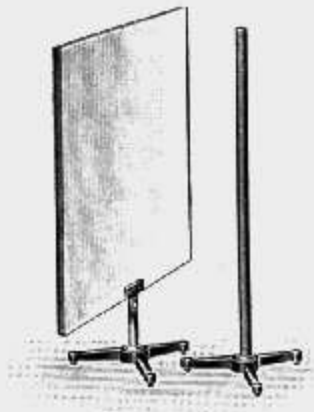
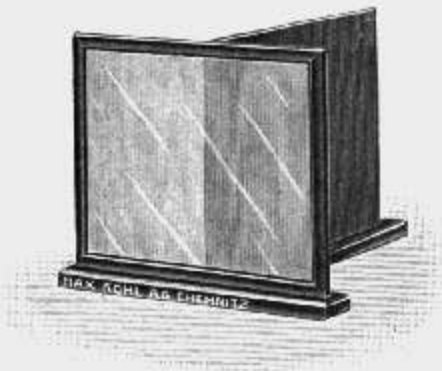


53 640. 1 : 2,5.



53 643. 1 : 12.



53 644. 1 : 15.

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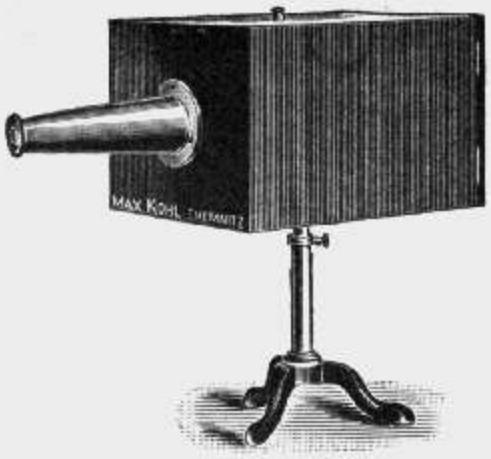
	£ s. d.
53,633. **Photometer** after Wingen, for determining intrinsic brilliancy, Figure; **benzene lamp with optical flame measuring apparatus** after Krüss, for a range of 1—500 metric candles	4. 0. 0
This photometer is constructed on the same principle as the preceding apparatus, but admits of more accurate and extensive measurements.	
53,634. — idem, with **Hefner Lamp**	10. 10. 0
53,635. **3 Demonstration Photometers** after Lambert (Rumford), Ritchie and Bunsen, modified by Kolbe (Ztschr. f. d. phys. u. chem. U. **1**, 1887—88, p. 193), without optical bench, together	3. 5. 0
53,636. **Photometer Screen** after Töpler, on stand	0. 12. 0
53,637. **Photometer** after Bunsen, Figure (cf. W. u. E. phys. Prakt., p. 231, Fig. 130), with house, on stand	1. 10. 0
The photometer corresponds to that used in practice. The grease-spot screen is enclosed, along with two tilted mirrors, in a sheet iron box open at both sides; to the side of this is the adjustable candle holder.	
53,638. — idem, with **tape measure,** for determining the distance of the source of light to be measured from the photometer	1. 16. 0
53,639. **Photometer** after Bunsen, Figure, with divided circle and rotary photometer house, to enable measurements to be made upon light sources from various angles .	3. 0. 0
53,640. **Standard Photometer Bench,** Figure, for testing gas flames, with two graduations, which give the candle power direct, with **Photometer Head** after Bunsen, cf. No. 53,637	10. 10. 0
The bench is constructed of iron and is 2,50 m long; the one graduation enables readings to be taken when the distance between Hefner lamp and photometer screen is invariable, i. e. when the lamp is on the carriage; the other graduation corresponds to the case of both luminous sources permanently set up on the ends of the bench.	
53,641. — idem, with Lummer-Brodhun **Photometer Head,** cf. No. 53,653, for setting at **Equality**	15. 10. 0
53,642. — idem, for setting at **Equality** and **Contrast;** for the most accurate measurements	17. 0. 0
53,643. **Photometer** after Rumford (W. D., Fig. 261 [247]), Figure, with 2 rules . . .	0. 10. 0
53,644. **Photometer** after Bouguer, Figure, for measuring luminous intensity by comparing two adjacent illuminated surfaces, with 2 rules	1. 4. 0

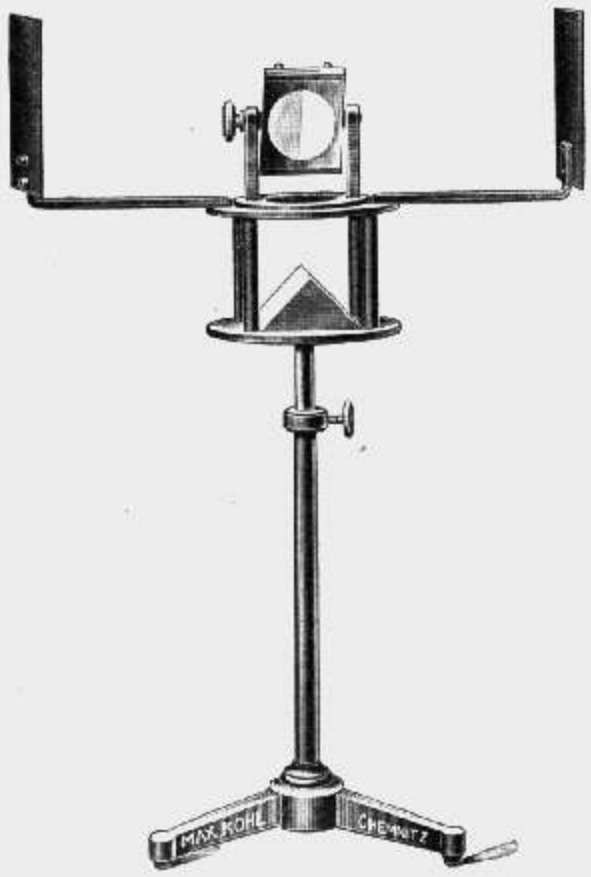
Regarding Apparatus for Testing Illuminating Gas for its sulphuretted-hydrogen content (also self-recording), its ammonia and carbonmonoxide and for testing the specific gravity, etc., kindly ask for **quotations.** Cl. 6040, 5999, 6034. 30*



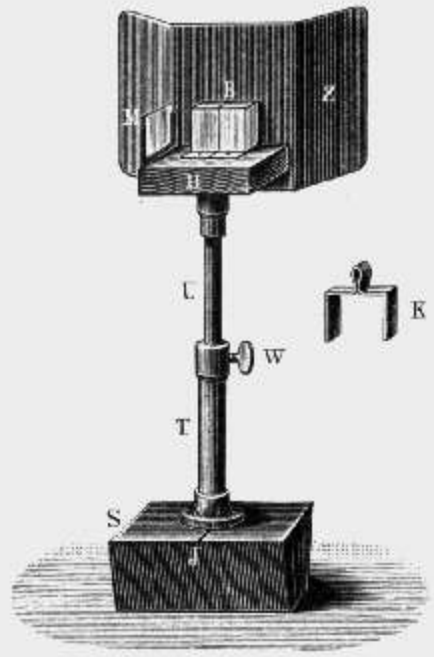
53 645. 1 : 9.



53 646. 1 : 10.



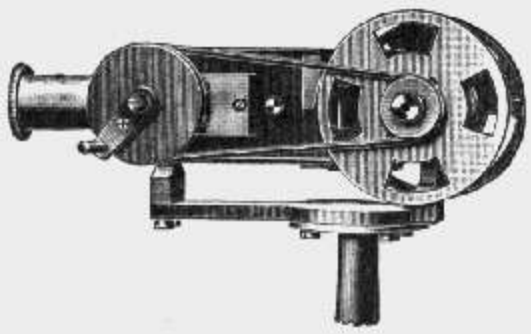
53 647. 1 : 5.



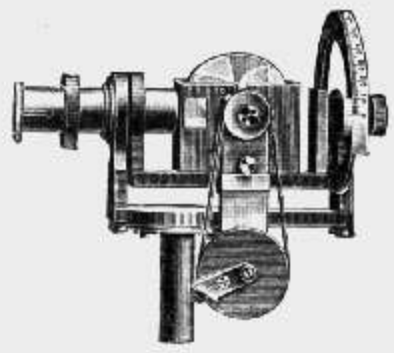
53 648. 1 : 7.



53 649. 1 : 4.



53 650. 1 : 2.



53 651. 1 : 2.

	£	s.	d.
53,645. **Photometer** after Foucault, Figure (Chwolson II, Fig. 350), with observing tube	2.	8.	0
In this photometer the screen is formed by a glass plate covered with dry milk, this arrangement being very sensitive.			
53,646. **Photometer** after Ritchie, Figure (Fr. phys. Techn. II, 2, Fig. 3379 [II, Fig. 693])	1.	4.	0
In this apparatus observations are taken on two white surfaces inclined towards each other.			
53,647. **Demonstration Photometer** after Ritchie-Weinhold, arranged for objective demonstration, Figure (W. D., Fig. 263 [249])	1.	2.	0
53,648. **Diffusion Photometer** after Joly, Figure (W. u. E. phys. Prakt., Fig. 131) . .	2.	0.	0
The photometer consists of a screen, carrying in front of an aperture two small paraffin blocks with the plane surfaces pressed on each other. The paraffin blocks appear equally bright when illuminated to the same intensity and the partition joint disappears entirely. Absorption glasses can be inserted at M.			
53,649. **Photometer** after Wheatstone, Figure (Gan.-Rein., Figs. 484 [485])	1.	16.	0
The apparatus consists of a spherical mirror moved in a curve by means of a set of wheels. The luminous sources to be compared are reflected in the small mirror as two luminous points, which shine as two curviform images of different brilliancy when the mirror is rotated and when the illumination is unequal.			

Cl. 1212, 1213, 1210, 1211, 1214, 5931, 5932.

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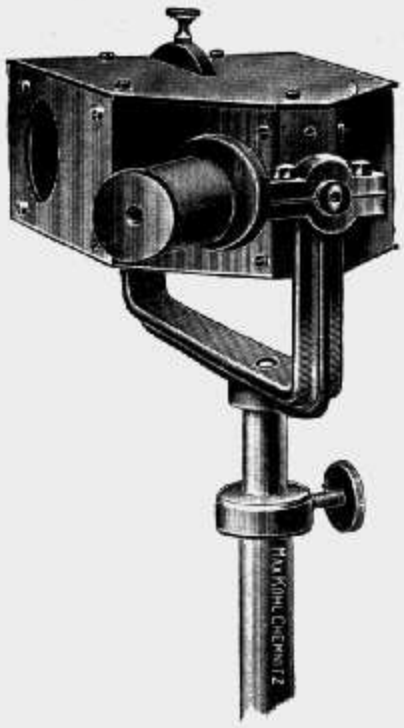
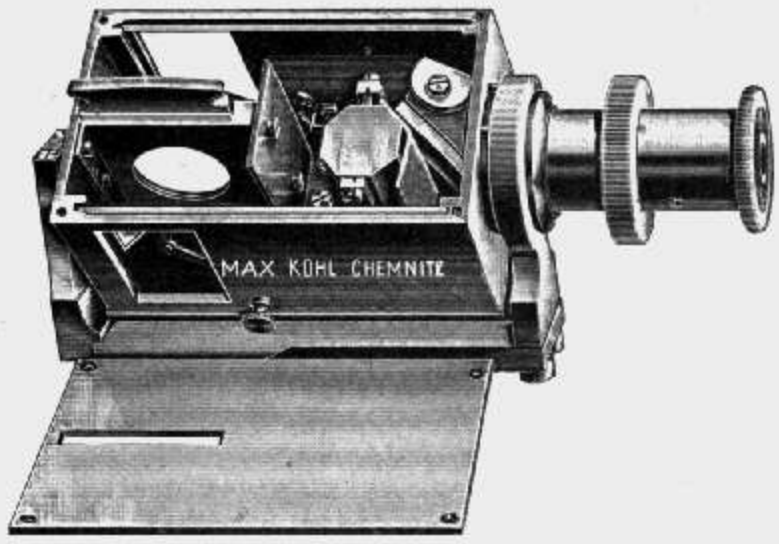
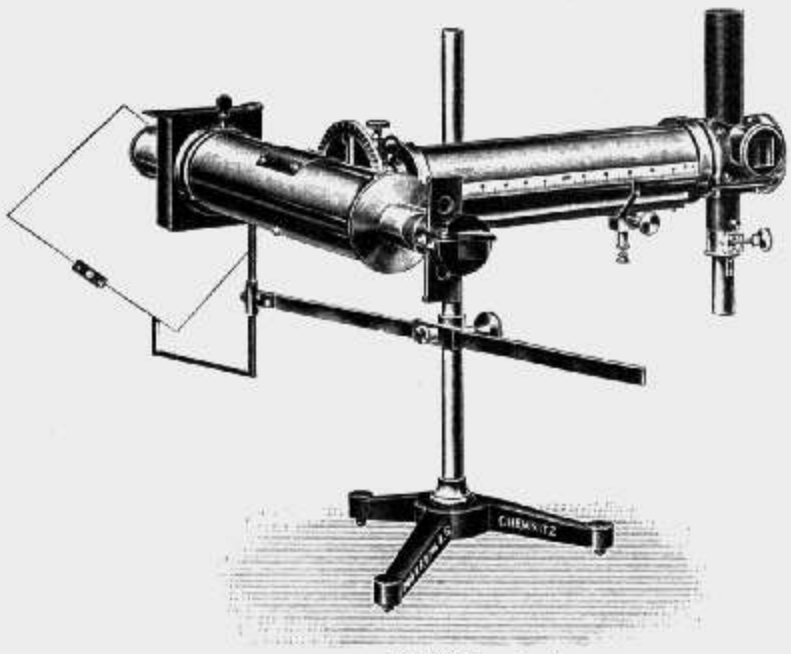


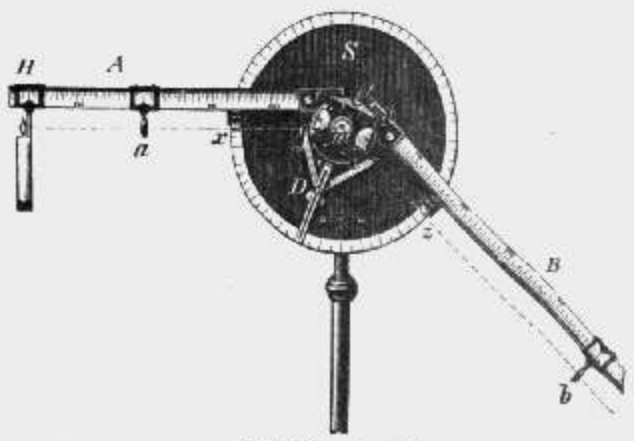
53652. 1 : 2.



53653. 2 : 5.



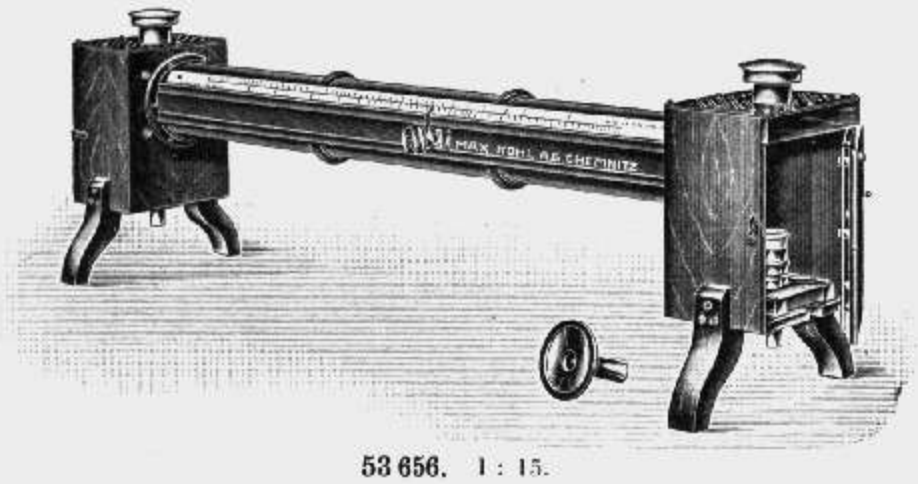
53654. 1 : 9.



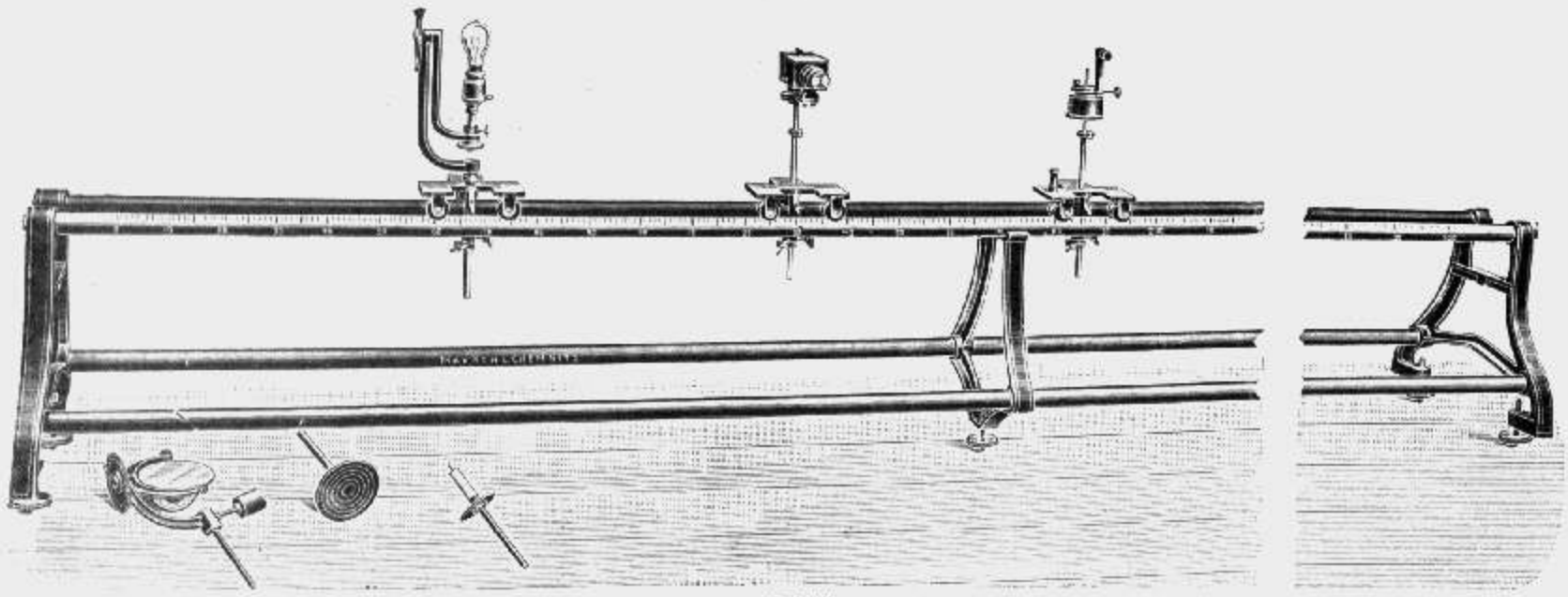
53655. 1 : 14.

	£ s. d.
53,650. **Flicker Photometer Head,** Figure, with sector disc	5. 0. 0
The Flicker Photometer is based on the fact that two illuminated surfaces coming alternately before the eye only show a flickering if differently illuminated.	
53,651. — idem, with **rotating flicker body,** Figure, with inclining device and degree graduation, for measurements from different directions	6. 15. 0
53,652. **Lummer-Brodhun Photometer Head,** with stand, Figure (Ztschr. für Instrumentenkunde **9**, 1899, p. 41)	5. 0. 0
53,653. — idem, for viewing perpendicular to the luminous sources, Figure	6. 5. 0
53,654. **Photometer** after Leonh. Weber, Figure, with complete accessories, in polished wood box	20. 0. 0
The photometer is based on the comparison of two illuminated ground discs, one of which is arranged so as to be movable in a horizontal tube; the tube perpendicular to the latter tube, and containing the other ground disc, contains a Lummer-Brodhun Cube, is arranged to rotate, and can be conveniently focussed on the luminous source to be investigated. A graduated arc permits the angle described to be read off. As comparison light source use is made of a small benzine lamp having a flame-height of 20 mm; the correct height can be read off on a scale pasted on plate glass, and can be adjusted by a rack.	
53,655. **Photometer** after Rousseau, Figure, for photometering arc lamps in various directions (Elektrot. Ztschr. **8**, 1887, p. 356)	9. 0. 0

Cl. 1216, 3385, 5442, 1219.



53 656. 1 : 15.



53 657. 1 : 16.

53,656. **Glow Lamp Photometer,** Figure, with comparison apparatus on Joly's principle, which permits of very sharp focussing . . . . . £ s. d. 7. 10. 0

The photometer is 1 m long and is arranged in such manner that the candle powers of glow lamps can be compared without a dark room, the ratio of intensity being read direct on a scale. The range extends in both directions from 1 to 10 times. The exchange of the glow lamps under test proceeds very rapidly. Calibrated glow lamps are used as standards. The apparatus is fitted with Edison Glow lamps sockets, but can be arranged for any other holder.

Comparison Glow Lamps — see Nos. 53,660—53,662.

53,657. **Large Photometer Bench,** 3 m long, Figure, with millimetre graduation, **3 Stands** on Carriage, fitted with Lummer-Brodhun **Photometer Head, Hefner Lamp, Candle Holder, Lamp Table, Photometry Stand** for glow lamps and a **Mirror** for determining the luminous intensity of arc lamps at various angles of emission 34. 0. 0

The photometer bench should be placed on a table of suitable height so that the graduations can be conveniently read off: see also No. 53,659.

53,658. **Angle Mirror** for photometering glow lamps in accordance with the Rules of the Verband Deutscher Elektrotechniker 1. 16. 0

53,659. **Portable Iron Table for the large Photometer Bench** No. 53,657, with **Rotary Switchboard** and **Regulating Resistance,** Figure. Price exclusive of measuring instruments, regulating resistance, and photometer bench 17. 0. 0

The switchboard carries 1 voltmeter, 1 ammeter, and 1 wattmeter, also the requisite plug-contacts. The regulating resistance can also be manipulated from the farthest end of the bench. The prices of the measuring instruments and regulating resistance vary according to local current and voltage conditions, as to which we should require precise details.

This table used in conjunction with photometer Bench No. 53,657 is intended for testing the luminous intensity of glow lamps in **factories** and **electricity works.**

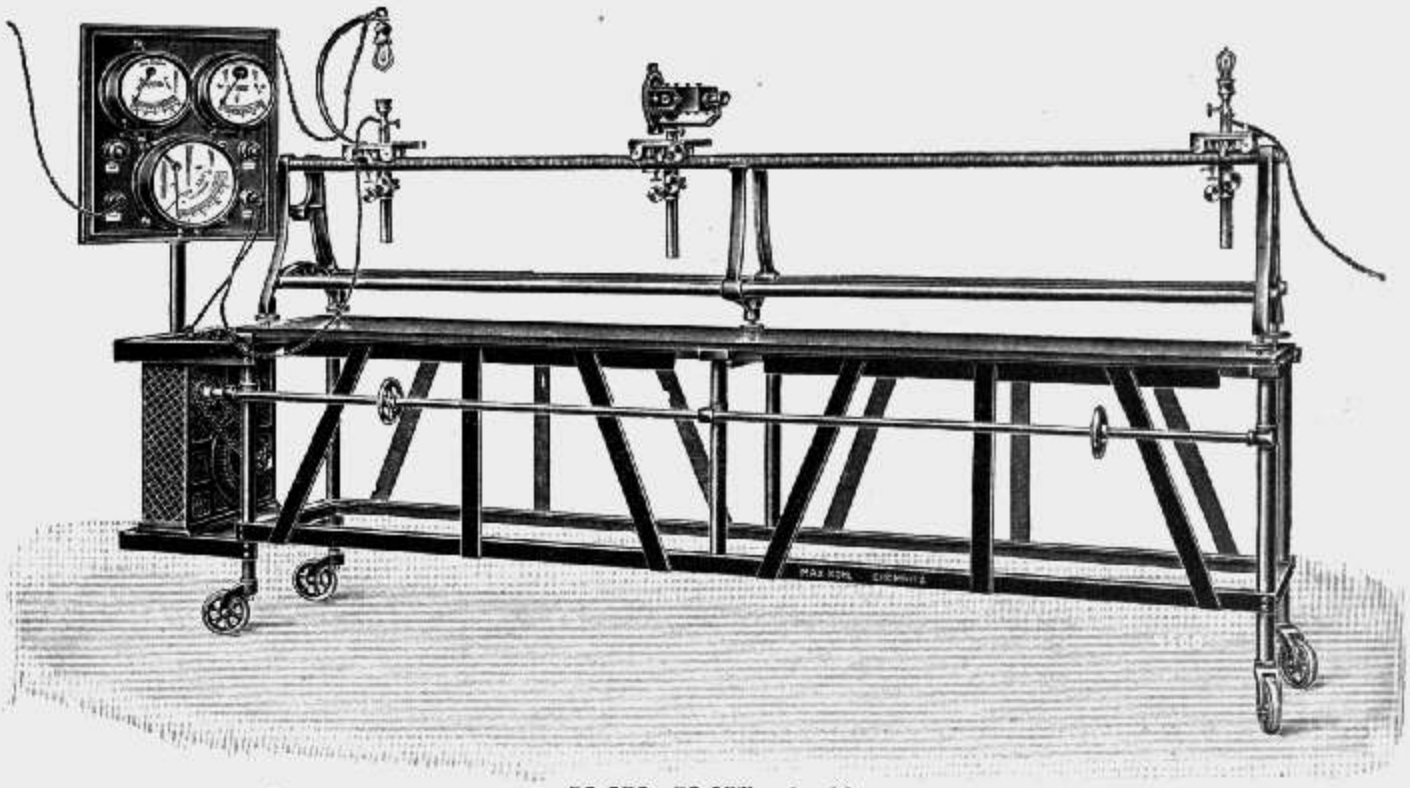
53,660. **Glow Lamp for use as Comparison Lamp,** of approx. 5, 8, 10, 16, 25, and 32 Candles (Hefner), specially for photometering glow lamps with Apparatus No. 53,656, for an accurately prescribed voltage 0. 5. 0

These comparison glow lamps are supplied calibrated at an accurately prescibed voltage and for a luminous intensity in one direction, approximately as ordered, e. g. for 16.6 Standard Candles (Hefner) at 110 volts.

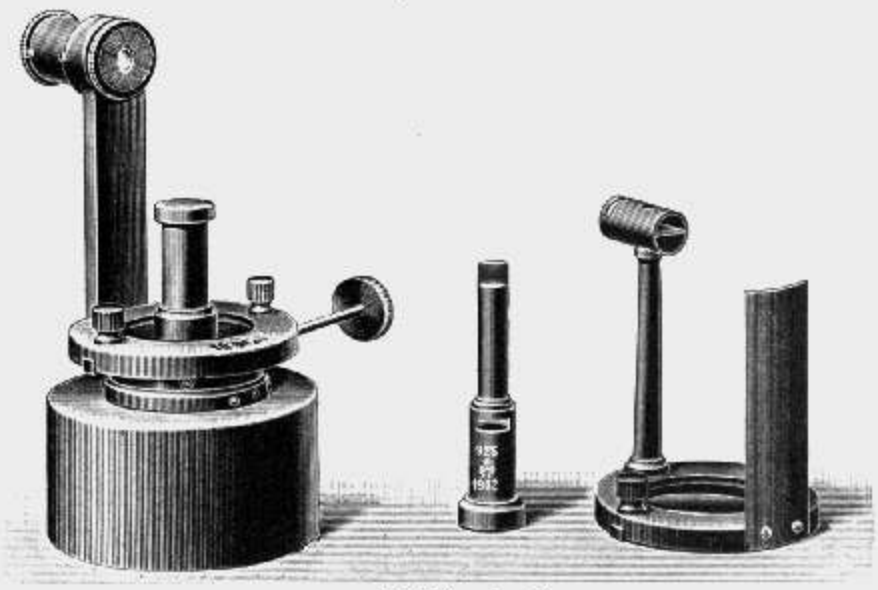
The lamps are supplied for the usual voltages; when ordering the voltage available and desired candle-power should be stated; in every case only one of these two values can be strictly adhered to.

Zinc-Bulb Photometer for Determining the ultra-viole Radiation of the Sun quoted for on application.

Cf. 6039, 1217.



53 659, 53 657. 1 : 23.



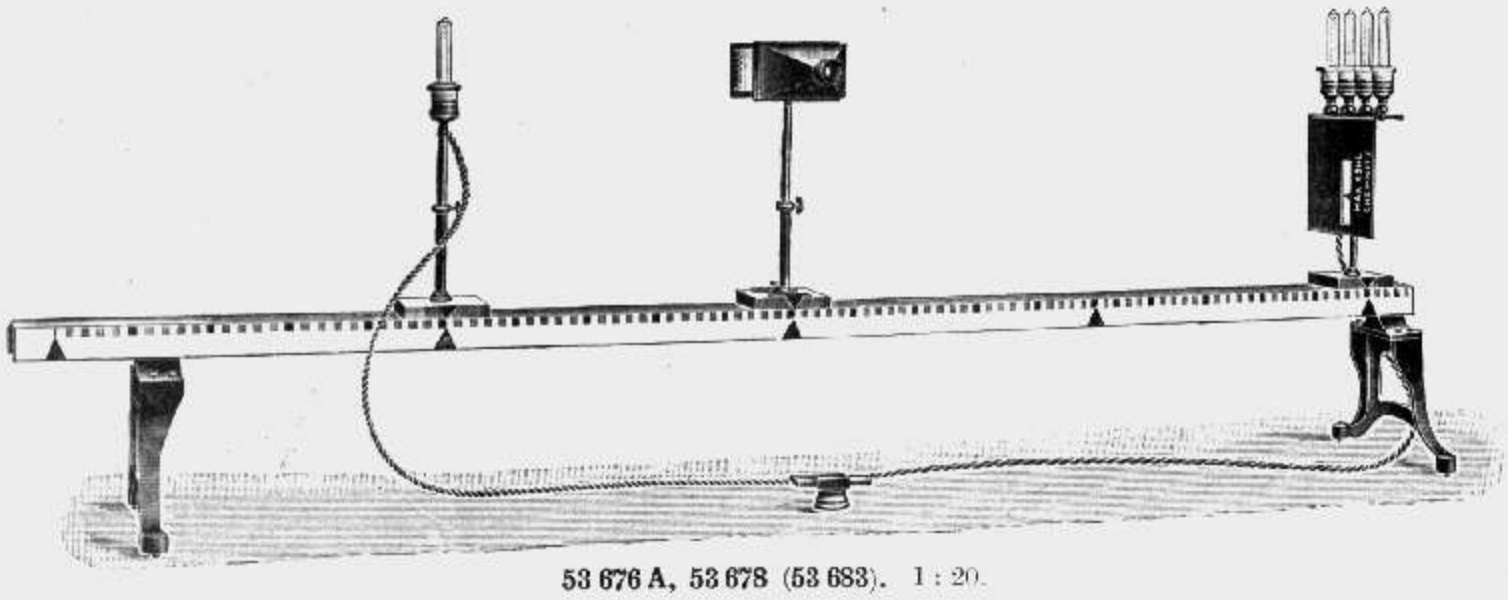
53 668. 1 : 2.

It is advisable always to obtain 2 comparison lamps of the same sort, keeping one as a chief standard, and comparing it from time to time with the standard in use.

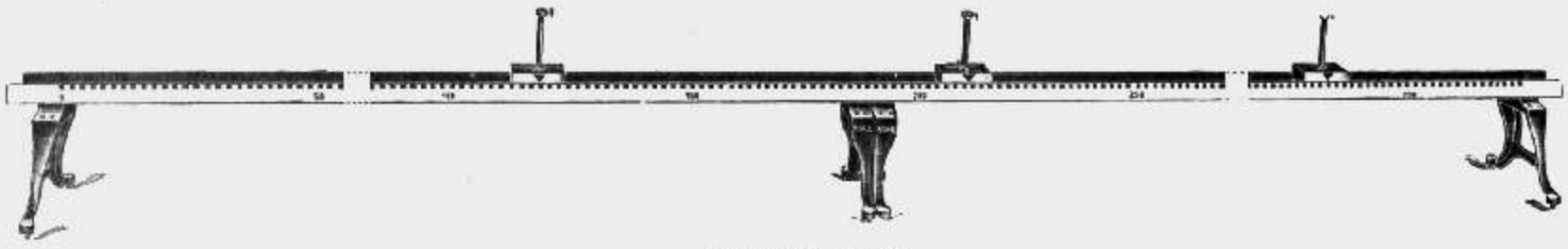
	£	s.	d.
53,661. — idem, calibrated for an **accurately prescribed Candle-power** in one direction, for working on the photometer bench	0.	5.	0

If accurate measurements are desired with these glow lamps — especially in the photometry of arc light — the voltage obtained for the candle-power in question when calibrated must be adhered to.

53,662. — idem, calibrated for an **accurately prescribed mean horizontal Candle-power,** for glow lamp measurements, in accordance with the rules of the Verband Deutscher Elektrotechniker, on Photometer Bench No. 53,657 and with the aid of the Angle Mirror No. 53,658	0.	7.	0
53,663. **Hefner Lamp,** admitted for test by the Physikalisch-Technische Reichsanstalt (Ztschr. für Instrumentenkunde, **13**, p. 257), with optical flame measuring apparatus (after Krüss), check gauge and scissors	2.	2.	0
53,664. — idem, verified	2.	6.	0
53,665. — with flame meter after v. Hefner-Alteneck, check gauge and scissors	2.	2.	0
53,666. — idem, verified	2.	6.	0
53,667. — with 2 flame measuring apparatus, check gauge and scissors, cf. Fig. 53,668 .	2.	10.	0
53,668. — idem, verified, Figure	2.	16.	0



53 676 A, 53 678 (53 683). 1 : 20.



53 676 B. 1 : 20.

	£ s. d.
53,669. **Spare Wick Tube for the Hefner Lamp,** verified	0. 4. 0
53,671. **6 Standard Candles**	0. 3. 0
53,672. **Optical Bench** after Weinhold, cf. Figure 53,675 (W. D., 2nd Edn., Fig. 237), constructed **in one part** of wood, **4 m long,** with scale on both sides and with 3 saddle-stands; in addition to being used as a photometer bench it can be employed for a large number of optical experiments. Price, without photometer screen, paraffin burner or comparison lamp For accessories: see Nos. 53,678—53,695.	3. 0. 0
53,673. — idem, of wood and constructed in two parts	3. 12. 0
53,674. — idem, **3 m long,** of wood and **in one part,** cf. Figure 53,675, without accessories	2. 10. 0
53,675. — idem, **constructed in two parts, 3 m long,** Figure, without accessories No. 53,684 illustrated	3. 2. 0
53,676. **Optical Bench** after Weinhold, **entirely of metal,** graduation **4 m long,** and constructed in two parts, Figures A and B (W. D., Fig. 262 [248]), without the comparison lamps set up on the saddle-stands and without photometer Fig. A shows only one-half of the bench.	4. 16. 0
53,677. — idem, graduation **3 m long,** entirely of metal and constructed in two parts, cf. Figure 53,676 B	4. 10. 0
53,678. **Photometrical Accessories with electric light,** for the Weinhold Optical Benches, with Bunsen Photometer, see Fig. 53,676 A and 53,678 a and b (a) Carrier with 4 tubular glow lamps and movable diaphragmic screen (£ **1. 4. 0**); (b) 1 Comparison Glow Lamp together with connecting leads and double plug-contact, arranged for inserting in the saddle-stands of the optical bench (£ **0. 10. 0**); (c) 1 Bunsen Photometer, No. 53,683 (£ **1. 2. 0**).	2. 16. 0
53,679. — idem, with Töpler Photometer Screen No. 53,680 instead of the Bunsen Photometer, see Fig. 53,675	2. 0. 0
53,680. **Photometer Screen** (after Töpler) alone, for inserting in the saddle-stands of the bench, see Fig. 53,675	0. 6. 0
53,681. **Photometrical Accessories for Gas Light,** for Weinhold Photometer and Optical Benches, see Fig. 53,681b and c, with Töpler Photometer Screen (see Fig. 53,675), without stands (a) Incandescent Gas Burner (£ **0. 5. 0**); (b) Carrier with 4 small gas jets and movable Diaphragm (Fig. 53,681 b) (£ **0. 12. 0**); (c) Small Comparison Lamp for gas (Fig. 53,681 c) (£ **0. 3. 0**); (d) Töpler Photometer Screen (see Fig. 53,675) (£ **0. 6. 0**).	1. 6. 0
53,682. — idem, with Bunsen Photometer (see Fig. 53,676 A) instead of the Töpler Photometer Screen.	2. 2. 0
53,683. **Bunsen Photometer Head,** alone, for inserting in the saddle-stands, of the bench (see Fig. 53,676 A)	1. 2. 0

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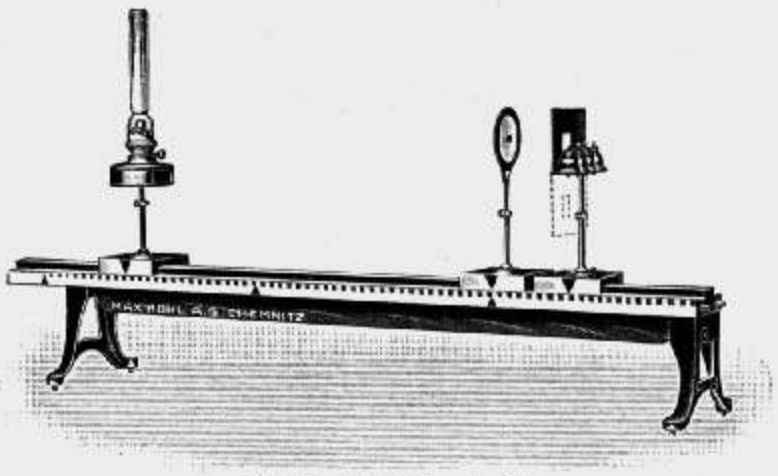
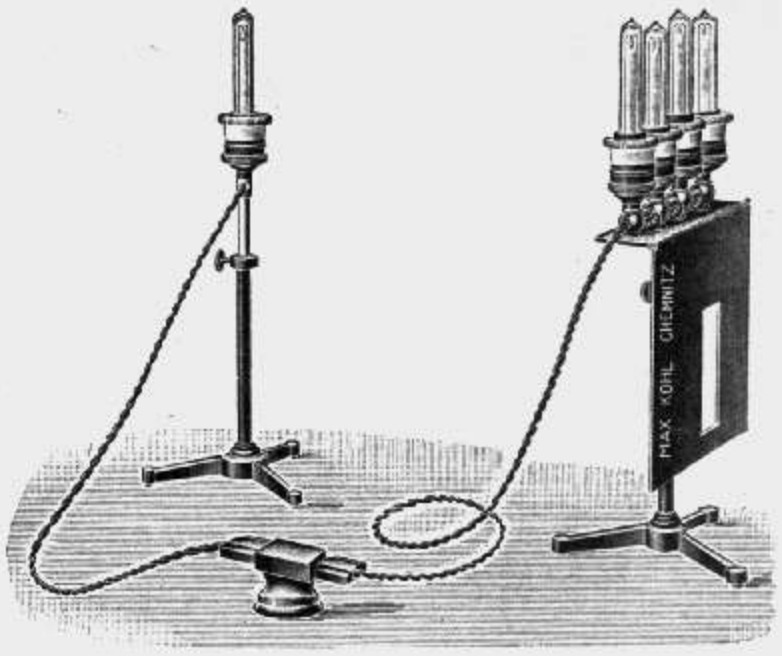


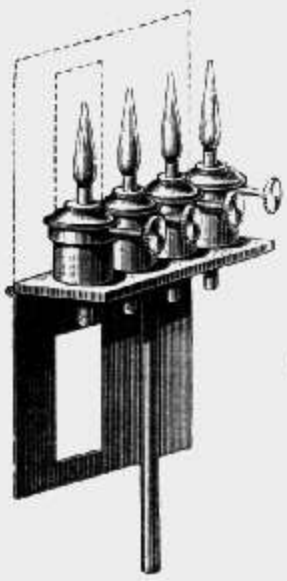
53 675, 53 684. 1 : 20.



53 678 a, 53 678 b, 53 686. 1 : 8.



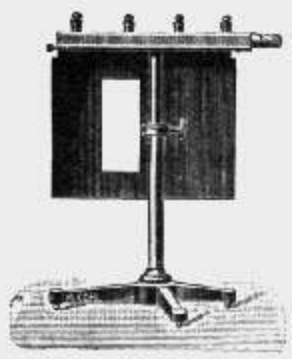
53 689, 53 684 a (53 688). 1 : 7.



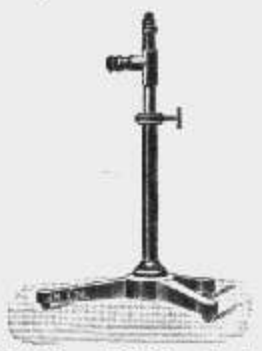
53 684 b. 1 : 4.



53 690. 1 : 5.

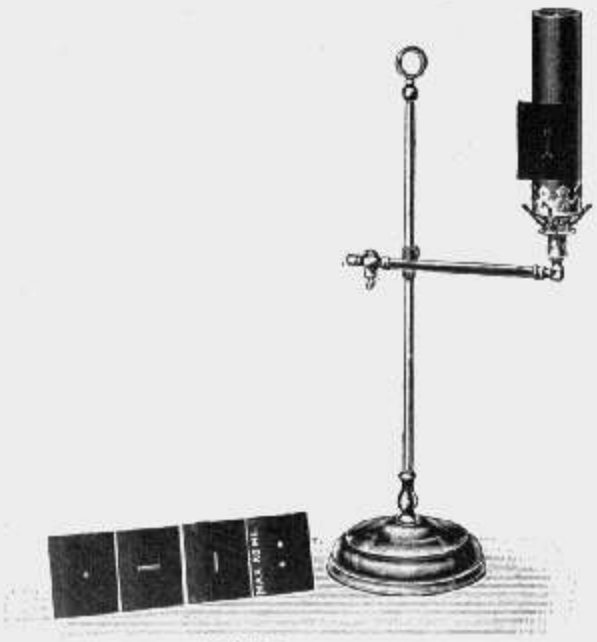


53 681 b, 53 686. 1 : 7.



53 681 c, 53 686. 1 : 7.

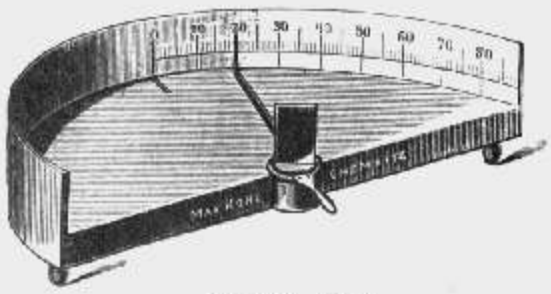
	£ s. d.
53,684. **Photometric Accessories with paraffin light** for the Weinhold Photometer and Optical Benches, cf. Fig. 53,675, with Töpler Photometer Screen, without stands . . . . . (**a**) Paraffin Lamp, Figure (£ **0. 6. 0**); (**b**) Carrier with 4 small Paraffin Lamps and movable diaphragm, Figure (£ **0. 12. 0**); (**c**) Carrier with small Paraffin Comparison Lamp (£ **0. 3. 0**); (**d**) Töpler Photometer Screen, see Fig. 53,675 (£ **0. 6. 0**).	1. 7. 0
53,685. — idem, with Bunsen Photometer No. 53,683 instead of Töpler Photometer Screen	2. 3. 0
53,686. **Stands** for preceding Accessories in order to enable them to be used independently on the lecture table in conjunction with any photometer (see pp. 467, 468) or to enable the accessories to be more conveniently stored, see Figures . . . . . Each Three or four at least should be ordered.	0. 5. 0
53,687. **Glow Lamp for 110 volts,** with socket and haft, for concave mirror and lens experiments (W. D., p. 356 [329])	0. 5. 0
53,688. **Perforated Cylinder** for concave mirror and lens experiments (W. D., Fig. 272 [258]), fitting Argand Gas Burner No. 53,681 a	0. 1. 6
53,689. — idem, for the Paraffin Burner No. 53,684 a, Figure, without burner	0. 1. 6
53,690. **Diaphragmic Cylinder,** Figure, with 5 diaphragms of different sizes, for Gas Lamps . . . . . The cylinder is 48 mm diameter. The diaphragm apertures are 0,5, 4, 10, 15 and 30 mm.	0. 12. 0
53,691. — idem, for Paraffin Lamps	0. 12. 0
53,692. **2 Screens** for Concave Mirror and Lens Images (W. D., Fig. 273 [259])	0. 8. 0
53,693. **4 Lenses** in brass mounts with haft, 3 bi-convex, 1 bi-concave, for demonstrating the **terrestrial, astronomical** and **Galilean Telescope** and the **Microscope**	0. 16. 0
53,694. **Convex Lens,** exact focus 600 mm, 60 mm diameter, in mount with haft	0. 12. 0
53,695. **Lens Holder** with Haft, for inserting one or two lenses for investigating the focal length of a lense system, fitting Lenses No. 53,894 (W. D., p. 386 [354])	0. 5. 0
53,696. **Optical Bench** after Friedr. C. G. Müller (M. T., Fig. 114 and pp. 166 to 171, 173, 174, 175), **3 m** long, with 4 saddle-stands . . . . . For screen for above, see No. 53,624.	1. 10. 0
53,697. **Punctiform Limelight** after Friedr. C. G. Müller, for feeding with a gas blast burner (M. T., Fig. 115)	0. 6. 0
53,698. **Arc Light** after Friedr. C. G. Müller (M. T., Fig. 116)	0. 6. 0



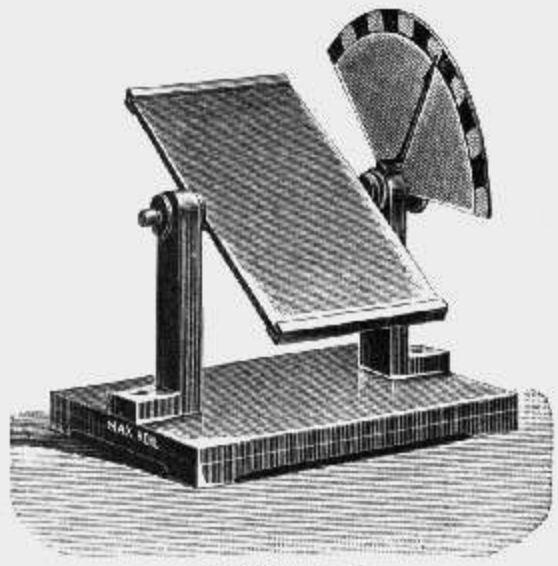
53703. 1 : 10.



53707. 1 : 4.



53708. 1 : 8.



53709. 1 : 3.

	£	s.	d.
53,699. **Rectangular Platinum Wire Glow-Light** (M. T., Fig. 117), serving as luminous source for concave mirror and lens images	0.	8.	0
53,701. **Candle Holder** for 5 Candles, with stand with height adjustment (M. T., Fig. 118)	0.	6.	0
53,702. **Storing Box** for the preceding luminous sources and the screens of No. 53,624	0.	6.	0
53,703. **Incandescent Gas Lamp,** Figure, adjustable, with 5 diaphragms (M. T., Fig. 119)	1.	6.	0
53,704. **Arc Light Lantern** (M. T., Fig. 120)	1.	4.	0
53,705. **Prism, Disc and Cylinder of Cardboard,** for showing the dependence of the luminous intensity on the angle of incidence and for photometric experiments (M. T., Figs. 125 [126])	0.	4.	0
53,706. **Photometer Screen** with grease spot for Friedr. C. G. Müller's optical bench (M. T., p. 175), cf. Figure 53,624 A, without stand	0.	10.	0

Reflection of Light.

53,707. **Apparatus for Explaining the Laws of Reflection,** after Weinhold, Figure (W. V. d. E., Fig. 245)	0.	14.	0
53,708. — idem, after J. Müller, Figure (M. P., 9th Edn., II, 1, Fig. 27; Fr. phys. Techn. II, 2, Fig. 2019 [II, Fig. 700])	1.	0.	0
53,709. **Apparatus for Explaining the Laws of Reflection,** after Tyndall, Figure, varied by Prof. Meutzner	1.	2.	0

The scale of the apparatus moves of itself so as to make its zero point agree with the incident ray of light. The apparatus can be used without darkening the room.

53,710. **Reflection Apparatus** after Stahlberg, Figure (Ztschr. f. d. phys. u. chem. U. **15**, p. 73), on adjustable stand with foot-screw	1.	8.	0

The hinge-pin of two metal bars carries a mirror and, perpendicular to the latter, a rod which always forms the angle-bisector for the two bars and thus forms the axis of incidence. The luminous ray along the one limb encounters the mirror and is always reflected along the other limb. The apparatus can be employed for light falling from the right or the left.

For further apparatus for Reflection of Light: see Section "Light Refraction". Cl. 5101, 6044, 1230, 1231.

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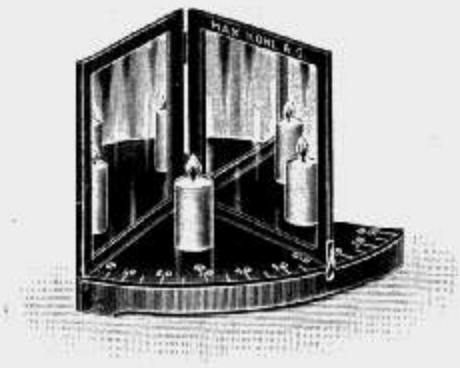
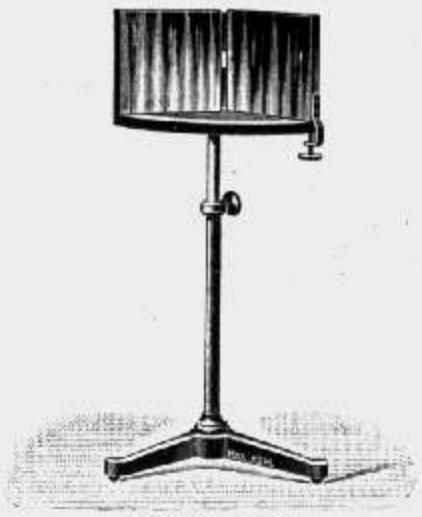
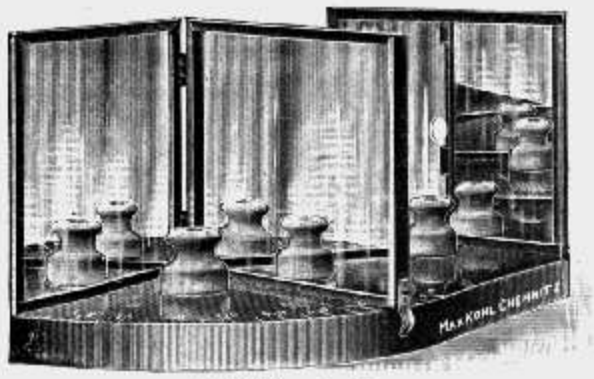
53710. 1 : 10.



53737. 1 : 5.



53738. 1 : 7.



53740. 1 : 5.

53,711. **Reflection Apparatus** after Rosenberg (Kleiber, Gymnas., Fig. 206), for showing that the reflected rays of a punctiform source of light appear to proceed from a point situated on the rear elongation of all the rays . . . . . £ s. d. 1. 4. 0

53,712. **Reflection Apparatus** after Friedr. C. G. Müller (M. T., Fig. 127), for showing that the reflected ray lies in one plane with the incident ray and with the axis of incidence 0. 18. 0

53,713. **Polemoscope** (Magic Mirror) (M. T., Fig. 128) 0. 14. 0

53,714. **Mirror Arrangement** after Porro (M. T., Fig. 129), for reversing an image 0. 16. 0

Reflecting Prisms (**Reversing Prisms**), with round base surfaces, of Crown Glass, strictly accurate at all angles, without pyramidal error:

List No.	**53,715**	**53,716**	**53,717**	**53,718**	**53,719**	**53,720**
Aperture of polished base-surface mm	27	34	41	47	54	61
£	**1. 17. 0**	**2. 9. 0**	**3. 0. 0**	**4. 3. 0**	**5. 15. 0**	**7. 10. 0**
List No.	**53,721**	**53,722**	**53,723**	**53,724**	**53,725**	
Aperture of polished base-surface mm	68	75	81	95	108	
£	**9. 15. 0**	**14. 10. 0**	**17. 5. 0**	**28. 15. 0**	**46. 0. 0**	

— i d e m, **sharp-edged,** with polished base surfaces:

List No.	**53,726**	**53,727**	**53,728**	**53,729**	**53,730**	**53,731**
Base-length mm	14	20	27	34	41	47
£	**0. 18. 6**	**1. 10. 0**	**2. 2. 0**	**3. 12. 0**	**4. 18. 0**	**5. 15. 0**
List No.	**53,732**	**53,733**	**53,734**	**53,735**	**53,736**	
Base-length mm	54	61	68	75	81	
£	**7. 0. 0**	**9. 5. 0**	**12. 15. 0**	**17. 5. 0**	**23. 0. 0**	

Intermediate sizes are the same price as the next largest size. The height of the preceding prisms is equal to the length of the base.

53,737. **Angle Mirrors,** F i g u r e, with a fixed mirror and a mirror movable in hinges over an easily visible stay 0. 16. 0

53,738. — i d e m, of brass, on stand, F i g u r e, with graduated arc 1. 12. 0

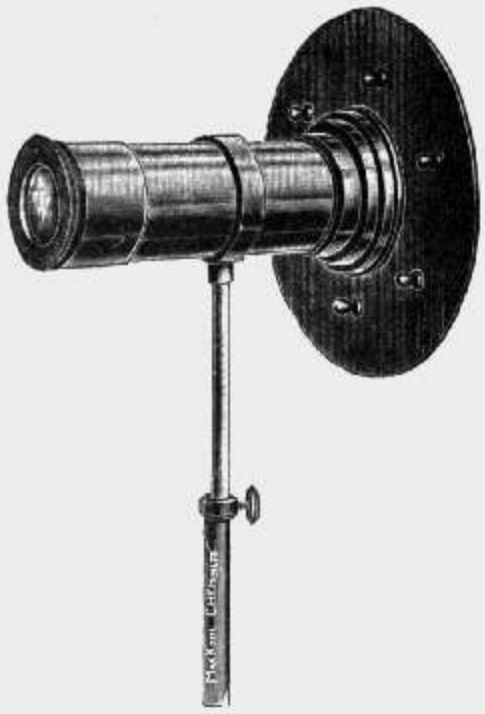
53,739. — i d e m, without base and without graduation (M. T., p. 176) 0. 8. 0

53,740. **Angle Mirror and Parallel Mirror,** F i g u r e, with two fixed double-sided mirrors (glass) and two mirrors on hinges movable over an easily visible scale 1. 4. 0

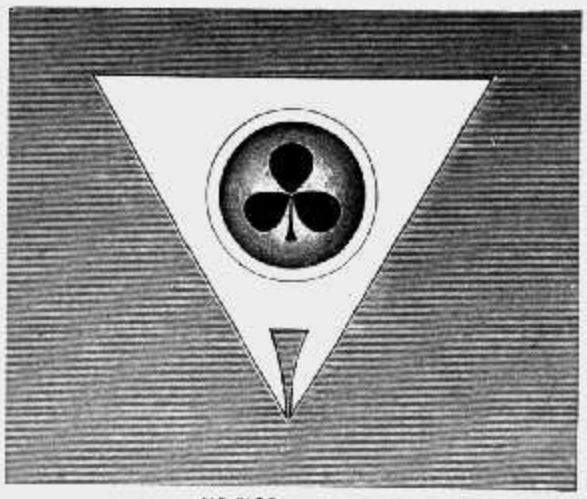
53,741. **Parallel Mirrors** after Friedr. C. G. Müller (M. T., pp. 176 and 177) 0. 12. 0

Angle Mirrors for Geissler Tubes:
see under "Geissler Tubes".

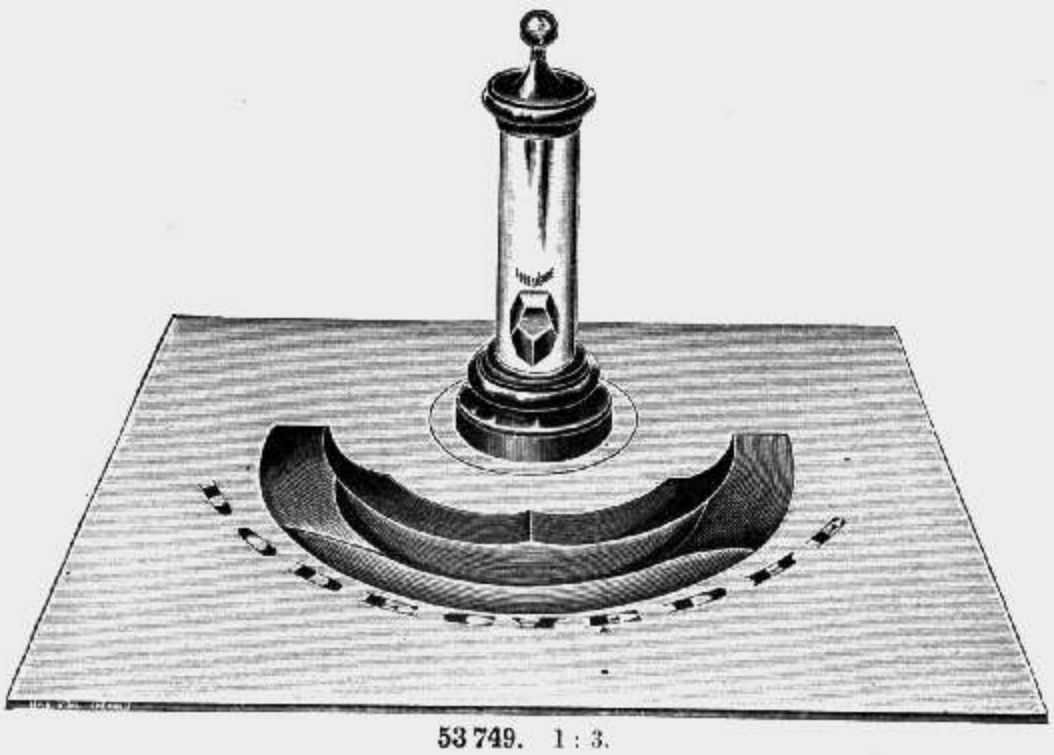
Cl. 6036, 6038, 1234 a, 3386.



53 746. 1 : 5.



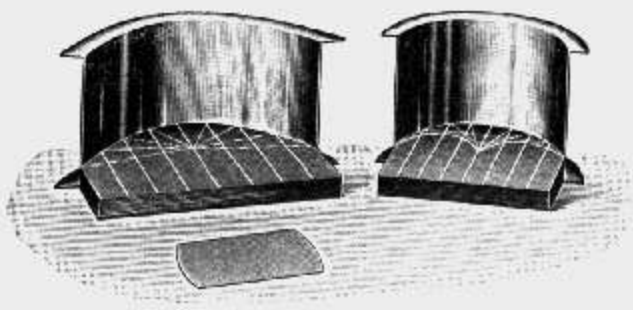
53 748. 1 : 3.



53 749. 1 : 3.



53 747. 1 : 7.



53 750. 1 : 3.

Kaleidoscopes, with movable front part, simple construction, on wood stand:

	List No.	53,743	53,744	£ s. d.
	Diameter of Image mm	65	80	
	£	**0. 5. 0**	**0. 10. 0**	
53,745.	— idem, good pattern, on stand			2. 0. 0
* 53,746.	**Projection Kaleidoscope** on stand, Figure, giving very pretty images			1. 10. 0
53,747.	**Kaleidoscope** for polarised light, Figure, with dark mirror, Nicol prism, and gypsum objects			3. 0. 0
53,748.	**Conical Mirror,** Figure, with 6 images (anamorphoses)			0. 10. 0
53,749.	**Cylindrical Mirror,** Figure, with 6 images (anamorphoses)			0. 10. 0
53,750.	**Parabolic and Cylindrical Mirror** after Rebenstorff, Figure, with indication of the path of rays for parallely striking rays, for demonstrating **reflection** and the **caustic line,** with a template according to which the curvatures are produced			0. 16. 0

* Can be used with the Projection Apparatus.

Cl. 1268, 1266, 1267, 4515, 5109.

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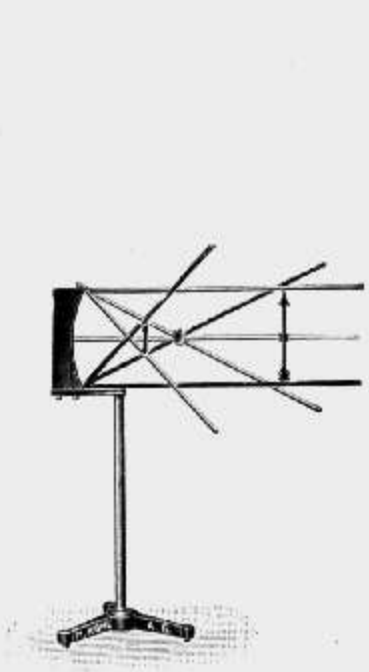


53 752. 1 : 10.



53 753. 1 : 10.



53 757. 1 : 6.



53 775. 1 : 6.

53,751. **Parabolic and Circular Mirror Ring** for Demonstrating **Catacautery**, after Friedr. C. G. Müller (M. T., Fig. 130) . . . . . £ s. d. 0. 12. 0

53,752. **Model of a Concave Mirror** after Mühlenbein, Figure, with fixed and movable coloured rods for demonstrating the path of the rays and the relations between object and image 1. 2. 0

53,753. **Model of a Convex Mirror** after Mühlenbein, Figure 1. 2. 0

Spherical Concave Mirrors and Convex Mirrors, of Glass, of exactly 600 mm focal length, Figure 53,757, ground optically true and silvered, in metal mount with haft and cover, without stand, for use on the optical bench, for demonstrating the images and laws relative to concave mirrors.

Concave Mirrors silvered on front			Convex Mirrors silvered on back			Concave and Convex Mirrors silvered concave side			Stand	
List No.	Diam. mm	Each £ s. d.	List No.	Diam. mm	Each £ s. d.	List No.	Diam. mm	Each £ s. d.	List No.	Each £ s. d.
53 754	60	**0. 12. 0**	**53 758**	60	**0. 12. 0**	**53 762**	60	**0. 18. 0**		
53 755	90	**0. 18. 0**	**53 759**	90	**0. 18. 0**	**53 763**	90	**1. 4. 0**	**53 766**	**0. 5. 0**
53 756	120	**1. 4. 0**	**53 760**	120	**1. 4. 0**	**53 764**	120	**1. 10. 0**		
53 757	150	**1. 16. 0**	**53 761**	150	**1. 16. 0**	**53 765**	150	**2. 6. 0**		

The Concave and Convex Mirrors Nos. 53,762—53,765 consist of a single mirror provided with a cover both back and front.

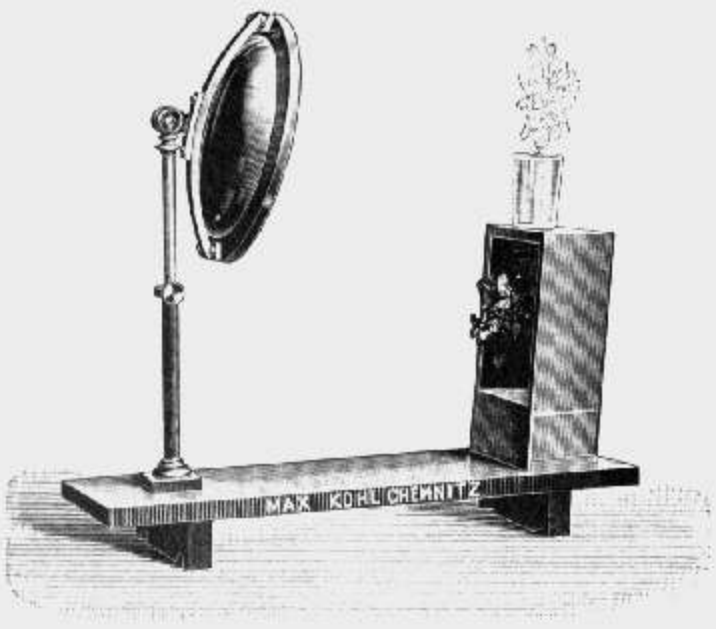
We supply Mirrors Nos. 53,754/57 and 53,762/65 also with an extra coat of gold for increasing the durability; extra price for this £ **0. 3. 0.**

Spherical Concave Mirrors and Convex Mirrors of Glass, cf. Figure 53,775, in black polished **Wood Mount,** with **wood handle** (M. T., p. 177).

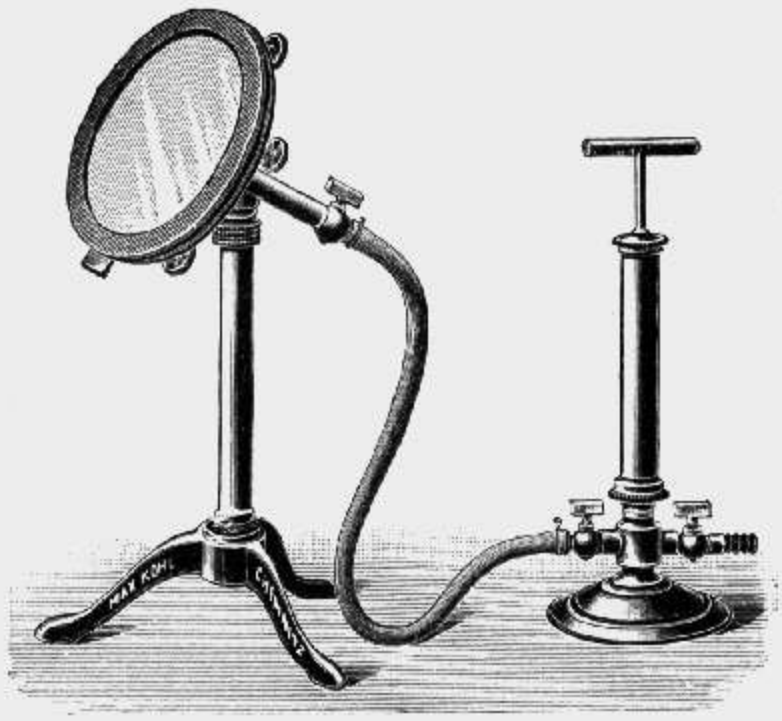
	Concave Mirrors		Convex Mirrors		Concave & Convex Mirrors	
List No.	**53,767**	**53,768**	**53,769**	**53,770**	**53,771**	**53,772**
Diameter mm	100	150	100	150	100	150
Focal Length mm	350	350	350	350	350	350
Each £	**0. 4. 0**	**0. 7. 0**	**0. 4. 0**	**0. 7. 0**	**0. 6. 0**	**0. 10. 0**

— idem, on **Stand,** Figure 53,775.

	Concave Mirrors		Convex Mirrors		Concave & Convex Mirrors	
List No.	**53,773**	**53,774**	**53,775**	**53,776**	**53,777**	**53,778**
Diameter mm	100	150	100	150	100	150
Focal Length mm	350	350	350	350	350	350
Each £	**0. 10. 0**	**0. 13. 0**	**0. 10. 0**	**0. 13. 0**	**0. 12. 0**	**0. 16. 0**



53 779. 1 : 8.



53 795. 1 : 6.

53,779. **Spherical Concave Mirror,** of glass, with small box, bouquet and vase, for producing real images, Figure . . . . . £ 4. 10. 0

In a black box is arranged, inverted, a bouquet, which has to be strongly illuminated. By means of a concave mirror an upright, real image is produced of this bouquet, this image appearing to issue from the glass when the correct position is given to the rotary mirror and on glancing, a suitable distance off, at the glass and the mirror.

Spherical Concave Mirrors, of **Glass, ground,** fixed on Stand, silvered on the back, focal length 600 mm.

List No.	**53,789**	**53,790**	**53,791**	**53,792**
Diameter mm	200	300	400	500
Each £	**3. 0. 0**	**4. 0. 0**	**6. 0. 0**	**9. 0. 0**

Style: as Nos. 53,780/84.

53,794. **Spherical Mirror** (M. T., p. 177), 100 mm diameter, on stand . . . . . £ 0. 10. 0

53,795. **Japanese Mirror (Magic Mirror),** Figure, of metal, with force-pump . . . . . £ 5. 10. 0

The images can be rendered visible both by sunlight and with the projection lantern.

53,796. **Glow Lamp Ring** after Grimsehl, for concave mirror experiments (Fr. phys. Techn. II, 2, Fig. 2648), stand with 16 7-volt electric glow lamps in series . . . . . £ 2. 4. 0

53,797. **Black Mirror,** for drawing, in case, 11 cm long, 8 cm wide . . . . . £ 0. 10. 0

53,798. — idem, 16 cm long, 13 cm wide . . . . . £ 0. 18. 0

53,799. **Plane Mirror,** of silvered glass, in frame . . . . . £ 0. 4. 0

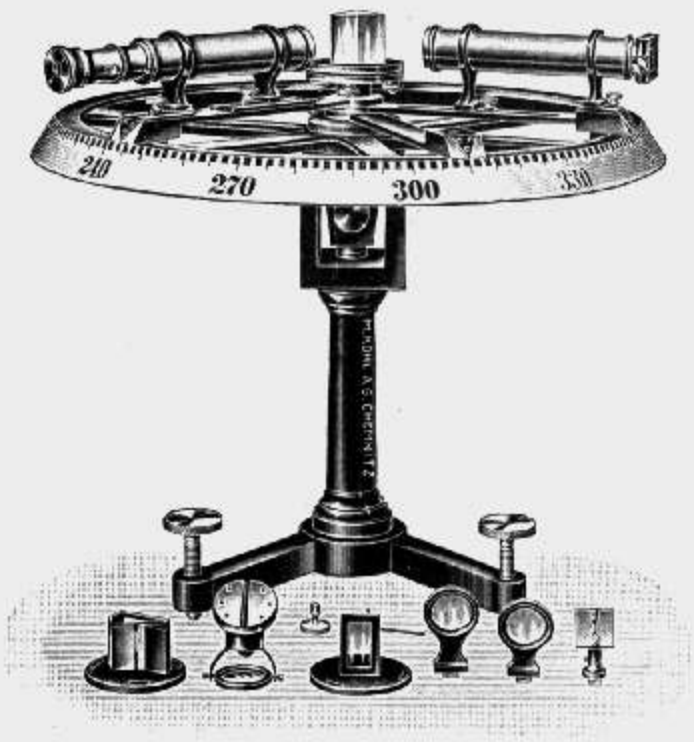
Mirrors of perfectly plane parallel glass, coated with silver, for instruments read by a mirror.

List No.	**53 800**	**53,801**	**53,802**
Thickness mm	0.5—1	0.5—1	0.5—1
Diameter mm	5—10	11—15	16—20
Each £	**0. 4. 0**	**0. 7. 0**	**0. 10. 0**

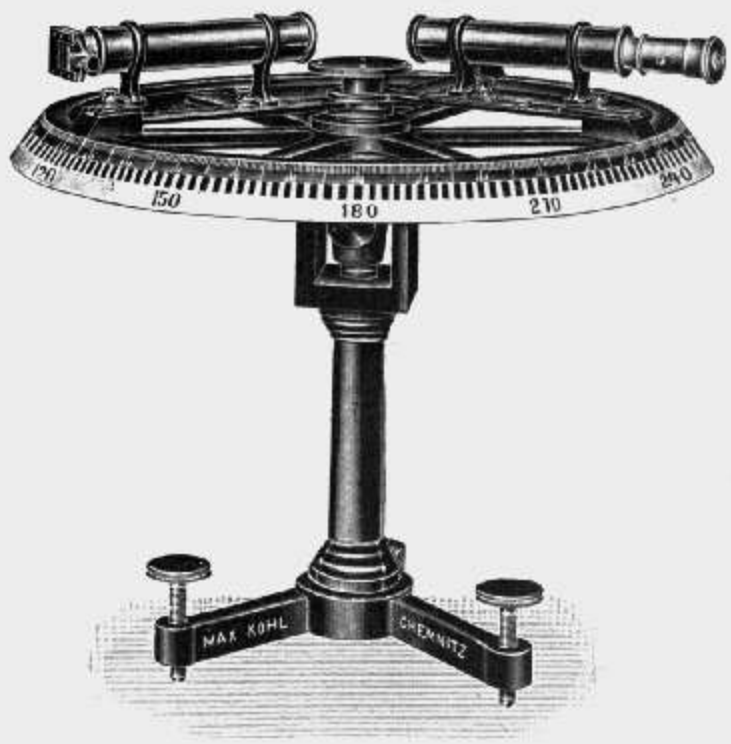
Concave Mirrors for instruments with mirror-reading, silvered on back; focal length 100 cm.

List No.	**53,803**	**53,804**	**53,805**
Diameter mm	10	15	20
Each £	**0. 6. 0**	**0. 9. 0**	**0. 12. 0**

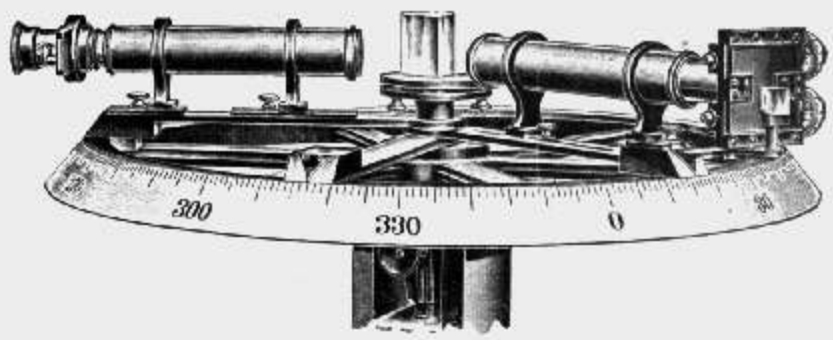
Max Kohl A. G. Chemnitz, Germany.



53 806. 1 : 8.



53 807. 1 : 7.



53 809, 53 806. 1 : 6.

53,806. **Demonstration Goniometer** after Weinhold, cf. Figure, **large Pattern** (W. D., Figs. 265—267 and 286—288 [251—253 and 270—271]) . . . . . £ 18. s. 0. d. 0

The Goniometer can be used horizontally and vertically. It is used for more accurate experiments on reflection, refraction and colour-dissipation, for determining the angles of prisms and refractive indices by Fraunhofer's, Meyerstein's or Listing-Abbe's Method, as a Goniometer and Spectrum Apparatus. Height, 50 cm; diameter of circle, 55 cm. The apparatus is graduated in whole degrees.

The accessories comprise a centering plate for crystals, a plane mirror in mount, a water-vessel with gap, a gap with illuminating mirror, one index, two lenses, one collimator tube, one observing telescope, one prism of flint glass, 45 mm side, and a key. All parts placed in a box.

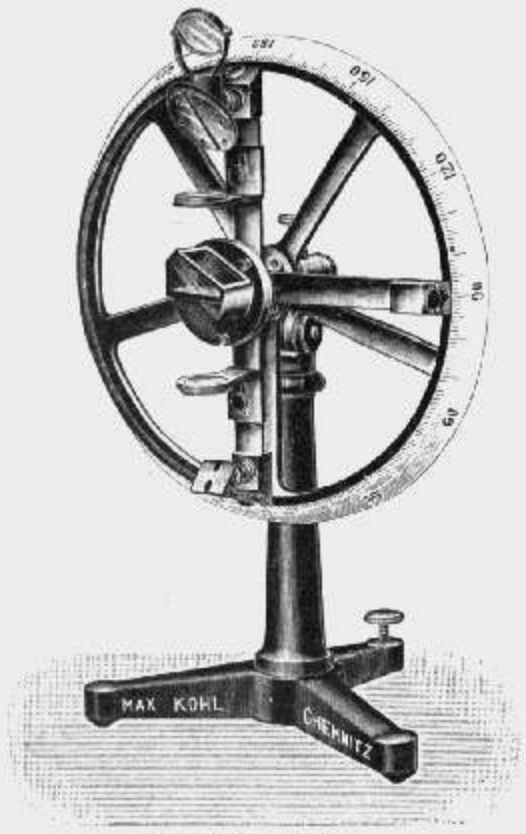
53,807. — idem, with a **second graduation on brass** in whole degrees and with vernier reading, for subjective observations, Figure 21. 0. 0

53,808. — the same apparatus as No. 53,806, but **without Telescopes**, without prism or box; cannot be used as a Spectrometer, etc. 15. 0. 0

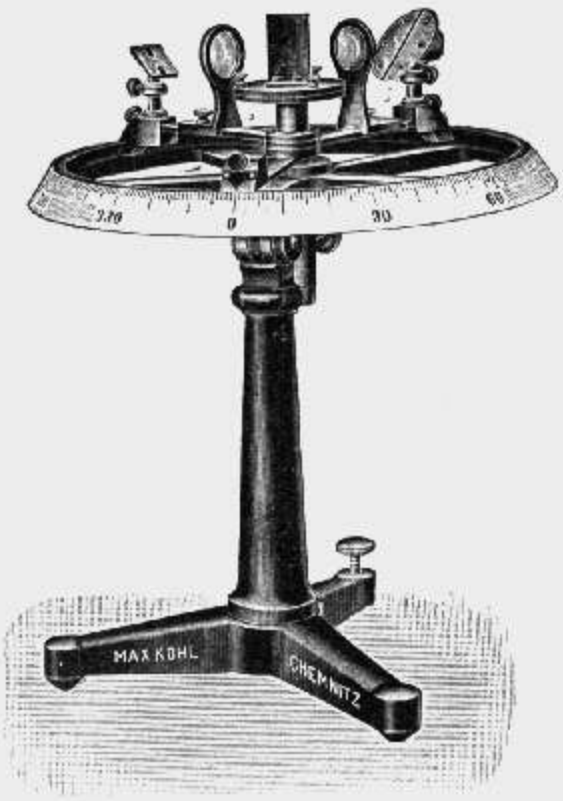
53,809. **Ocular with Gap** for the observation telescope, and **Symmetrical Double Gap** after Vierordt (v. Konkoly, Handbuch der Spektroskopiker, Halle, 1890, pp. 388—390), for the collimator tube of the Weinhold Goniometer No. 53,806 or 53,807 (cf. Fig. 53,809), in order to enable the apparatus to be used in addition as a **Spectrophotometer** . . 7. 10. 0

Ocular and double gap can be set up forthwith on the observation telescope or collimator telescope supplied with Nos. 53,806 or 53,807. The illustration shows the demonstration goniometer arranged in the manner in which it is used as a spectrophotometer.

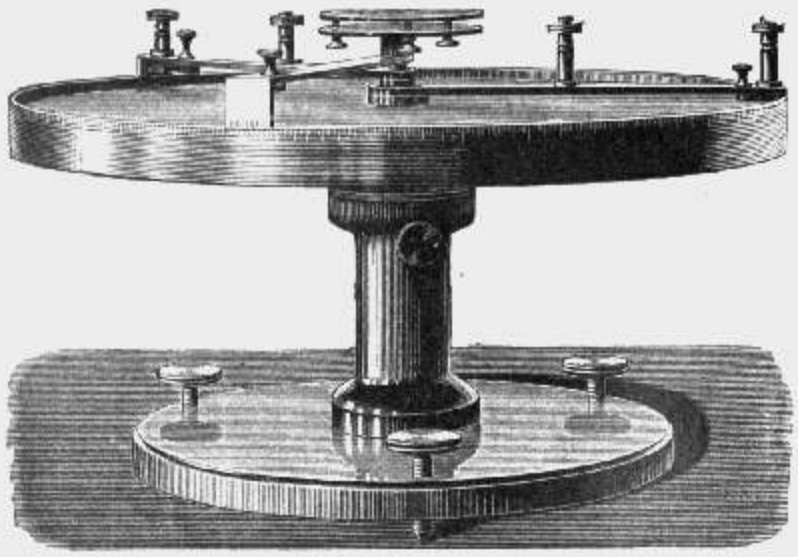
Cl. 6057, 5317, 3676.



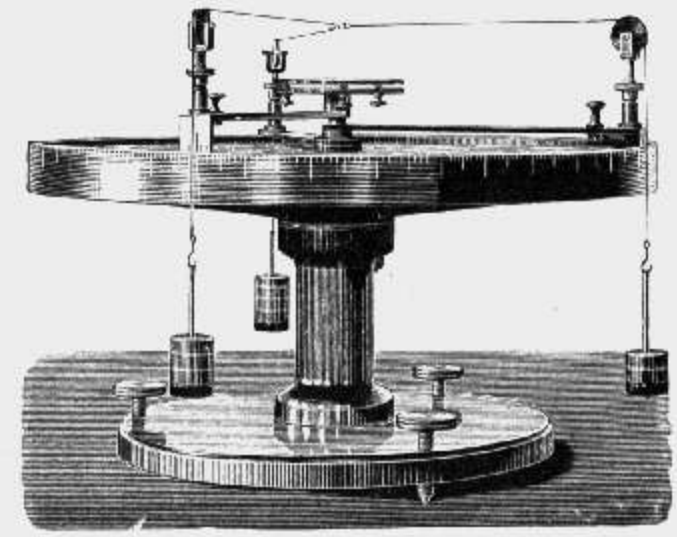
53 810 A. 1 : 7.



53 810 B. 1 : 7.



53 814 A. 1 : 5.



53 814 B. 1 : 6.

	£	s.	d.
53,810. **Demonstration Goniometer** after Weinhold, **small pattern,** cf. Figures A and B The Goniometer is used as No. 53,806. The height is 13 cm, diameter of circle 38 cm. The apparatus is divided in whole degrees. Accessories as No. 53,806.	14.	0.	0
53,811. — idem, with a **second graduation on brass,** in half degrees, and with vernier reading, for subjective observations	16.	0.	0
53,812. — the same apparatus as No. 53,810, but **without telescopes, prism** or **box** . . .	11.	10.	0
53,813. **Simple Goniometer for students' use,** after Noack (Noack, Leitfaden für Schülerübungen, p. 9), for use with accessories No. 53,815—53,817 and 51,851 l; can be used as a Demonstration Goniometer for subjective and objective observation, as a Spectrum Apparatus and for various other optical experiments; as a Magnetometer, Galvanometer, and Tangent Galvanometer; for Demonstrating the Parallelogram of Forces, the Reflection of Impact and of Torsional Effects	6.	0.	0
53,814. **Demonstration Goniometer** after Noack, Figures A and B (Ztschr. f. d. phys. u. chem. U. **3**, 1889—90, pp. 1 and 57)	15.	0.	0
The divided circle of zinc, with German silver edge, is very accurately graduated in half-degrees and permits of readings being made to 5 minutes with the aid of the vernier provided on the 3 alidades			

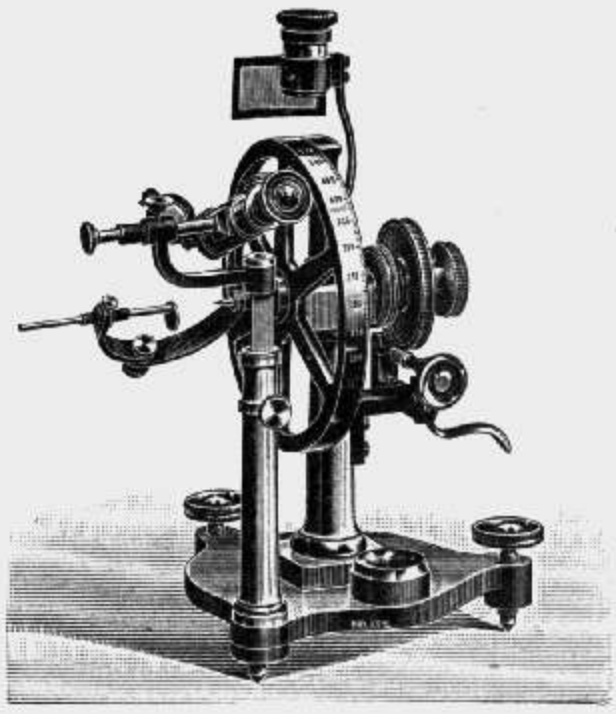
Cl. 3942, 3941, 1250, 1255.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



53 819. 1 : 3.

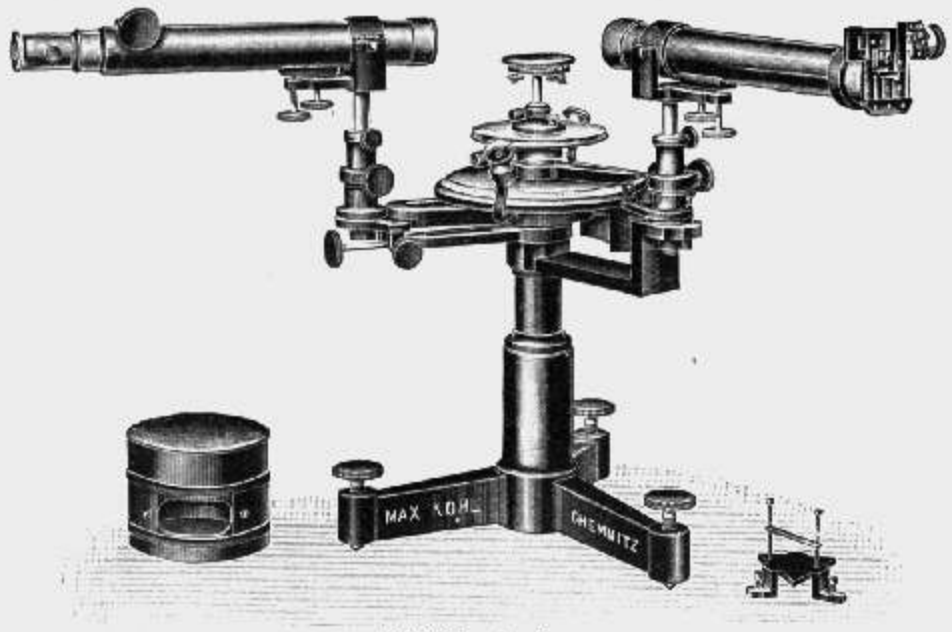


53 820. 1 : 3.

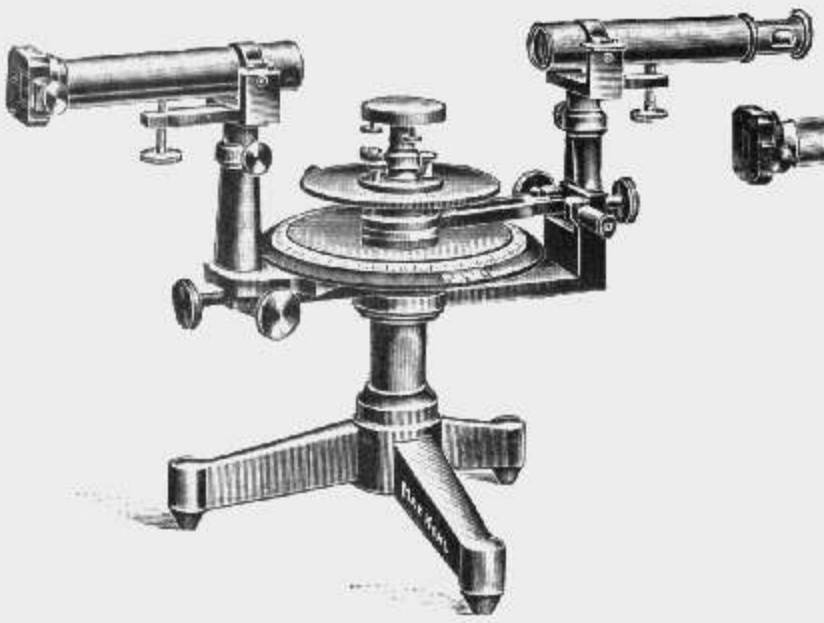
pertaining to the apparatus. Hollow brass pillars can be screwed into the alidades, and various accessories can be fitted into the pillars, e. g., for optical experiments, two massive brass forks with lateral levelling screws and two brass heads pointed at the top, and these accessories are interchangeable.

The following are supplied along with the apparatus: 4 small pillars, 4 cylinders, 1 movable table top, 1 key, 2 brass forks, 2 brass pivots, 1 gas burner, 1 glow light and 1 camera obscura.

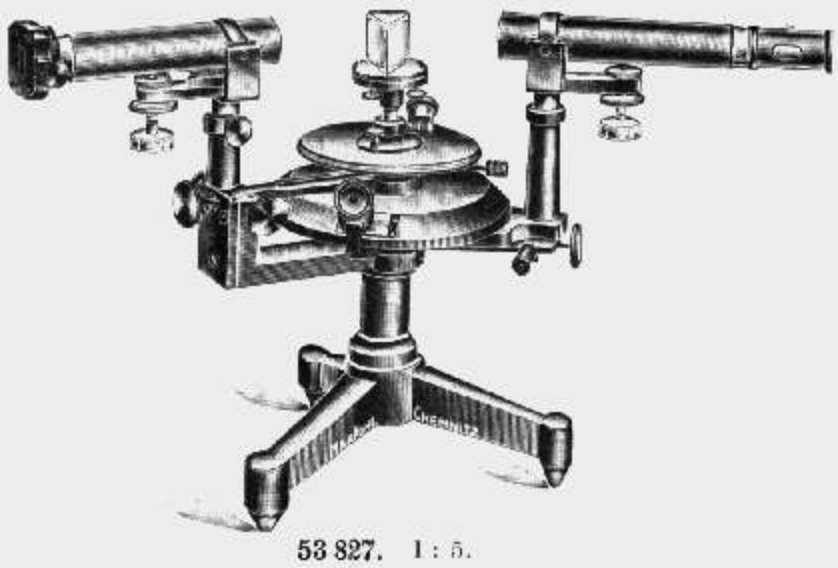
	£. s. d.
53,815. **Accessories for Optical Experiments** for the Noack Goniometer	3. 0. 0
(a) Telescope (£ **1. 10. 0**); (b) Slotted Tube (£ **1. 10. 0**).	
53,816. **Accessories for Magnetic and Electric Experiments** with the Noack Goniometer, Nos. 53,813 and 53,814	9. 2. 0
(a) Magnetometer with bar magnet (£ **2. 14. 0**); (b) Compass with Binnacle (£ **1. 16. 0**); (c) Galvanometer (without compass, £ **3. 12. 0**); (d) Tangent Galvanometer (£ **1. 0. 0**).	
53,817. **Accessories for Demonstrations in Mechanics** with Goniometers Nos. 53,813 and 53,814	1. 18. 0
(a) 3 Pulleys, Fig. 53,814 B (£ **0. 15. 0**); (b) Cubical Tube with Sphere (£ **0. 5. 0**); (c) Ring for Tissue Paper (£ **0. 6. 0**); (d) Torsion Head (£ **0. 12. 0**).	
51,851[1]. **Set of Weights,** comprising 20 weights of 50 g each, with small hooks	0. 10. 0
53,818. **Goniometer and Spectrum Apparatus for Students' Exercises,** after Grimsehl (Ztschr. f. d. phys. u. chem. U. **17**, 1904, p. 207)	2. 8. 0
53,819. **Reflecting Goniometer** after Wollaston, Figure, with telescope: the crystals are centered by a centering needle	9. 0. 0
The divided circle is graduated in half degrees, of brass, silvered, and provided with vernier for reading to 2 minutes. The telescope aperture is 15 mm, the focal length 104 mm, and the power, 4.	
53,820. — idem, Fig. 53,820, with **Fine Motion** and **Magnifier reading**	12. 10. 0
The divided circle is 108 mm diameter, the fine motion being secured by worm and rack; with round pattern spirit level.	
53,821. — idem, **simple,** for students' use (Wied. u. Ebert, Fig. 135)	6. 0. 0
On tripod with levelling screws, graduated in $^1/_2{}^0$, vernier read by magnifying glass up to $^1/_3$ minute.	



53 823. 1 : 6.



53 826. 1 : 5.



53 827. 1 : 5.

53 822. **Large Reflecting Goniometer** with circle 230 mm diameter, with concealed graduation on silver, objective aperture 31 mm, reading by magnifying glass with 2 verniers for 10 seconds, with **Centering Apparatus** . . . . . £. s. d. 50. 0. 0

The circle and observing telescope have independent motion about the central axis, with screw motion. The measurements can be taken either by firmly clamping the circle carrying the crystal, and by turning the alidade along with the telescope, or by clamping the alidade with the telescope and rotating the circle with the crystal. The instrument has two oculars and a number of slots for the collimator; the observing telescope is provided with an extra objective, thus facilitating the focussing of the objects under test. Illustration on application.

53,823. **Reflecting Goniometer,** can also be used as a **Spectroscope.** Figure, with circle 150 mm diameter, concealed, on silver, with reading by means of magnifying glass to 20 seconds; objective aperture 27 mm. **Without Centering Apparatus** 27.10.0

53,824. **Reflecting Goniometer for the Laboratory,** with circle 150 mm diameter, graduated in $^1/_3{}^0$, with telescope having an objective aperture of 22 mm, with magnifying glass, reading to 30 seconds. **Without Centering Apparatus** 19. 0. 0

53,825. **Centering Device** for the crystals, fitting the two preceding goniometers 3. 15. 0

53,826. **Reflecting Goniometer, smaller,** without magnifying glass reading, Fig. 53,826, practical model for laboratories; telescope of 19 mm aperture, graduated in $^1/_2{}^0$ and with vernier for reading to 1 Minute 13. 0. 0

53,827. — idem, Figure, with **concealed Divided Circle** and 2 magnifiers for reading, without prism illustrated in figure 16. 0. 0

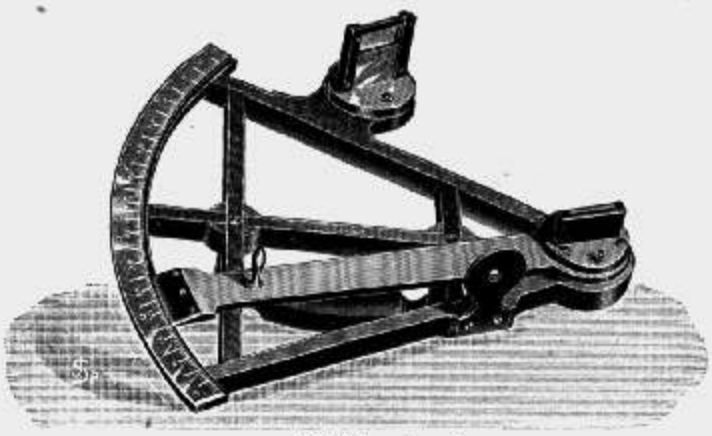
This pattern can be highly recommended as the graduation cannot be touched by the fingers.

53,828. **Model of a Mirror Sextant,** of wood, Figure 2. 0. 0

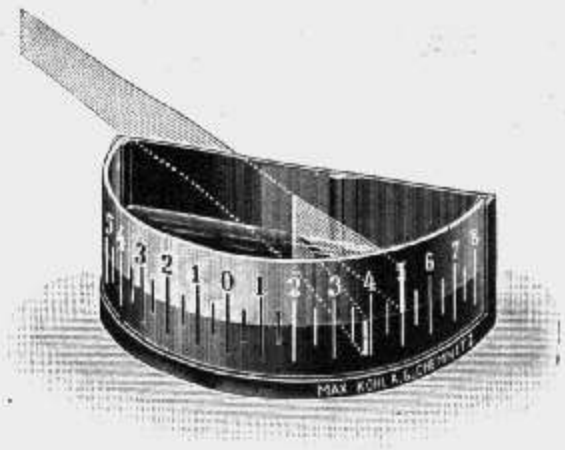
Contact Goniometers and Survey Goniometers: see p. 229

Cl. 5081, 1248, 1249.

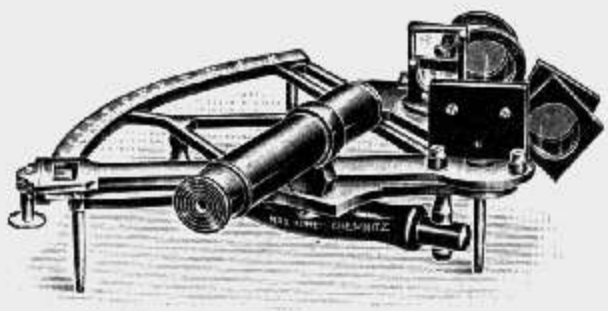
Max Kohl A. G. Chemnitz, Germany.



53 828. 1 : 5.



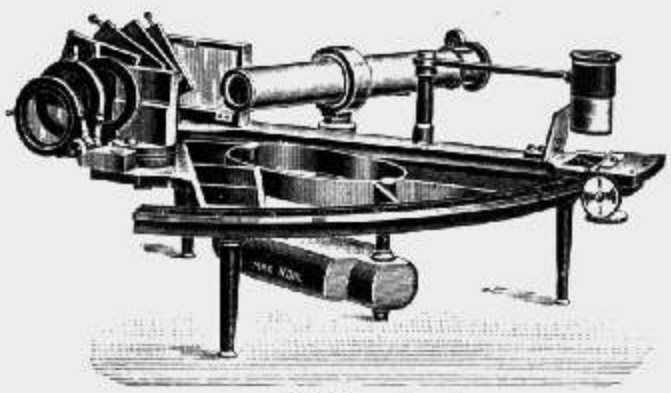
53 833. 1 : 7.



53 829. 1 : 4.



53 835. 1 : 6.



53 830. 1 : 4.



53 832. 1 : 2.

53,829. **Mirror Sextant,** Figure, entirely of brass, with telescope and 4 screening glasses, the vernier giving 5 minutes . . . . . £. s. d. 4. 10. 0

53,830. **Mirror Sextant, Large Pattern,** entirely of brass, with circle divided on silver, with telescope, screening glasses, vernier with magnifying glass 10. 10. 0

53,831. **Level Quadrant,** for determining angles of altitude to an accuracy of 1 minute . . 3. 15. 0

The level and the object are observed simultaneously in the telescope. The instruments can also be used on vehicles, ships, airships, etc.

53,832. **Pocket Heliotrope** after Steinheil, Figure, in case 4. 0. 0

The apparatus gives luminous signals to a distance of 50 km.

Refraction, Total Reflection.

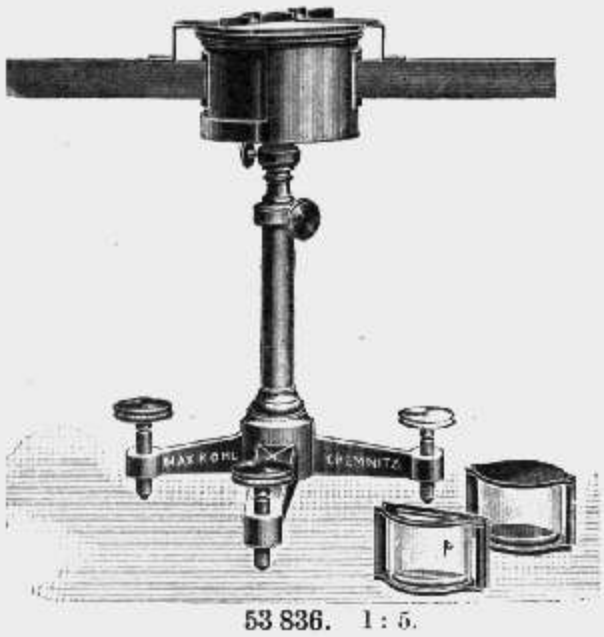
53,833. **Light-Refraction Apparatus,** after Müller, Figure, for showing the refraction of light-rays in liquids, with etched graduation on ground glass, metal vessel with gap . . . 0. 16. 0

53,834. — idem, entirely of glass 0. 12. 0

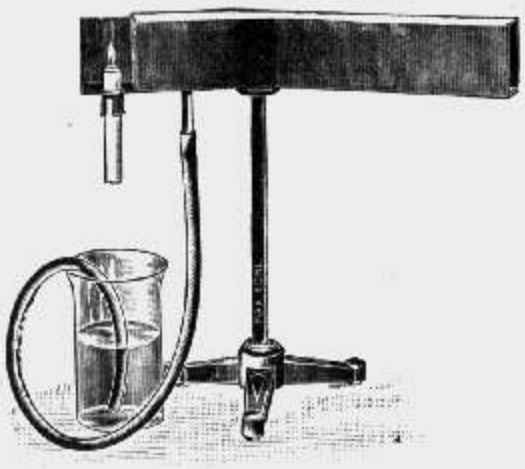
53,835. **Light-Refraction Apparatus** after Mühlenbein, Figure, for demonstrating the laws of reflection and of refraction for solids and liquids; also total reflection; can also be used as a camera obscura (Prakt. Phys., Vol. 2, Part 1) 8. 0. 0

The apparatus has circular and sine graduation, and has, as accessories, a Plane Mirror, two Half-cylinders of crown and flint glass respectively, also a hollow cylinder for liquids.

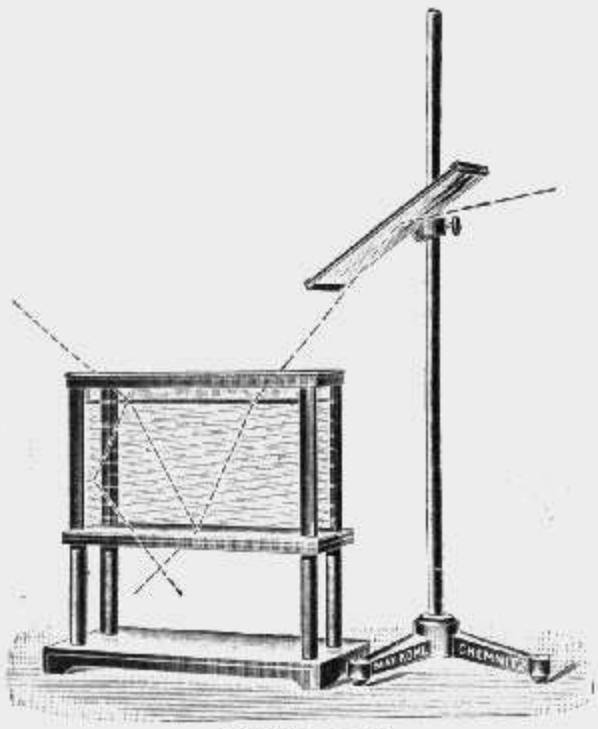
Heliographs for Signalling — Particulars on Application.



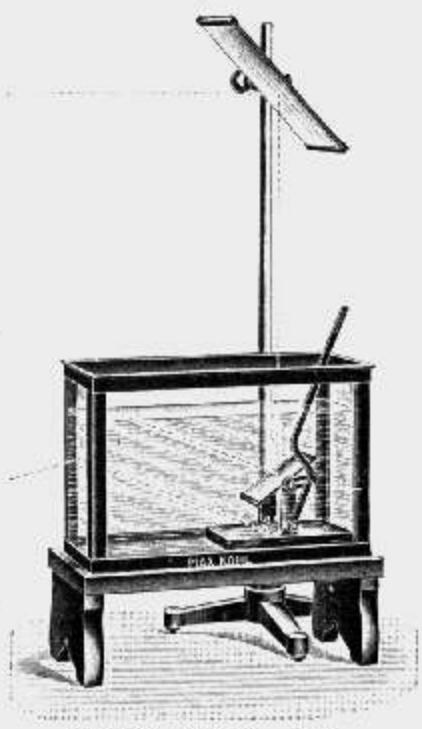
53 836. 1 : 5.



53 837. 1 : 6.



53 839. 1 : 8.



53 839, 53 840. 1 : 8.

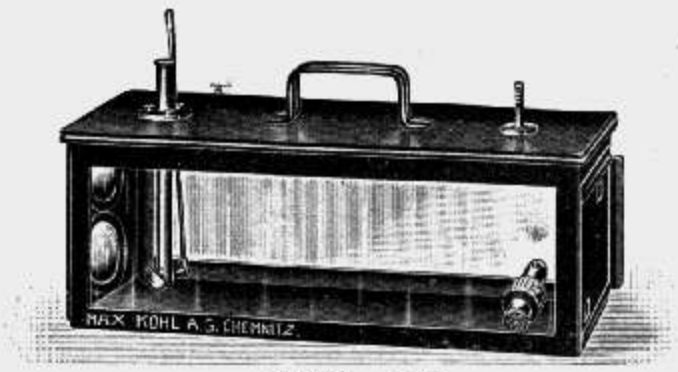
	£. s. d.
53,836. **Light-Refraction Apparatus** after Neumann, Figure, also for experiments on simple and total reflection, on stand with levelling screws, vertical adjustment, with head graduated for convenience of reading (Ztschr. f. d. phys. u. chem. U. **8**, 1894/5, p. 357)	4. 10. 0
53,837. **Light-Refraction Trough** after Neumann, Figure, simple pattern (Ztschr. f. d. phys. u. chem. U. **7**, 1893/4, p. 29), on stand with glass vessel and rubber connecting tubing	0. 16. 0
53,838. **Rectangular Glass Box for Experiments on Refraction and Total Reflection** (W. D. Fig. 277—283 [263—269]) and for the curvilinear propagation of light (W. D., p. 337 [310]), 25 cm long, 8 cm wide and 16 cm high	0. 18. 0
53,839. — idem, **with support and adjustable mirror,** Figures, otherwise as No. 53,838	2. 8. 0
53,840. **Rotary Mirror** for inserting the glass box of the preceding apparatus, see Figure, with lever for conveniently adjusting; for use under water	0. 18. 0
53,841. **Refraction Box** after Stahlberg, Figure (Ztschr. f. d. phys. u. chem. U. **15**, 1901, p. 65), with 2 watch glasses inserted in one of the side walls	2. 8. 0

One half of the box is filled with flourescent water, the other half with tobacco smoke. A mirror, which can be rotated and adjusted from the outside, is fitted on the lid.

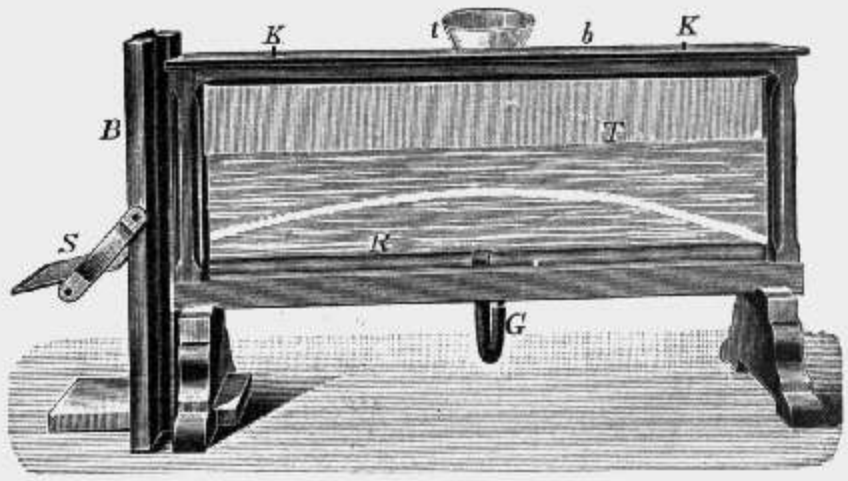
In order to observe simultaneously the refraction and reflection occurring for different angles, use is made of a small glass, with slot diaphragm, which has to be fixed between the two longitudinal walls; this glass reflects (by total reflection) the transmitted light in single cones in every direction.

Cl. 1298, 1299, 1286, 1287.

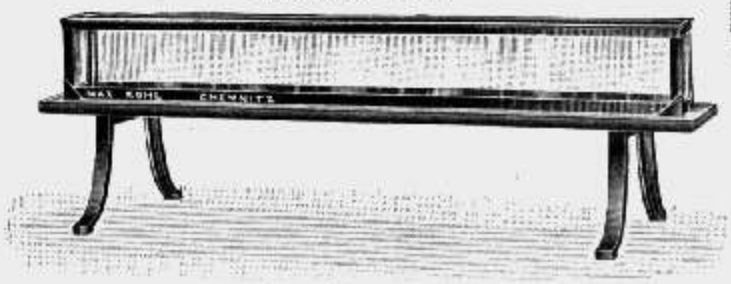
Max Kohl A. G. Chemnitz, Germany.



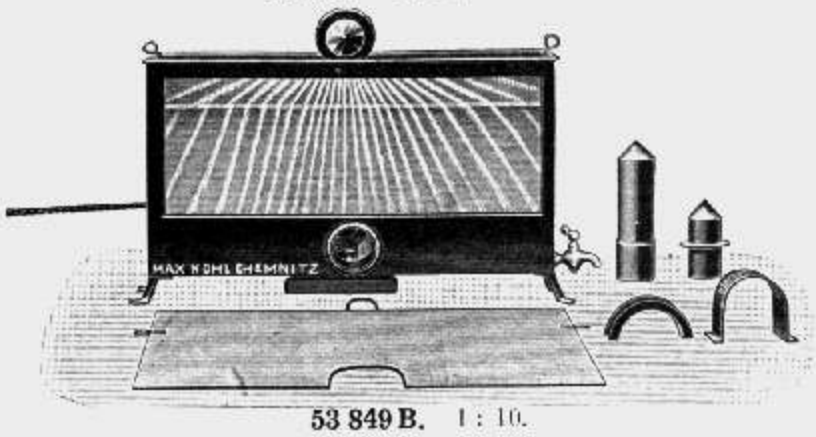
53 841. 1 : 7.



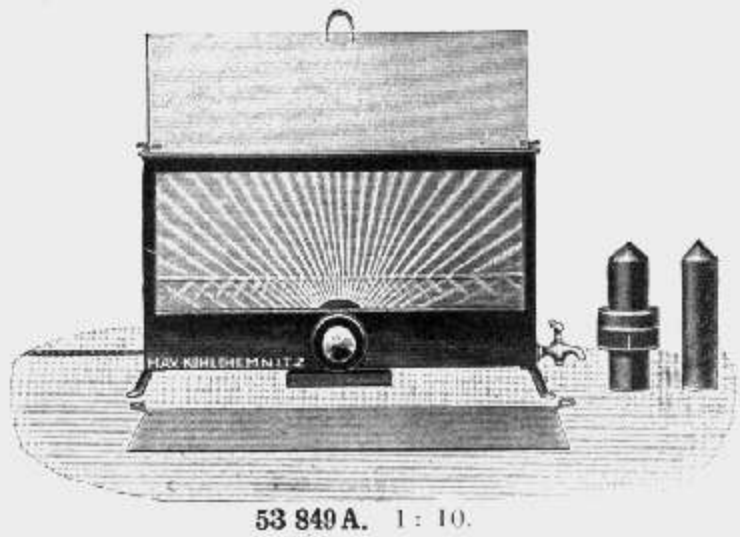
53 847. 1 : 5.



53 846. 1 : 14.



53 849 B. 1 : 10.



53 849 A. 1 : 10.

Max Kohl A. G. Chemnitz, Germany.

2 watch glasses, one with the convex and the other with the concave side facing outwards, allow the phenomena to be demonstrated experimentally on spherical surfaces. The apparatus can be used either with the light entering from the left or the right. £ s. d.

53,842. — i d e m, without **Watch Glasses** 2. 2. 0

53,843. **Light-Refraction Apparatus** after Kepler (M. T. Fig. 133) 0. 16. 0

53,844. **Refraction and Reflection Apparatus,** after Weinhold (W. D. Figs. 284, 285), after the style of apparatus No. 53,849, casting the luminous rays in all directions . . . 0. 16. 0

53,845. — i d e m, after Grimsehl (Ztschr. f. d. phys. u. chem. U. **20**, 1907, p. 214), with glass vessel 1. 2. 0

The apparatus can be used with the room half darkened. An arc lamp should be employed as the luminous source.

53,846. **Rectangular Glass Vessel,** F i g u r e, for showing the curvilinear course of the rays through a medium of unequal optical density, 1 m long 1. 6. 0

53,847. **Apparatus** after Hartl for showing the curvilinear path of the rays through a medium of unequal optical density, F i g u r e (Ztschr. f. d. phys. u. chem. U. **9**, 1896, p. 116) 2. 0. 0

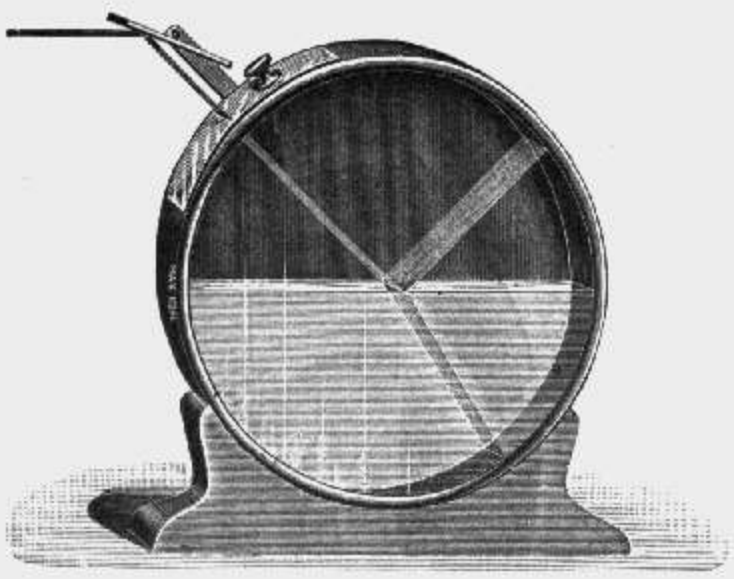
The apparatus can be filled in a few minutes; the filling device consists of a funnel, a length of tubing and a tube having a number of small apertures directed downwards and terminating in the bottom of the apparatus. By means of this device the layers can be drawn off and kept for further experiments.

53,848. **10 Bottles,** with Glycerine-Water mixtures for above, with 10—100 % solutions . . 0. 6. 0

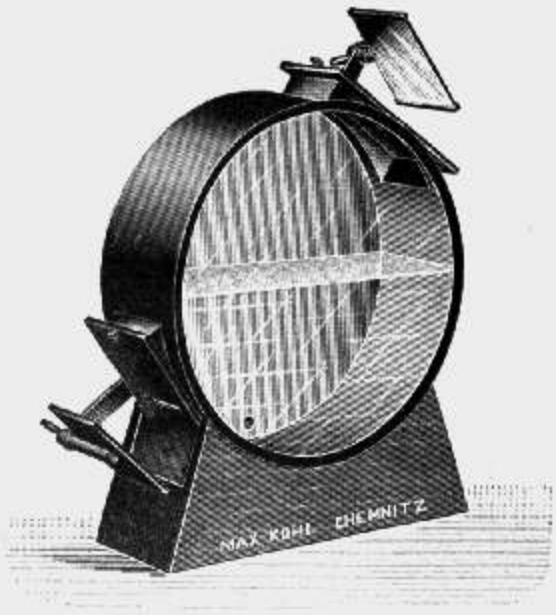
53,849. **Apparatus for Reflection and Refraction in Water,** after Kolbe, Figs. A and B (Ztschr. f. d. phys. u. chem. U. **19**, 1906, p. 1) 3. 4. 0

A glow lamp having a straight filament can be placed inside and above the vessel (surrounded by corresponding slotted cylinders).

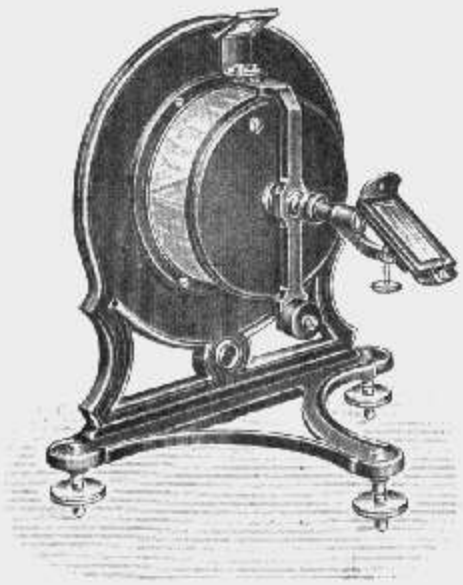
Given in arc **2 Half Cylinders** and **3 Whole Cylinders with slots,** also **2 white screens.** Fig. 53,849 A shows the path of the rays in demonstrating Kemna's experiment on the refraction and reflection of light when the light passes from water to air, Fig. 53,849 B when passing from air to water.



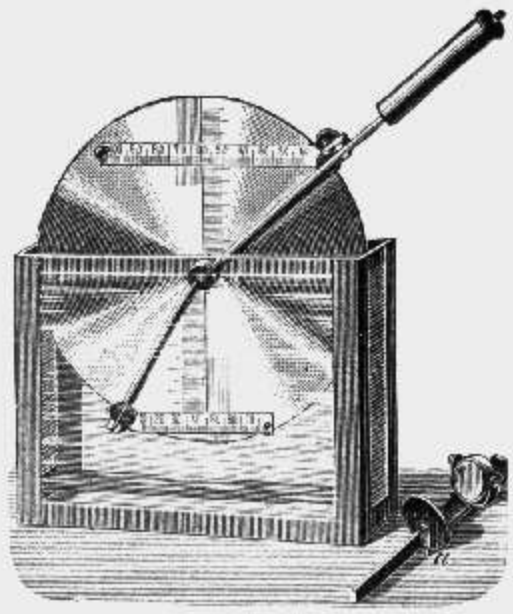
53 850. 1 : 7.



53 851. 1 : 6.



53 852. 1 : 6.



53 853. 1 : 5

* 53,850. **Light-Refraction Apparatus,** after Tyndall (Tyndall's Drum), Figure, for objective demonstration (M. P. II, 1, Fig. 31 [26]) . . . . . £. s. d. 2. 0. 0

A cylindrical metal vessel 300 mm diameter can rotate about a polished wood base. In front of a gap a mirror is fitted wth the aid of which a ray of light may be made to penetrate at various angles, according to the rotation of the vessel. The water is coloured with a fluorescent liquid; the air space being filled with smoke.

* 53,851. — idem, Figure, with a second Mirror and Gap underneath, for total reflection 2. 10. 0

* 53,852. **Light-Refraction Apparatus** after Mach, Figure (M. P. 8th Edn., II, 1, Figs. 64 and 65; Carls Repertorium **7**, 1871) 3. 0. 0

The illustration shows the apparatus from the back, with the device for reflecting the luminous pencil. The front of the vessel is glazed.

* 53,853. **Apparatus for Determining the Refractive Indices of Liquids,** after Blümel, Figure (Ztschr. f. d. phys. u. chem. U. **2**, 1888/9, p. 163) 2. 8. 0

The apparatus consists of a vessel with plate glass walls, and a graduated disk of German silver, about the centre of which 2 levers can rotate. Two rules permit of reading the sine of the incident and refractive angle. The apparatus is arranged for subjective and objective demonstration.

* Can be used with the Projection Apparatus.

Cl. 1235, 3952, 5066, 1292,

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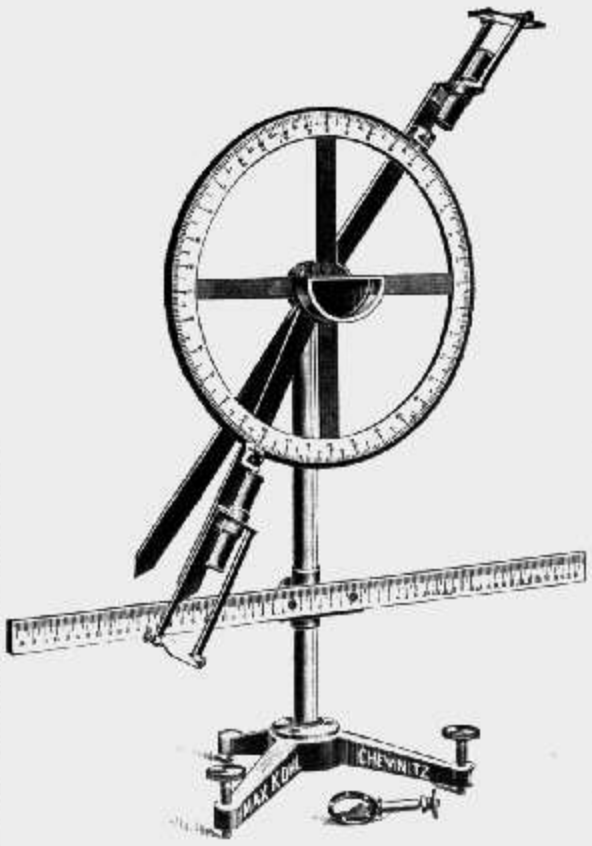
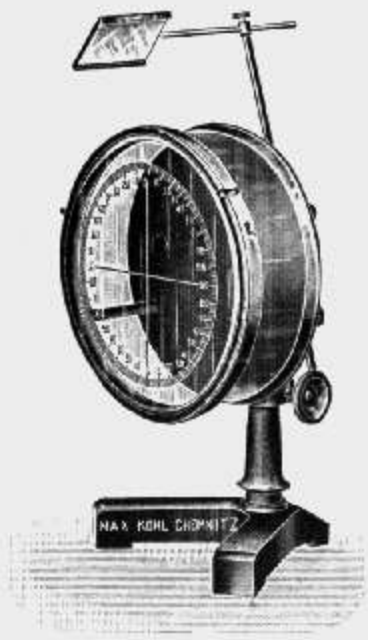
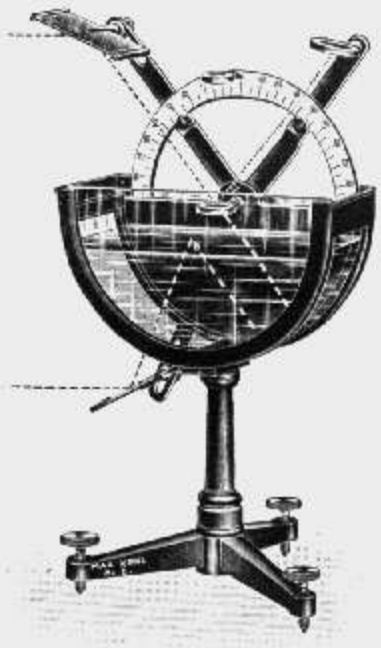


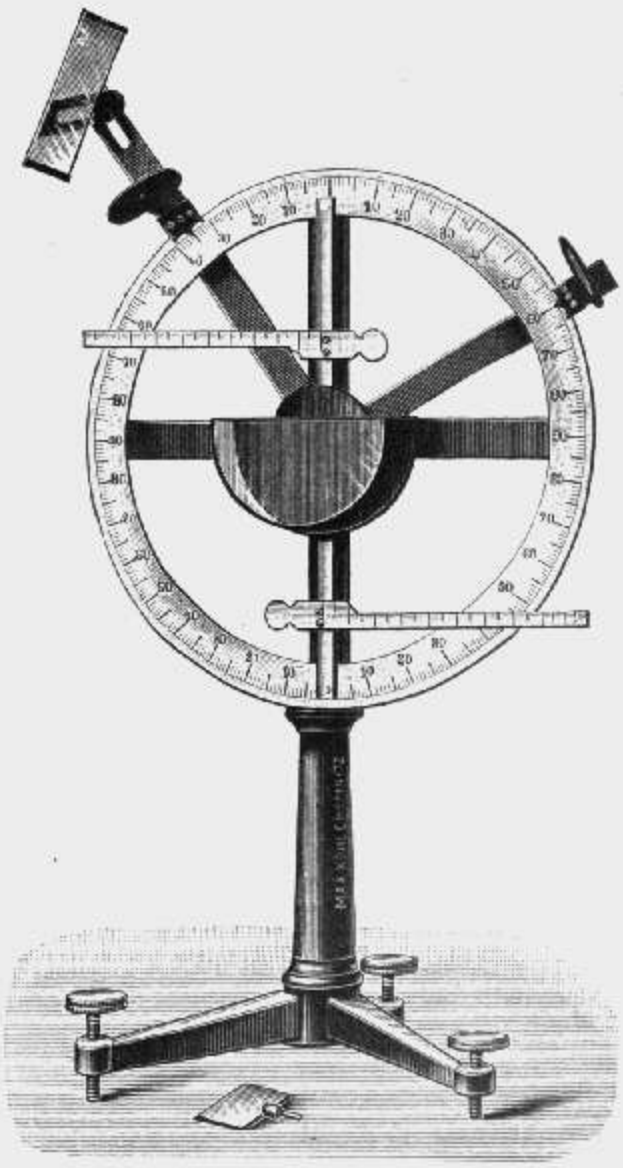
53 858. 1 : 8.



53 854. 1 : 5.



53 855. 1 : 7.

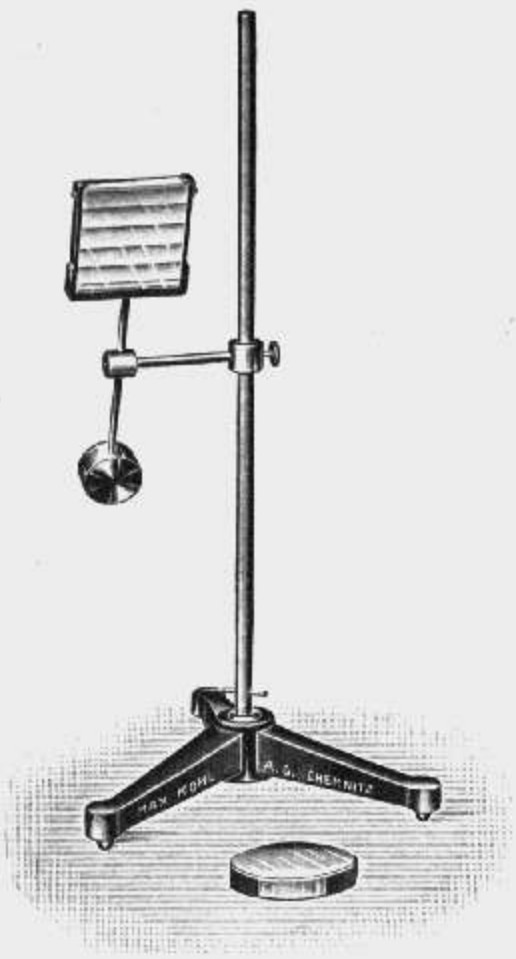


53 857. 1 : 5.

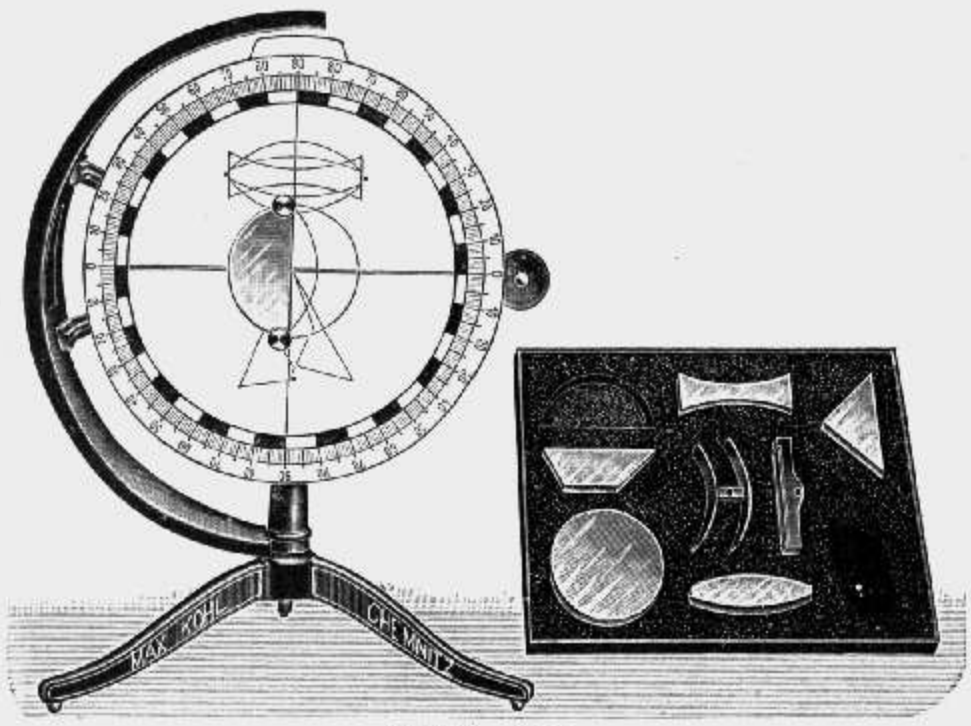
	£ s. d.
* 53,854. **Optical Demonstration Apparatus,** after Stromann, Figure (Ztschr. f. d. phys. u. chem. U. **18**, 1905, p. 71), for demonstrating various fundamental laws relative to the theory of light	8. 0. 0
The following can be proved: Refraction of light; Reflection on Plane and Cylindrical Surfaces; the Bounding Angle and Total Reflection; the passage of the rays through plane parallel plates; through plano-convex and bi-convex lenses; Polarisation; the warped band of light; Total Reflection in a jet of water; the various properties of refraction possessed by different coloured lights; Chromatic Aberration and combination; the Curvilinear path of the rays in a substance of varying density, etc. etc.	
* 53,855. **Apparatus for the Laws of Refraction, Reflection, Total Reflection,** etc., Figure	4. 0. 0
In the centre a mirror can be introduced for experiments on reflection, or a lens for demonstrating the path of rays in lenses.	
* 53,856. — idem, **with Perfect Circle**	4. 12. 0
* 53,857. **Reflection and Refraction Apparatus,** Figure	5. 10. 0
The semi-cylindrical glass vessel can be replaced by a plane mirror. The circle is 30 cm diameter and carries two alidades for measuring the angles, and two graduated sliding rules for directly determining the sines.	
53,858. **Reflection and Refraction Apparatus** after Silbermann, Figure	8. 0. 0

* Can be used with the projection Apparatus.

Cl. 4174, 3389, 5880, 1290.



53 860. 1 : 6.



53 859 A. 1 : 6.

53,859. **Optical Disc** after Hartl, Figs. A and B (Nos. 1—17), for demonstrating the laws of elementary optics (Ztschr. f. d. phys. u. chem. U. **9**, 1896, p. 113; M. T. Fig. 134), for experiments with single rays and parallel rays . . . . . £. s. d. 3. 18. 0

The apparatus is used in an undarkened room with direct sunlight; the entire arrangement is very comprehensive. The following can be demonstrated: the Law of Reflection for Plane Mirrors; the effects and laws relative to the concave and convex mirror; Refraction by a plane parallel plate; prismatic refraction and chromatic aberration; the action of condensing and dispersion lenses; explanation of the rainbow.

The following pertain to the apparatus: 2 Slotted Sheets with three and seven gaps; Coloured Glass Plates and small Brass Plates; 1 Glass Plane Mirror; 1 Concave and 1 Convex Mirror, of glass; 1 each semi-circular, circular, and trapezoidal Crystal Plate; 1 Bi-convex and Bi-concave Cylindrical Lens of crystal glass, also a rectangular prism with members of equal length.

Fig. 53,589 B shows the path of the rays in the following experiments: (1) Reflection on plane surfaces; (2) Parallel Rays parallely reflected; (3) Reflection on the Concave Mirror; (4) incident parallel Rays are reflected to the focus; after removing the slot diaphragm, demonstration of Catacautery; (5) corresponding Phenomena on the Convex Mirror; (6) Refraction and Reflection of Light between Air and Glass, determination of the refractive indices; (7) the same, between Glass and Air; (8) total Reflection in Glass; (9) Refraction in a plane Plate; (10) Refraction on the 45° prism; chromatic aberration; (11) minimum deflection with symmetrical Ray; (12) Refraction at condensing lens, focus; (13) collecting parallel Rays at the focus; (14) Diacautery; (15) aberration of parallel Rays; (16) combination of Lenses; (17) explanation of the Rainbow; (18) Reflection of a central pencil of rays on a plane surface; (19) idem, on the concave Mirror; (20) central pencil of rays, rendered parallel.

53,860. **Addition to the Optical Disc,** Figure, for experiments with central pencils of rays (Ztschr. f. d. phys. u. chem. U. **10**, 1897, p. 236), see also Figure 53,859 B, Nos. 18—20 1. 6. 0

Eight cones of rays, proceeding divergently from a point, are produced with this apparatus. The following can be demonstrated: the Rule of the Image for the Plane Mirror; the Reflection of the Luminous Rays issuing from a point, on Concave and Convex Mirrors; existence of the real Image; Refraction by a Condensing Lens or Aberrating Lens of the Rays issuing from one point; Action of Spectacles; Action of Diaphragms.

The additional apparatus consists of a separate ground crystal plate on iron stand, one bi-convex crystal glass lens and one diaphragm.

53,861. **Reflector** for reflecting the Solar Rays 0. 12. 0

Liquid Prisms for determining Refractive Indices: see page 501 and 502.

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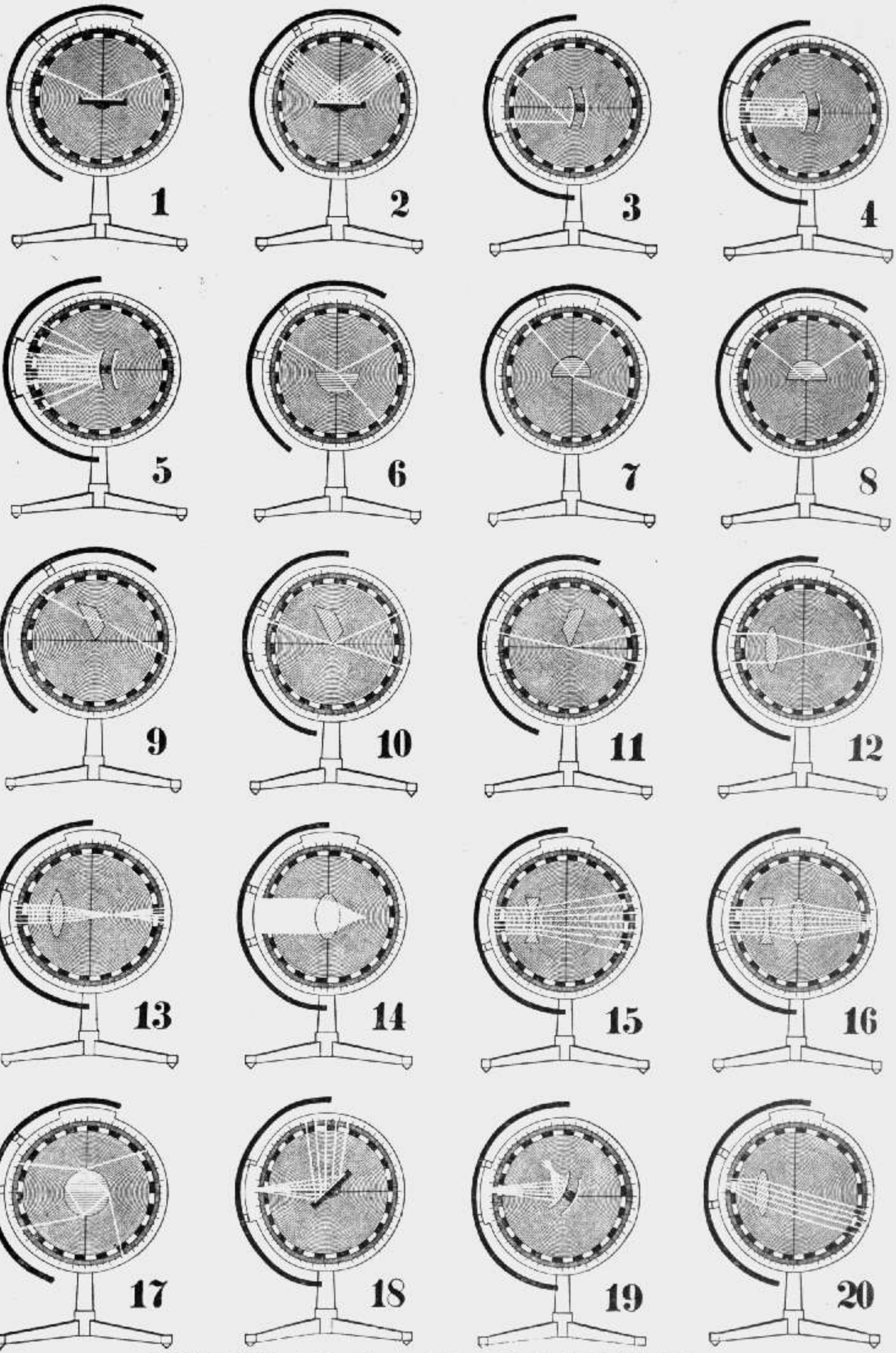
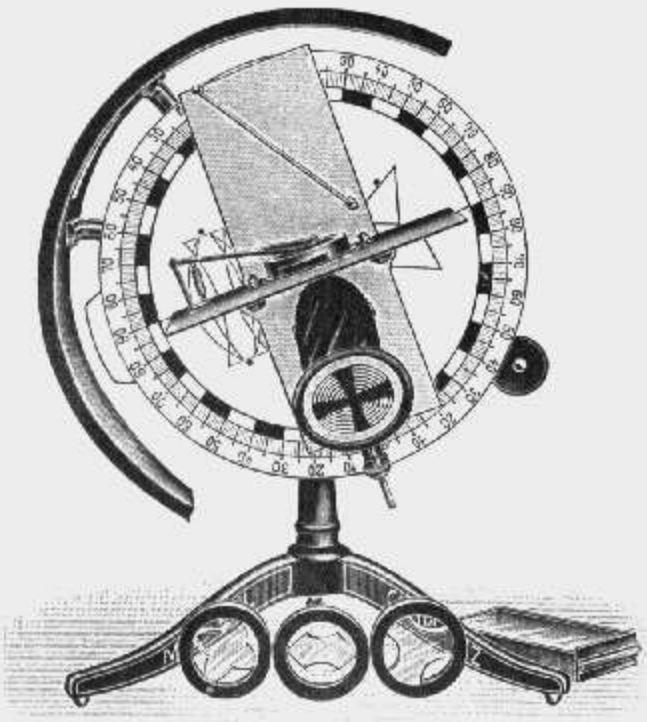
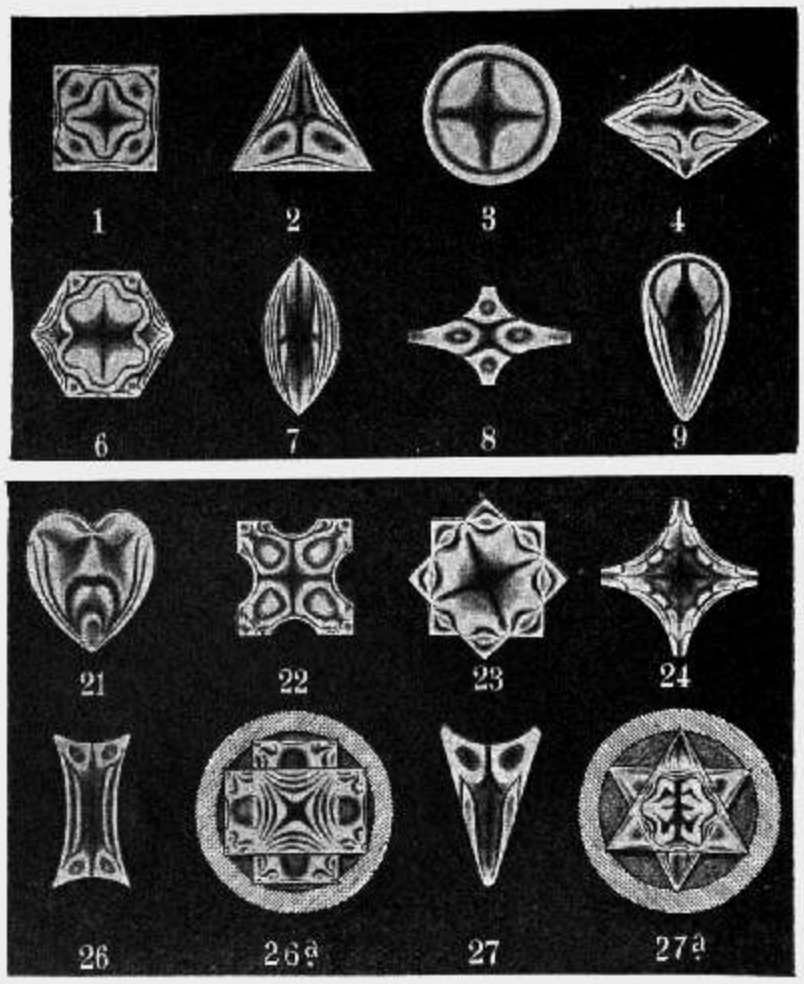
Max Kohl A. G. Chemnitz, Germany.



53859B, 53860. 1 : 11. Demonstrations with the Hartl Optical Disc.



53 862, 53 859, 53 863. 1 : 6.



53 863. 1 : 4.

53,862. **Polarisation Apparatus** for placing on the Hartl Optical Disc, Figure (Ztschr. f. d. phys. u. chem. U. **19**, 1906, p. 105), without glass preparations . . . . . £. s. d. 2. 8. 0

The following can be shown: uniform reflection of ordinary unpolarised Light; Polarisation by Reflection; Polarisation by repeated Refraction; chromatic Polarisation; Phenomena in converging; Polarised Light.

The apparatus consists of 1 rectangular Sheet Iron Plate fixed on the optical disc; 1 plate glass Slab and 1 set glass Plates as interchangeable Polarisers; 1 rotary black plate glass Slab as Analyser; 1 Stage arranged between the former; 1 small Projection Screen; 1 Condensing Lens for producing converging Light and 1 Sheet Iron Screen for completely shadowing the Projection Screen.

Fig. 53,862 shows the image when using an uniaxial crystal of sodium nitrate.

53,863. **Rapidly annealed Glasses,** Figure, for the Hartl Polarisation Apparatus, in wood mount, for producing interference images. Each (from selection) 0. 3. 6

The glasses show in polarised light the interference images obtained in Fig. 53,863. Two crossed glasses can also be used (see No. 26a and 27a in Fig. 53,863); it is advisable in this case to employ the baseplates listed under No. 53,864, which are supplied with a separate mount so as to allow the upper plates to be easily interchanged.

53,864. **Baseplate for Crossed Glasses** for producing Interference Images, comprising a rapidly annealed glass with special wood mount; for use in conjunction with the rapidly annealed glasses listed in the preceding item . . . . . Each 0. 4. 0

The type of glasses (1) (2) and (7) as per Fig. 53,863 is specially suitable for baseplates. Unless otherwise stated, triangular baseplate No. 2 is supplied. The mount of the baseplate is provided with special clamps, one of which can easily be loosened so that the upper plate can be quickly interchanged.

53,864 a. **Projection Lens** for projecting the interference figures on the screen, the size of the image being 50 cm diameter. This lens is fitted on the Polarisation Apparatus in place of the small screen 0. 4. 0

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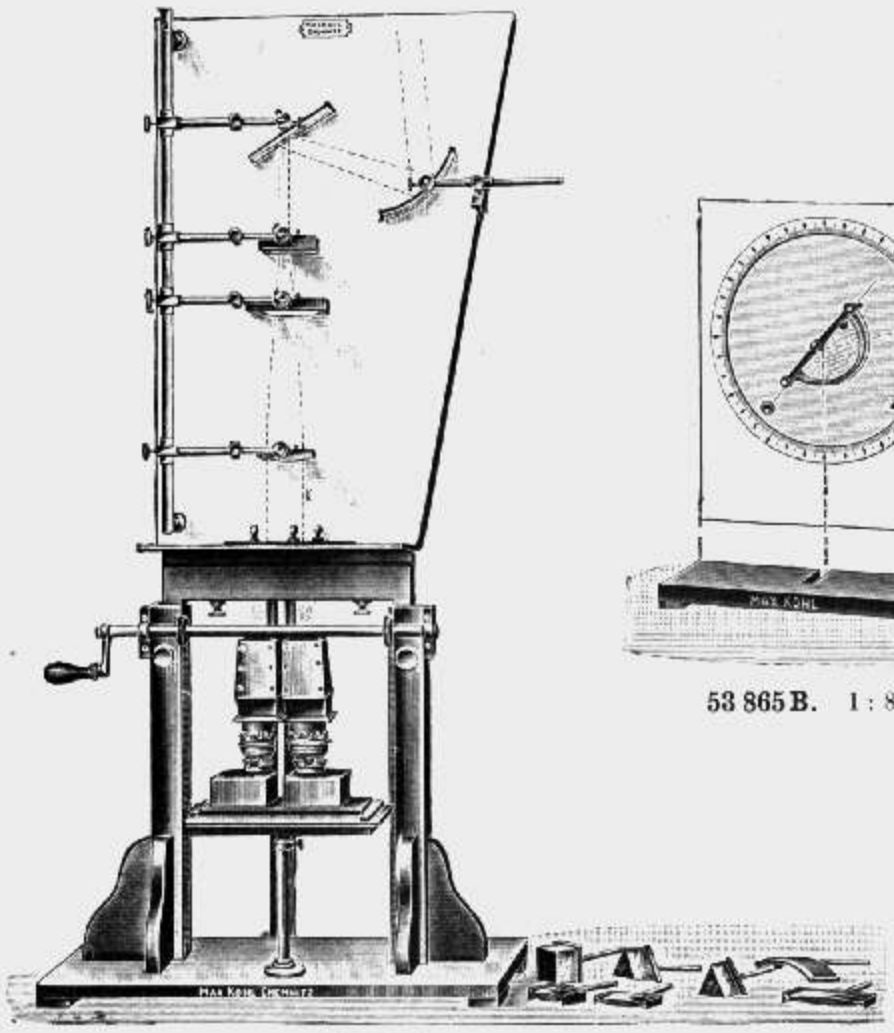
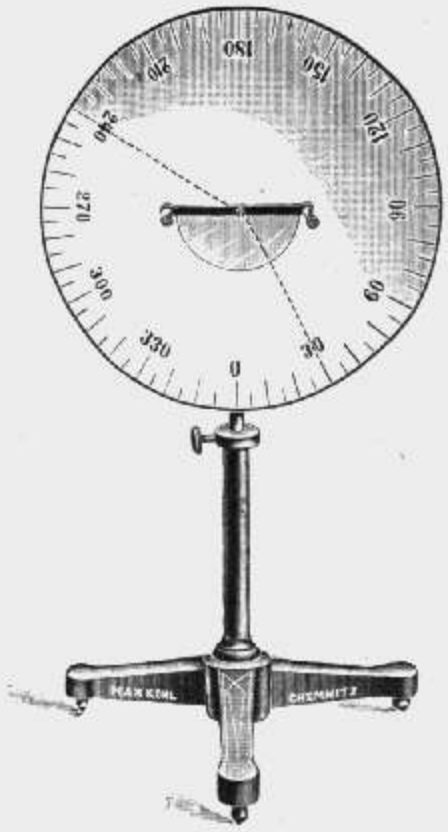
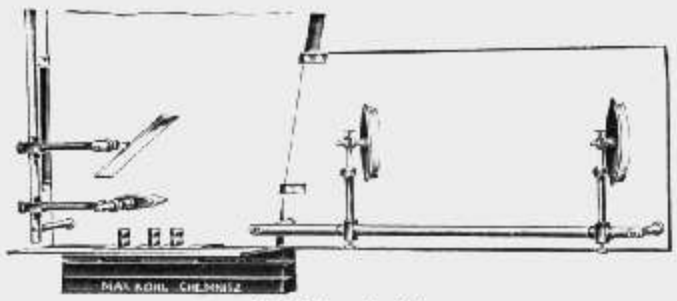


53 865 A. 1 : 12.

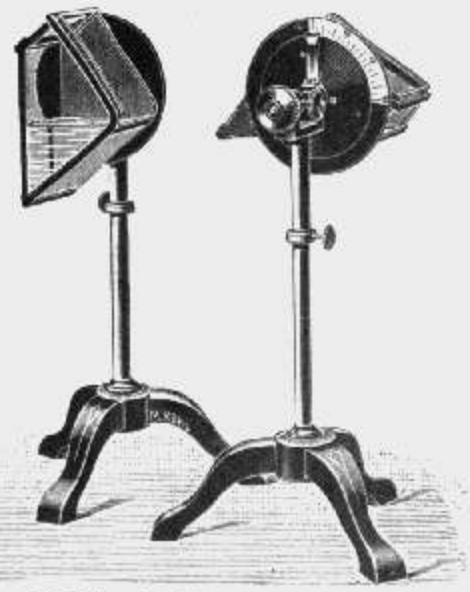
53 865 B. 1 : 8.



53 868. 1 : 7.



53 866. 1 : 12.



53 869. 1 : 6.

53,865. **Universal Optical Apparatus** after Rosenberg, Figs. A and B (Ztschr. f. Instrumentenkunde 7, 1887, p. 323) . . . . . £. s. d. 18. 0. 0

It is possible to show with the apparatus all the laws of reflection and refraction on mirrors, lenses and prisms as well as the splitting up of white light into the spectrum colours and the recomposition of the same. In addition, the microscope and the telescope can be explained with the apparatus.

The upper part of the apparatus can be fixed on the frame in three different positions.

Accessories: 2 Paraffin Lamps of special type; 1 plane Mirror; 1 concave Mirror; 1 convex Mirror; 4 bi-convex Lenses of different focal length and diameter; 1 bi-concave Lens; 1 plano-convex Lens; 1 glass Cube; 1 Apparatus for proving reflection and refraction, Fig. B; 2 Prisms, one of these being of flint glass. (For larger pattern apparatus see No. 53,867.)

53,866. **Auxiliary Apparatus for explaining the Measurement of the Velocity of Light** by the Fizeau and Foucault methods, Figure 3. 0. 0

53,867. **Universal Optical Apparatus** after Rosenberg, **larger pattern,** 2 m higher 30. 0. 0

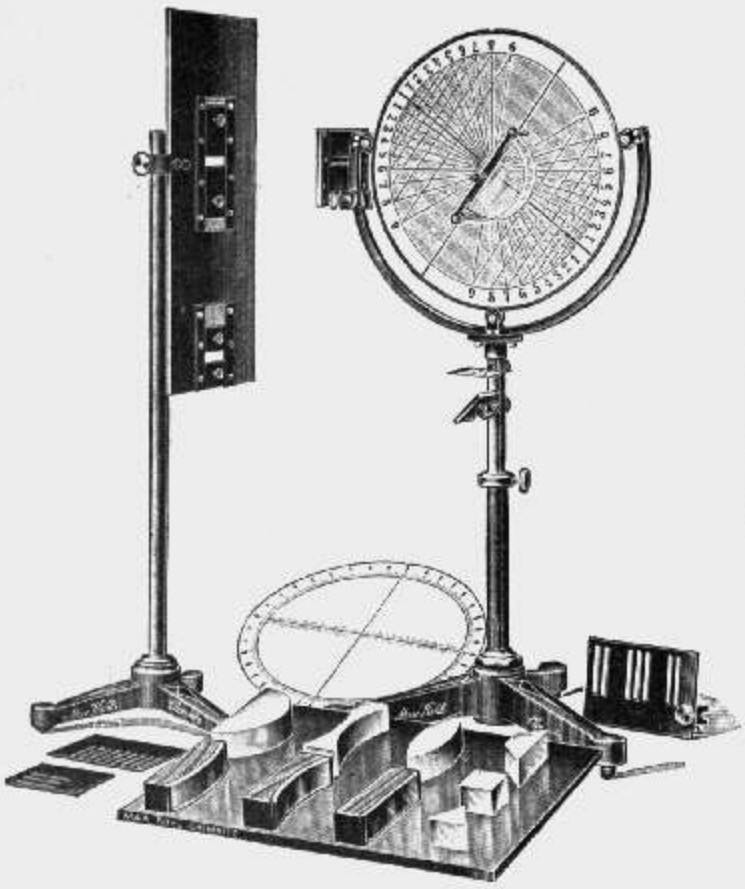
53,868. **Apparatus for Demonstration of the Refraction of Light in Glass and in a Glass Prism,** Figure 2. 10. 0

On a stand is fixed a divided circle, which is capable of rotation, and in the centre of which can be fitted a semi-circular ground glass body or a prism of 30 mm side.

53,869. **Hollow Prism** after Silbermann, Figure, for showing that the deflection increases when the refractive angle increases (M. P., 8th Edn., II, 1, Figs. 84—86) 3. 12. 0

The prism can be filled with any aqueous, alcoholic or corrosive liquid, as it is cemented in the fire. The box is rotary and has a graduation.

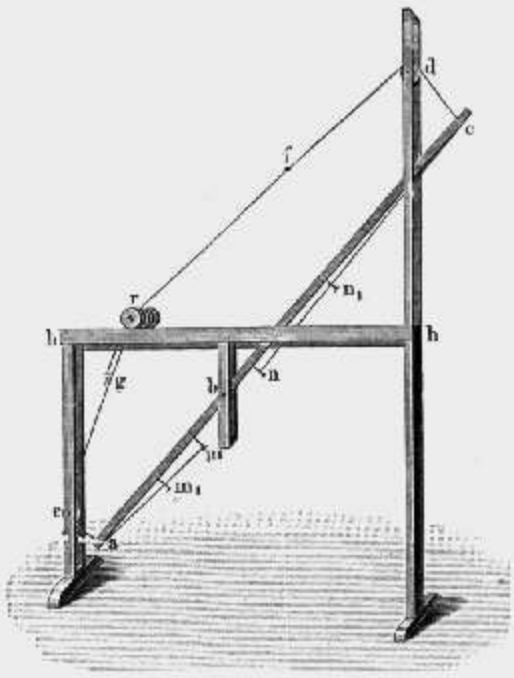
53,870. **Glass Plate for Refraction Experiments** (M. T. p. 179), 2 cm thick, size 10×15 cm 0. 4. 0



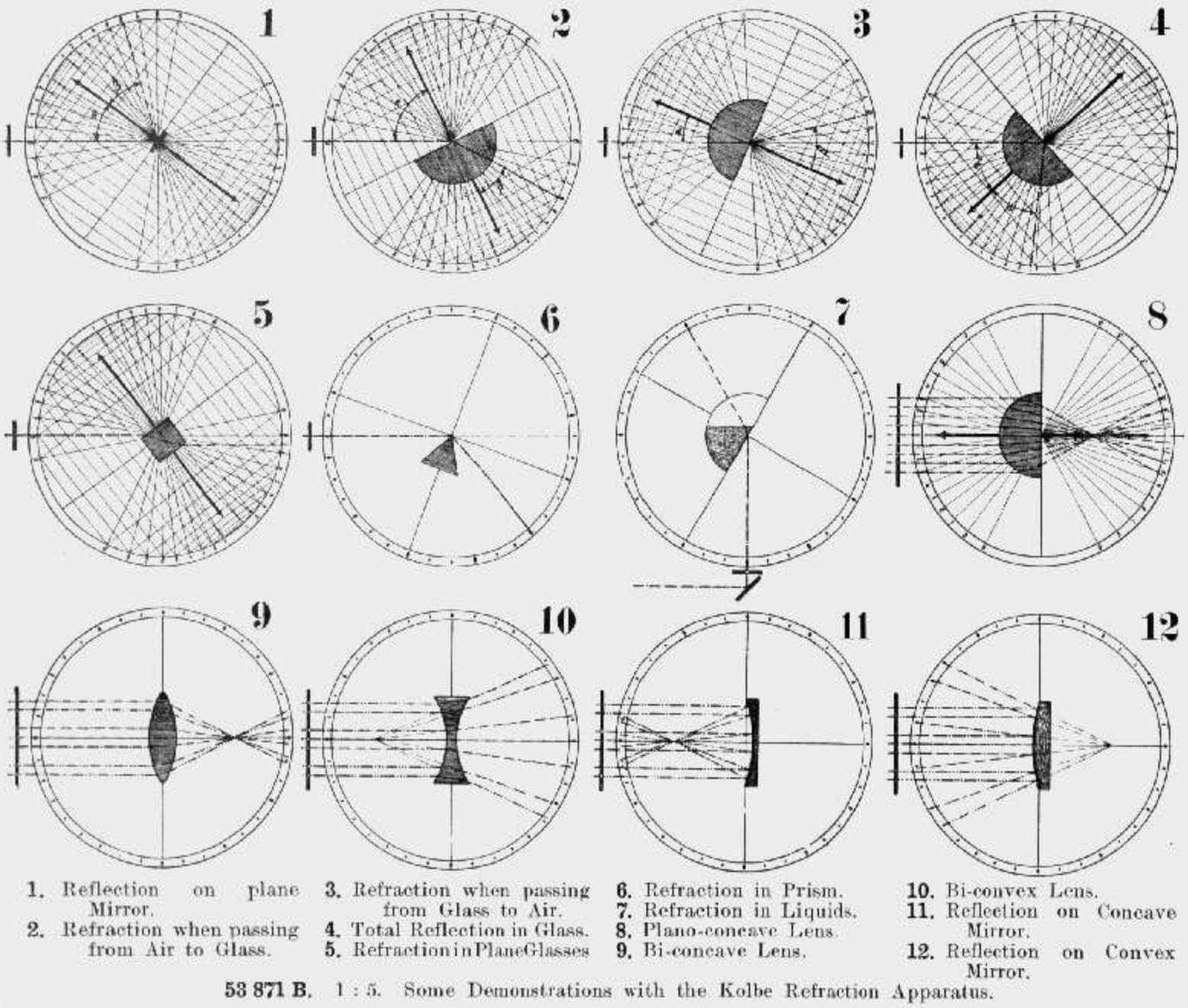
53 871 A. 1 : 7.



53 874. 1 : 5.



53 877. 1 : 10.



1. Reflection on plane Mirror.
2. Refraction when passing from Air to Glass.
3. Refraction when passing from Glass to Air.
4. Total Reflection in Glass.
5. Refraction in Plane Glasses
6. Refraction in Prism.
7. Refraction in Liquids.
8. Plano-concave Lens.
9. Bi-concave Lens.
10. Bi-convex Lens.
11. Reflection on Concave Mirror.
12. Reflection on Convex Mirror.

53 871 B. 1 : 5. Some Demonstrations with the Kolbe Refraction Apparatus.

Cl. 1300, 5795, 5017, 6512.

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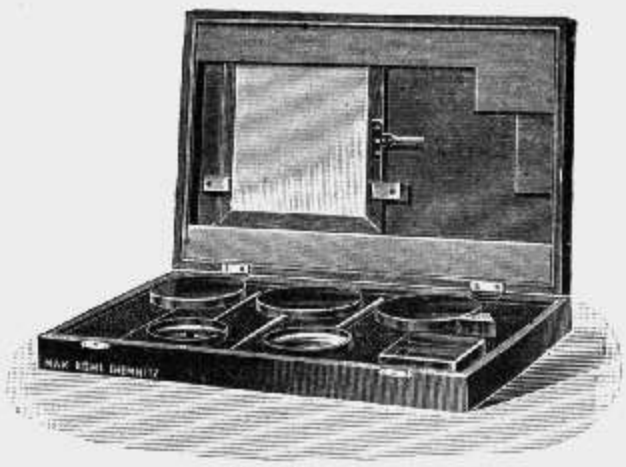
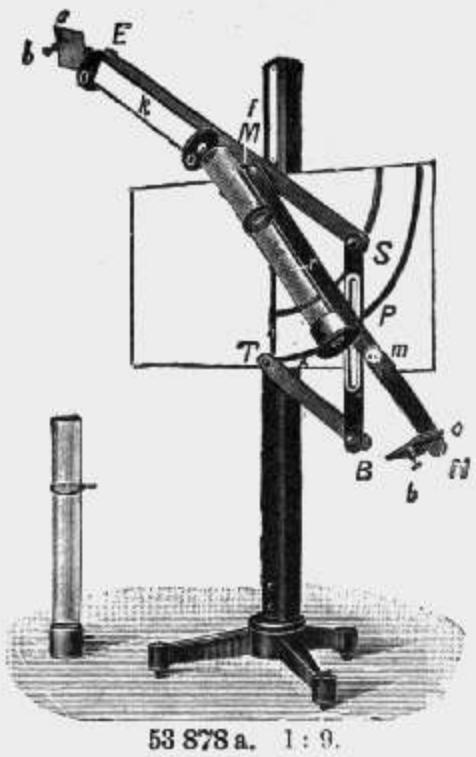
53 876. 1 : 5.



53 878. 1 : 8.



53 878 a. 1 : 9.

Max Kohl A. G. Chemnitz, Germany.

	£. £. d.
53,871. **Light-Refraction Apparatus** after B. Kolbe (Ztschr. f. d. phys. u. chem. U. **9**, 1896, p. 20, and **13**, 1900, p. 9), Figs. A and B, diameter of glass disc **360 mm**	9. 10. 0
When using parallel light experiments can be made with the apparatus on reflection on plane mirrors, refraction of the light when the rays pass from the thin into the denser medium and **vice-versa** (air-glass, glass-air, water-air, etc.), total reflection, refraction in plane parallel glasses, minimum of deflection, refraction in prisms and lenses, reflection on cylindrical mirrors.	
The apparatus consists essentially of a ground glass disc capable of rotation in rollers, provided with a suitable sine graduation and carrying a spring clip in order to easily interchange the light-refracting bodies. The following are given in with the apparatus: 1 Screen with two diaphragms; 1 cardboard Disc with marked degree graduation; 4 Diaphragms with 1, 3, 7 and 9 gaps; 1 Reflecting Mirror; 1 solid half-cylinder of Glass; 1 hollow half-cylinder of Glass; 1 flint Glass Prism; 1 Glass Block; 1 cylindrical Condensing Lens and 1 cylindrical dispersion Lens each 60 mm focus; 1 concave and 1 convex Mirror each 100 mm radius of curvature; 1 Glass Body with two plane parallel surfaces and a refracting angle of 45° and one of 60°.	
53,872. — i d e m, with glass disc 240 mm diameter	8. 0. 0
53,873. **Light-Refraction Apparatus** after Reusch, movable (W. D. Fig. 289 [272])	1. 4. 0
* 53,874. — i d e m, for the Projection Lantern, F i g u r e	0. 16. 0
53,875. **Light-Refraction Apparatus** after Pfaundler (M. P., 9th Edn., II, 1, Figs. 46 and 47), for demonstrating the minimum deflection in the prism	2. 0. 0
* 53,876. **Apparatus for Refraction in Plane Glasses,** F i g u r e, for showing the apparent displacement of the object by moving a plane parallel plate in front of an object .	0. 6. 0
53,877. **Niemöller's Apparatus for the Mechanical Demonstration of the Law of Refraction,** F i g u r e (Fr. phys. Techn. I, 2, Fig. 2212; Ztschr. f. d. phys. u. chem. U. **5**, 1892, p. 139)	1. 16. 0
Wood Protractor on Stand, Fig. 51,491, p. 229, after Friedr. C. G. Müller (M. T., Figs. 6, 14, 15), for measuring angles in mechanics and optics	2. 10. 0
53,878. **Collection of Apparatus for Demonstrating the Laws of Reflection and Refraction,** F i g u r e, in box	7. 0. 0
1 Plane Mirror 100 mm diameter; 1 Concave Cylindrical Mirror 90 mm diameter; 1 Convex Cylindrical Mirror 90 mm diameter; 1 Convex Lens 100 mm diameter; 1 Flint Glass Prism 45 mm side; 1 Water Trough, 1 Ground Glass Screen.	
53,878 a. **Refraction Apparatus** after Stahlberg (Ztschr. f. d. phys. u. chem. U. **15**, 1902, p. 69), F i g u r e, on stand with one tube each for water and benzol	3. 0. 0
This apparatus is constructed after the style of the Reusch light-refraction apparatus. It can be adjusted for the refraction-ratio 4 : 3 (air to water) and 3 : 2 air to glass and air to benzol) and can be used with the light penetrating either from the right or left.	
53,878 b. **Light-Refraction Apparatus** after Stahlberg, exactly as No. 53,878 a, but without benzol tube	2. 15. 0

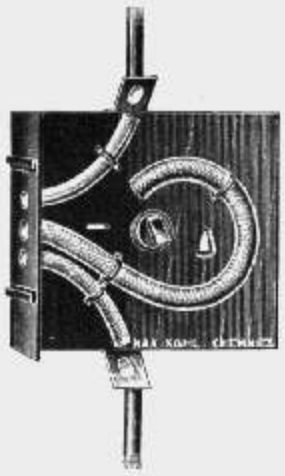
* Can be used with the Projection Apparatus.



53 880. 1 : 3.



53 881. 1 : 6.



53 883. 1 : 7.



53 884. 1 : 4.



53 886. 1 : 3.



53 888. 1 : 5.

	£. s. d.
53,879. **Small Tube with Mercury,** for demonstrating Total Reflection (W. D., Fig. 290 [273])	0. 4. 0
53,880. **Small Tube with Cedarwood Oil,** Figure, for showing the disappearance of reflection at the edge of equally refractive media (W. D., Fig. 292 [275])	0. 4. 0
* 53,881. **2 Glass Plates** with air gap, Figure, for proving Total Reflection (W. D., p. 378 [346])	0. 4. 0
* 52,590. **Calladon's Apparatus for Total Reflection in a Jet of Water** (Light Fountain): see Fig. 52 590, p. 352)	2. 0. 0
* 52,589. — smaller and without base, see Fig. 52,589, p. 352	0. 16. 0
53,882. **Prism** in which a vertical edge is cut away in the form of a vase. The figure appears, by total reflection, as a hexagonal body with glistening silvery surfaces (M. P., 8th Edn., II, 1, Fig. 80)	0. 5. 0
* 53,883. **Apparatus for Total and Partial Reflection in Glass Rods,** after Hartl (Ztschr. f. d. phys. u. chem. U. **19**, 1906, p. 134), Figure, with 1 bent rod of transparent glass which reflects the entire light on a small screen, and two frosted glass rods which reflect only a portion of the light; with stand	1. 5. 0
53,884. **2 Rectangular Prisms of Plate Glass,** Figure, 30 mm base and 30 mm height, **on Stand,** for showing the difference between ordinary reflection in glass and total reflection (M. P., 8th Edn., II, 1, Figs. 77 and 78)	1. 10. 0
53,885. — idem, 45 mm base-length and 45 mm height	2. 0. 0
53,886. **Glass Cube,** after Rosenberg, for total reflection, Figure . . . . . The light does not pass through two adjacent walls of the transparent cube.	0. 4. 0
53,887. **Glass Body** after Kolbe, with two plane parallel surfaces, a refracting angle of 45° and one of 60°	0. 8. 0
53,888. **Glass Box for Total Reflection,** after Hartl, Figure . . . . . The box is half filled with water; the corrugated glass bottom appears of silvery brightness on the upper surface when viewed from above, and as if the vessel were filled with ink, on the under side. When viewed laterally the contents can be recognised as water. Looked at from the back, the upper part seems darker than the lower, by virtue of total reflection, when the box is held up to a strong light.	0. 8. 0
53,889. **Built-up Model of a Convex Lens and of a Concave Lens (Polyprism),** after Grimsehl, for demonstrating the path of the rays (Ztschr. f. d. phys. u. chem. U. **20**, 1907, p. 215), consisting of two parallelepepedic glass vessels for filling with water, two similar vessels of trapezoidal section, which can be built up together into lenticular bodies; 1 table stand for same and 1 stand with 4 mirrors for conducting the luminous rays . . .	2. 14. 0
53,890. **Model of a Convex Lens,** after Mühlenbein, Figure, with fixed and movable coloured rods for demonstrating the path of the rays and the relations between object and image	1. 4. 0
53,891. **Model of a Concave Lens,** after Mühlenbein, same pattern as above	1. 4. 0

* Can be used with the Projection Apparatus.

Cl. 1316, 1320, 1317, 3927, 1319, 5571.

Max Kohl A. G. Chemnitz, Germany.

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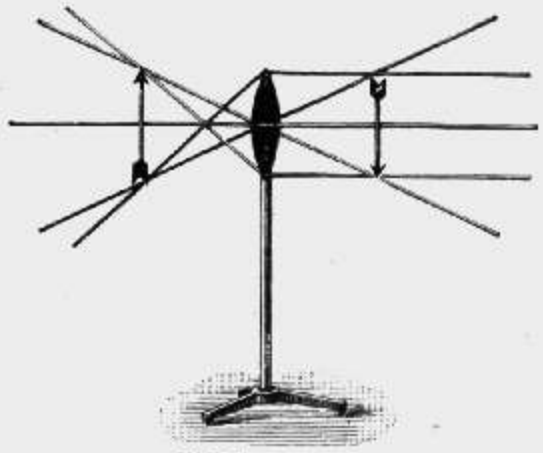
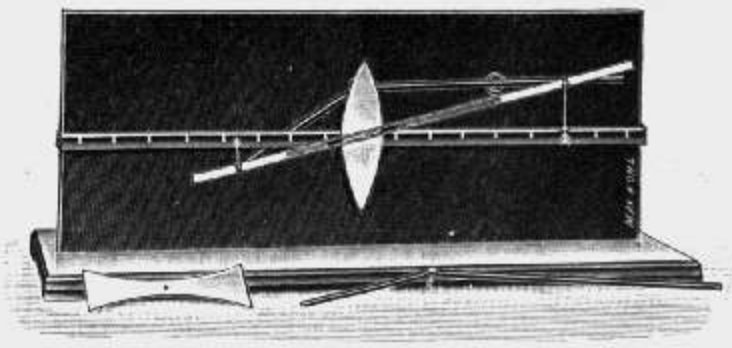


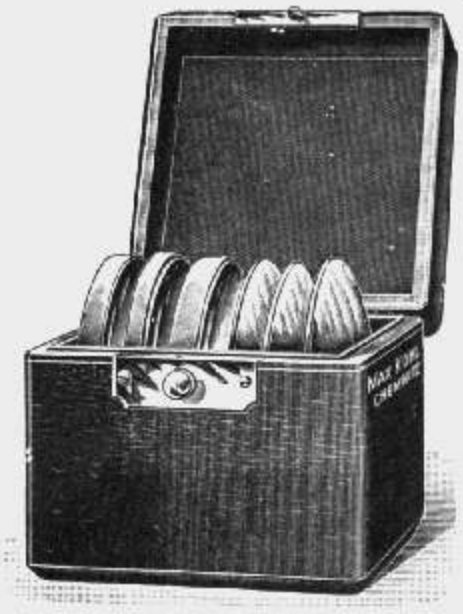
53 890. 1 : 10.



53 892. 1 : 10.



53 898. 1 : 10.



53 895. 1 : 2.

	£. s. d.
53,892. **Demonstration Apparatus for the Refraction of Light** by convex and concave lenses, Figure, after Neumann (Ztschr. f. d. phys. u. chem. U. **8**, 1895, p. 268)	1. 16. 0
The apparatus comprises two angles formed of brass strips (incident and refracted ray). The 149° angle is for the convex and that of 154° for the concave lens. The variable size and width of image can be demonstrated with the aid of the apparatus.	
53,893. **2 Slabs with Pair of Pulleys and velvet Supports,** for showing mechanically the deflection of the luminous rays in prisms, plates and lenses (M. P., 8th Edn., II, 1, Fig. 370) .	1. 12. 0
53,894. **6 Lenses in simple Case,** Figure, plano-convex, bi-convex, concave-convex, plano-concave, bi-concave, convex-concave, 50 mm diameter, Figure	0. 10. 0
53,895. **6 Lenses in case,** Figure, plano-convex, bi-convex, concave-convex, plano-concave, bi-concave, convex-concave, **65** mm diameter	0. 16. 0
53,896. **6 Lenses in Case, smaller:** plano-convex, bi-convex, concave-convex, plano-concave, bi-concave, convex-concave, 40 mm diameter, in mount with metal hafts	1. 10. 0
53,897. — idem, and, in addition, **2 Cylindrical Lenses** and **1 Achromatic Lens,** also **2 Stands**	2. 16. 0
53,898. **Plano-Convex-Lens** 200 mm diameter, Figure, on tripod, for demonstrating spherical aberration and chromatic aberration of the refracting light-rays with the aid of two diaphragms, one with a number of holes on the edge and one with round hole in centre	2. 10. 0
53,899. **Achromatic Lens System,** on Stand, one lens fixed and the other movable in hinge; diam. 30 mm, focal length 30 cm	1. 5. 0
53,900. — idem, **40 mm** diameter, focal length 30 cm	1. 10. 0

Achromatic Lenses, in mount with haft, without stand.

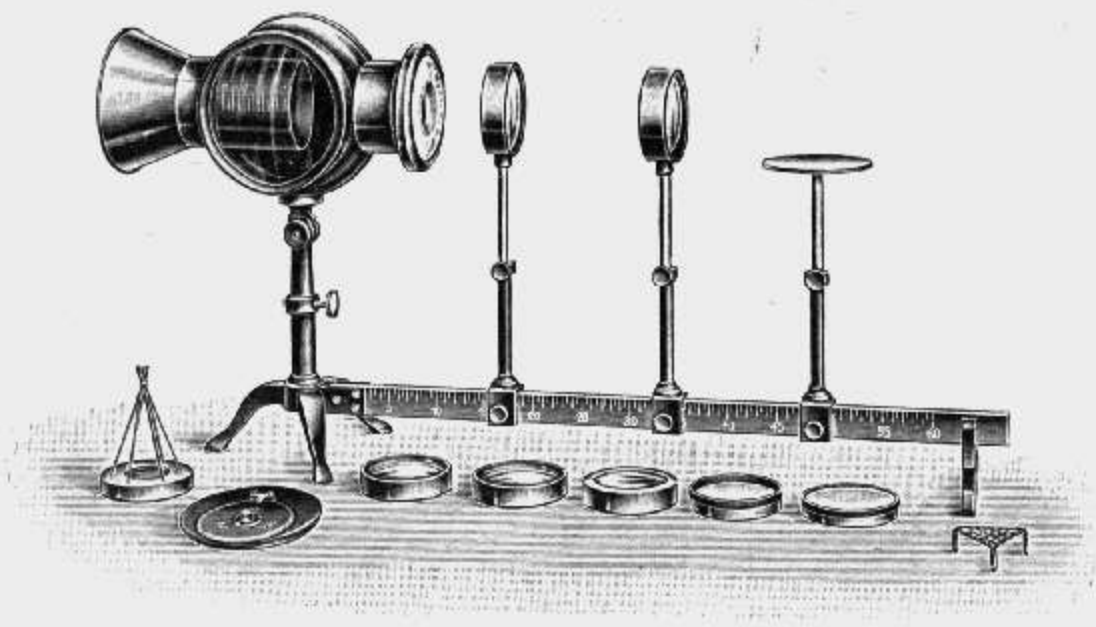
List No.	**53,901**	**53,902**	**53,903**	**53,904**	**53,905**
Diameter mm	50	60	70	80	100
Focal Length mm	300	500	500	500	800
£	**1. 0. 0**	**1. 10. 0**	**2. 0. 0**	**2. 10. 0**	**3. 12. 0**

53,906. **Stand** for above	0. 5. 0

Cl. 1348, 1349, 1353, 1352.



53 920. 1 : 5.



53 924. 1 : 8.

	£. s. d.
53,907. **Cylindrical Lens 60 mm** diameter, in mount, on stand	1. 4. 0
53,908. — i d e m, **80 mm** diameter	1. 10. 0
53,909. **2 Convex Lenses 80 mm** diameter and 500 mm focal length, on tall stands; can be used for a number of experiments, together	1. 10. 0

Hollow Lenses, bi-convex, with lateral opening for introducing liquids:

List No.	**53,910**	**53,911**	**53,912**	**53,913**	**53,914**
Diameter mm	50	80	105	130	155
£	**0. 5. 0**	**0. 7. 0**	**0. 8. 0**	**0. 10. 0**	**0. 13. 0**

— i d e m, **plano-convex:**

List No.	**53,915**	**53,916**	**53,917**	**53,918**	**53,919**
Diameter mm	50	80	100	130	160
£	**0. 5. 0**	**0. 7. 0**	**0. 8. 0**	**0. 10. 0**	**0. 13. 0**

53,920. **Lens Stand,** F i g u r e, in which can be mounted any lens from 25 to 50 mm diameter	1. 0. 0
53,921. — i d e m, for lenses from 50 to 100 mm diameter	1. 4. 0
53,922. — i d e m, for lenses from 100 to 150 mm diameter	1. 10. 0
53,923. **Hollow Concave Lens** (plano-concave) for use as a condensing lens under water (W. D., p. 384)	0. 10. 0
53,924. **Lens Apparatus** after Dr. Zwick, F i g u r e (Dr. Zwick, 150 optische Versuche usw., pp. 49 et seq.; see No. 53,928), with lenses 50 mm diameter, for showing the action of condensing and dispersing lenses and the camera obscura, the human eye and spectacles	4. 0. 0

The apparatus consists of one optical bench of 60 cm useful length, 1 Lens Holder; 2 curved Glass Disks, for representing the cornea and the iris, with the pupil, of the eye; 3 convex Lenses of 6, 8 and 11 cm focal length, in mount; 1 bi-convex Lens of 30 cm focal length with mount and haft; 1 bi-concave Lens of 15 cm focal length, with mount and haft; 1 Stage; 3 Stands; 1 Ground Glass Disk with mount; 1 Wire Cone; 1 Disk perforated in centre, with rotary disk and various diaphragm-apertures; 1 Ring for stretching paper; 1 small Tripod.

53,925. — i d e m, **larger Pattern;** diameter of Lenses 80 mm	6. 0. 0
53,926. **Optical Apparatus** after Dr. Zwick, **for the Fundamental Theories of Optics,** with optical bench 2 m long and the accessories listed below, which also contain the accessories of the lens-apparatus after Dr. Zwick, No. 53 924 (Dr. Zwick, 150 optische Versuche zur Veranschaulichung der Grundlehren der Ausbreitung, Spiegelung und Brechung des Lichts; see No. 53,928)	11. 0. 0

The constituents of the apparatus are: 1 optical Bench; 1 Lens Holder (as No. 53,924); 2 curved Glass Disks representing the cornea and the iris, with the pupil, of the human eye; 3 bi-convex Lenses of 9, 11, 15 cm focal length, with mounts; 1 bi-convex Lens of 30 mm focal length, with mount and haft; 1 bi-concave Lens of 15 cm focal length with mount and haft; 1 Stage; 5 Stands; 1 Ground Glass Disk with mount; 1 Wire Cone; 1 centrally pierced disk with pivoting disk and different diaphragms

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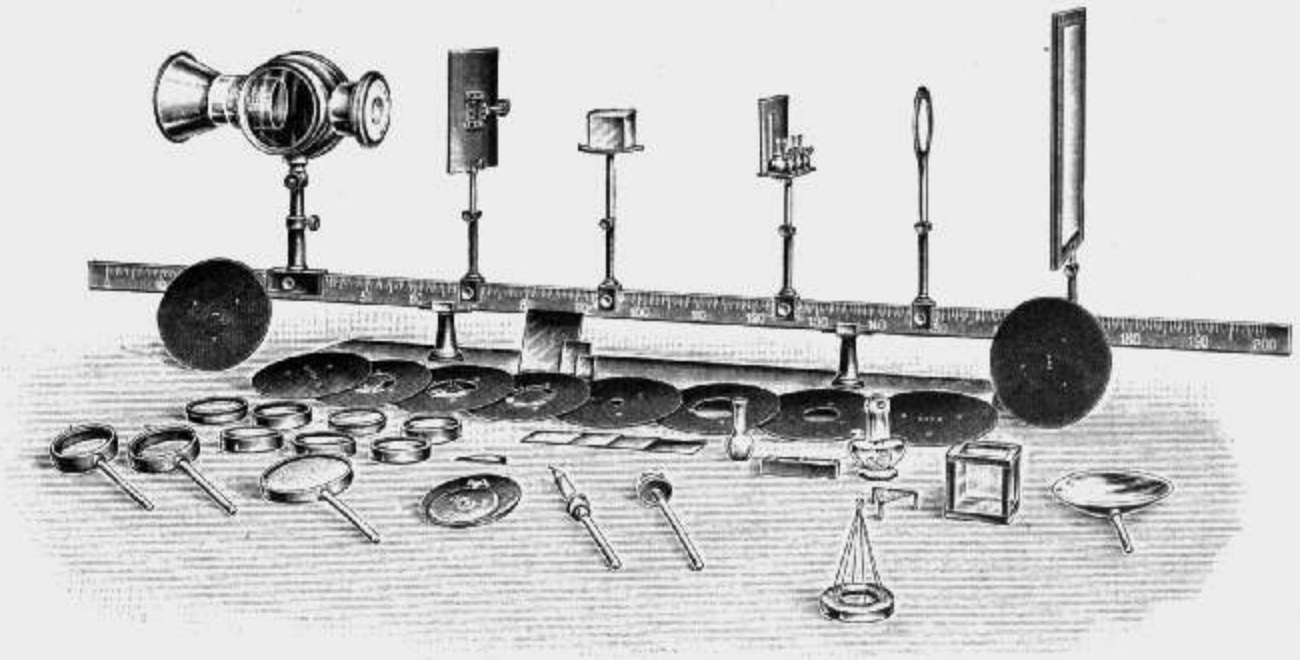
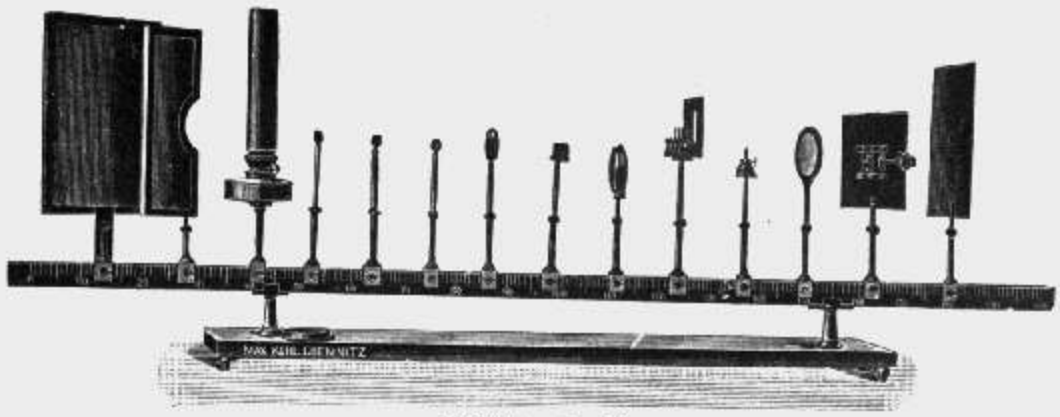


53 926. 1 : 14.



53 929. 1 : 16.

1 ring for stretching paper, 1 small tripod, 1 carrier for 1 candle, 1 carrier for 4 candles, 1 pivot holder, 3 silvered plane mirrors (glass) 10, 5 and 3 cm diam., 1 Concave Mirror (German Silver) 15 cm diam. and 5 cm focal length, 1 flint glass Prism, 1 Screen with adjustable gap, 1 Glass Cube 5 cm side, 1 Glass Lens for supplementing the terrestrial telescope, 4 Glass Plates (window glass, ground, red and green glass 8 cm square), 1 rectangular Trough 8 cm square, 1 Paper Screen, 1 Light Screen, 1 Spirit Lamp, 1 Protractor, 1 small Glass Flask 4 cm diam., also Diaphragms, Pasteboard and Tissue Paper. £ s. d.

53,927. — the same apparatus, fitted with the accessories of the larger Lens Apparatus No. 53,925, instead of No. 53,924, fittings otherwise the same as before . . . 13. 0. 0

53,928. **Pamphlet** by Dr. Zwick: "150 optische Versuche zur Veranschaulichung der Grundlehren der Ausbreitung, Spiegelung und Brechung des Lichtes", bound 0. 3. 0

53,929. **Optical Bench,** Figure, with accessories for demonstrating the path of rays in lenses and concave mirrors, for demonstrating the microscope and telescope, the Bunsen Photometer, etc. 12. 10. 0

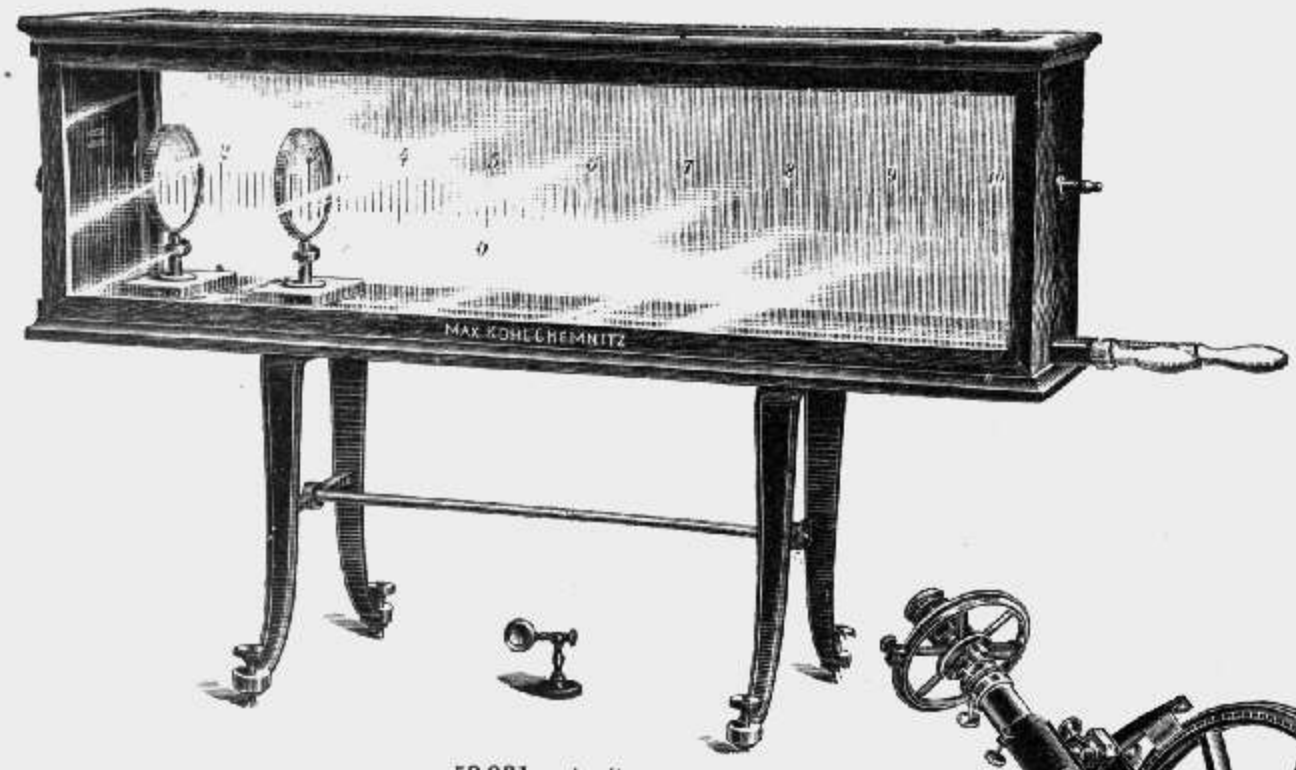
The optical bench consists of a 2 m long measuring bar, divided in centimetres, and constructed of maple-wood; it rests on two massive brass pillars, is mounted on a mahogany board and provided with 14 stands for raising and lowering the lenses, diaphragms, etc.

The following are included with the apparatus: 3 bi-convex Lenses, 1 bi-concave Lens, these being selected so that they can be used for setting up the microscope and the terrestrial, astronomical and Galilean telescope; also 1 concave Mirror (glass) 120 mm diam., silvered on front and closed by a cap; 1 flint glass Prism, 1 paraffin Lamp, 1 Gap with micrometer screw, 1 white Screen for receiving the images, 1 Screen for concave mirror images, 1 Diaphragm, 1 Light Holder with one light, 1 Light Holder with 4 small lamps for photometry, and 1 White Screen with grease spot.

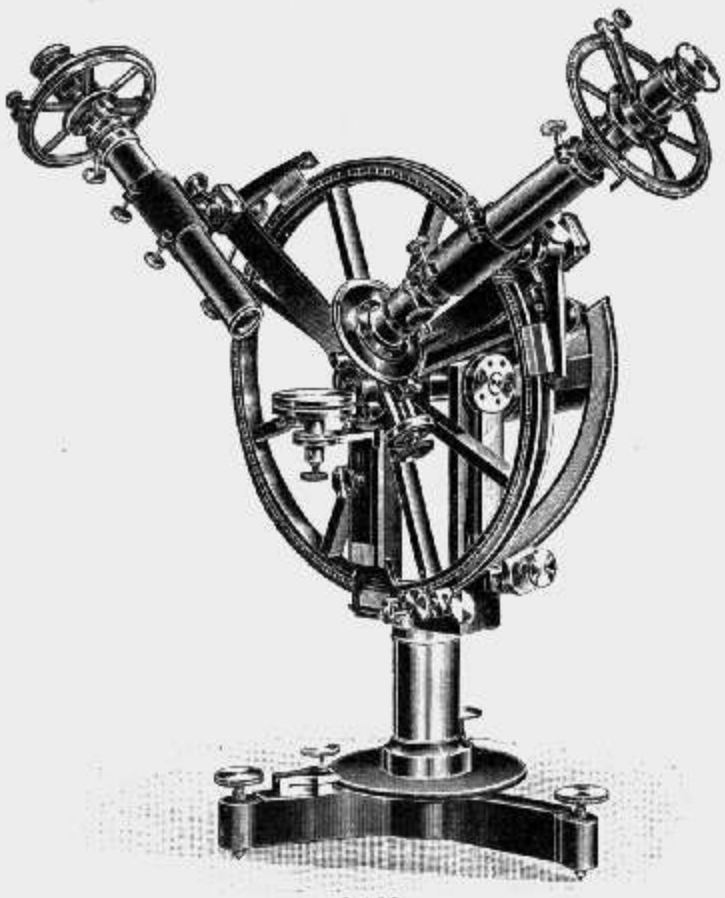
53,930. — idem, fittings of simpler pattern, with the accessories previously mentioned, but without Prism; mirror only 90 mm diam.; gap without micrometer; and with only 6 stands 9. 0. 0

Optical Benches Nos. 53,929 and 53,930 can also be used as **Melloni Apparatuses**: all parts fitting the same can be obtained from us.

Further Optical Benches for explaining the Telescope, Microscope, etc., etc.: see later on in list.



53931. 1 : 9.



53933. 1 : 6.



53932. 1 : 6.

53,931. **Optical Apparatus** after Mach. Figure, as improved by Kolbe, for explaining the phenomena of reflection and refraction with visible beams of light (Ztschr. f. d. phys. u. chem. U. **7**, 1887, p. 77) . . . . . £ 10. 10. 0

The apparatus consists of a box 1 m long, with iron legs, the walls being formed by glass plates, and in which an optical bench is set up. The sliders of the bench can be adjusted from outside. A graduation is provided on the front wall and permits of reading the distances between lenses. By inserting various gratings and frames with differently arranged coloured glasses at the narrow end, the experiments are carried out in the box, which is filled with smoke (reflection of spherical mirrors, refraction of light in lenses and prisms, demonstration of chromatic and spherical aberration).

The following pertain to above: 3 lenses in mounts, 120 mm diam.; 2 ground mirrors, convex and concave, 120 mm diam.; 1 prism, 1 screen, 3 gratings of different fineness, 1 small plane mirror on adjustable stand, 2 sliders with coloured glass, 2 cover plates.

53,932. **Supplementary Apparatus for Refraction and Total Reflection in Liquids,** Figure, and **Stand with 2 adjustable plane mirrors,** for Apparatus No. 53,931 . . . . . 3. 0. 0

The apparatus is provided on front side with circular graduation, degree and sine graduation.

53,932a. **Fillet with 2 lens mounts** and small glow lamp, also **lens mount on base,** after Grimsehl, for measuring the radius of curvature of a convex lens; for Students' use (E. Grimsehl, Ausgewählte physikal. Schülerübungen, Fig. 13) 0. 10. 0

53,932b. **30 Lenses,** arranged in dioptres, in box, for use with preceding apparatus and with apparatus for determining focal length, No. 53,932c, and the Grimsehl Diffraction Apparatus No. 54,549, etc. 1. 10. 0

Cl. 1359, 1360, 1367.

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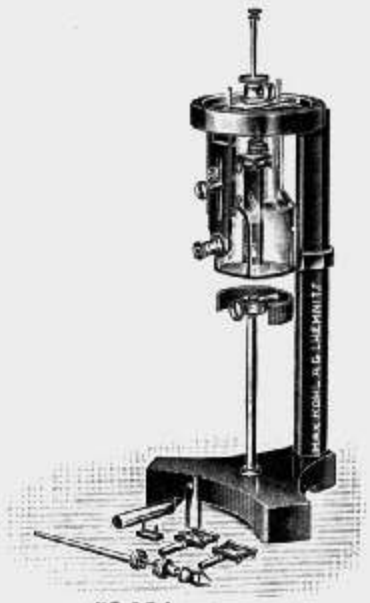

53 934. 1 : 7.



53 935. 1 : 3.

53,932 c. **2 Glow Lamp Holders and 1 Lens Mount** on wood pillar, with glow lamps and measuring rod, after Grimsehl, for determining the focal length of convex lenses and of concave lenses in practical school work (E. Grimsehl, Ausgewählte physikal. Schülerübungen, Figs. 23—26) . . . . . £ s. d. 0. 12. 0

Lenses for above: see No. 53,932 b.

Optical Measuring Instruments.

53,933. **Jamin's Circle,** Figure, for all kinds of measurements on reflection, refraction and polarisation (Jamin, cours de physique) 52. 10. 0

53,934. **Total Reflectometer** after Kohlrausch, Figure (W. u. E. phys. prakt. Fig. 159), for determining the refractive indices of liquids and solids 9. 0. 0

Spectrum Analysis and Synthesis.

53,935. **Glass Prism,** Figure, polished, 100 mm high and equal-sided, length of side 25 mm 0. 2. 0

Plate Glass Prisms, equilateral, with three polished surfaces; height = length of side:

List No.	**53,936**	**53,937**	**53,938**	**53,939**	**53,940**	**53,941**
Length of Side mm	30	35	40	45	50	60
£	**0. 5. 0**	**0. 6. 0**	**0. 8. 0**	**0. 10. 0**	**0. 12. 0**	**0. 15. 0**

Plate Glass Prisms, long pattern, equilateral, with three polished surfaces:

List No.	**53,942**	**53,943**	**53,944**	**53,945**	**53,946**	**53,947**	**53,948**
Length of Side mm	25	30	35	40	45	50	60
Height mm	50	60	70	80	90	100	120
£	**0. 8. 0**	**0. 10. 0**	**0. 12. 0**	**0. 16. 0**	**1. 0. 0**	**1. 4. 0**	**1. 10. 0**

Crown Glass Prisms, equilateral, with three polished surfaces; height = length of side:

List No.	**53,949**	**53,950**	**53,951**	**53,952**	**53,953**	**53,954**
Approx. Length of Side mm	30	35	40	45	50	60
£	**0. 10. 0**	**0. 12. 0**	**0. 15. 0**	**0. 18. 0**	**1. 0. 0**	**1. 5. 0**

Crown Glass Prisms, long pattern, equilateral, with three polished surfaces:

List No.	**53,955**	**53,956**	**53,957**	**53,958**	**53,959**	**53,960**	**53,961**
Approx. Length of Side mm	25	30	35	40	45	50	60
Approx. Height mm	50	60	70	80	90	100	120
£	**0. 15. 0**	**1. 0. 0**	**1. 5. 0**	**1. 10. 0**	**1. 15. 0**	**2. 0. 0**	**2. 10. 0**

Prisms made of glasses whose refractive index is greater than 1.7, icrease 100%, in price.

Flint Glass Prisms, equilateral, with three polished surfaces; height = length of side:

List No.	**53,962**	**53,963**	**53,964**	**53,965**	**53,966**	**53,967**
Approx. Length of Side mm	30	35	40	45	50	60
£	**0. 10. 0**	**0. 12. 0**	**0. 15. 0**	**0. 18. 0**	**1. 0. 0**	**1. 5. 0**

Flint Glass Prisms, long pattern, equilateral, with three polished surfaces:

List No.	**53,968**	**53,969**	**53,970**	**53,971**	**53,972**	**53,973**	**53,974**
Approx. Length of Side mm	25	30	35	40	45	50	60
Approx. Height mm	50	60	70	80	90	100	120
£	**0. 15. 0**	**1. 0. 0**	**1. 5. 0**	**1. 10. 0**	**1. 15. 0**	**2. 0. 0**	**2. 10. 0**

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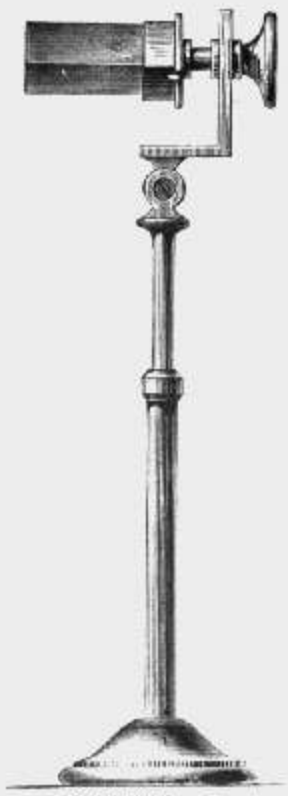
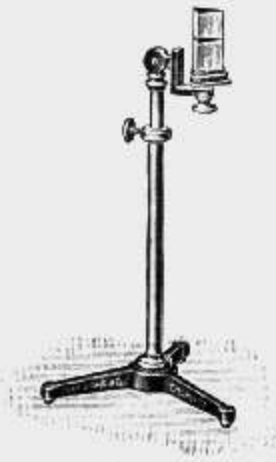


53 988/94. 1 : 4.



53 995. 1 : 3.



53 996. 1 : 6.

Prisms of Rock Crystal, the refracting edge ground perpendicular to the optical axis, with two polished square surfaces: £ s. d.

List No.	**53,975**	**53,976**	**53,977**	**53,978**	**53,979**	**53,980**
Side, approx. mm	20	25	30	35	40	50
£	**1. 5. 0**	**1. 10. 0**	**2. 0. 0**	**2. 10. 0**	**3. 5. 0**	**4. 10. 0**

The rays which traverse the prism at minimum deflection are parallel to the optical axis.

Prisms of Rock Crystal, the refracting edge ground parallel to the optical axis, with three polished square surfaces, **showing double refraction:**

List No.	**53,981**	**53,982**	**53,983**	**53,984**	**53,985**	**53,986**
Side, approx. mm	20	25	30	35	40	50
£	**1. 5. 0**	**1. 10. 0**	**2. 0. 0**	**2. 10. 0**	**3. 5. 0**	**4. 10. 0**

Prism Stands, with height adjustment, cf. Figs. 53,987—94; the prisms can be rotated about two horizontal axes perpendicular to each other.

List No.	**53,988**	**53,989**	**53,990**	**53,991**	**53,992**	**53,993**	**53,994**
Length of Side of Prism mm	25	30	35	40	45	50	60
Without Prism £	**0. 18. 0**	**0. 18. 0**	**1. 0. 0**	**1. 0. 0**	**1. 4. 0**	**1. 4. 0**	**1. 10. 0**

The preceding prices include the cementing in of the prisms if the latter are ordered at the same time as the Stands.

53,995. **Crossed Prisms** after Newton, Fig. 53,995, of plate glass, side 30 mm (Gan.-Man. Fig. 364; Gan.-Atk. Fig. 554) 2. 16. 0

53,996. **Double Prism on Stand,** Figure, of Crown and Flint Glass cemented together, 25 mm side, 50 mm length; for showing the varying refraction of different media . 1. 16. 0

53,997. — idem, 30 mm side, 60 mm long 2. 0. 0

53,998. **Polyprism on Stand,** of three kinds of glass cemented together, 25 mm side, 40 mm long 2. 0. 0

53,999. — idem, 30 mm side, 60 mm long 2. 10. 0

54,000. — idem, Figure, **of five kinds of glass** cemented together, 25 mm side, 40 mm long, **on Stand** 2. 10. 0

54,001. — idem, 30 mm side, 60 mm long 3. 5. 0

54,002. **Polyprism, of four kinds of glass** and a **Quartz Prism** cemented together, 25 mm side, 40 mm long, **on Stand** 3. 0. 0

54,003. — idem, 30 mm side, 60 mm long 4. 0. 0

Stages for Prisms: see Nos. 54,061, p. 503.

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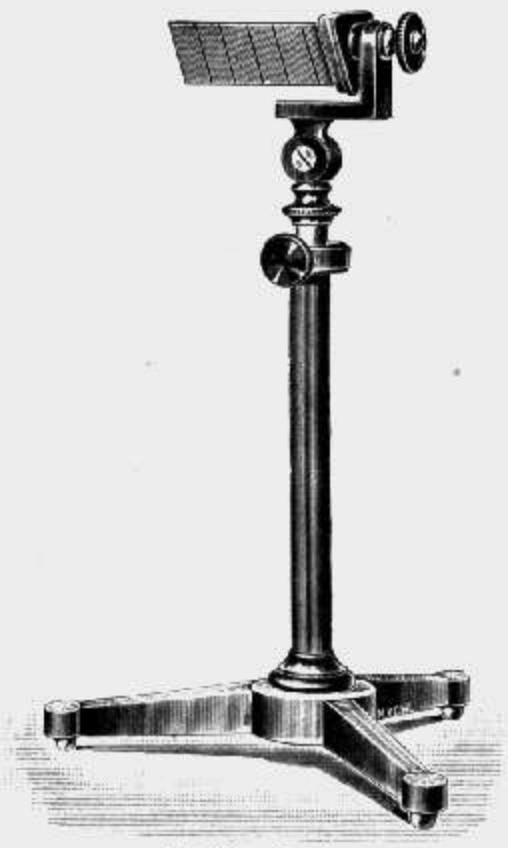


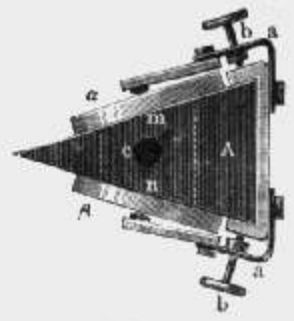
54 000. 1 : 4.



54 004. 2 : 7.



54 006. 1 : 2.



54 007. 1 : 2.



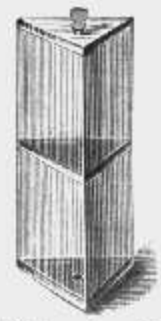
54 012. 2 : 5.



54 009. 2 : 5.



54 010. 1 : 5.



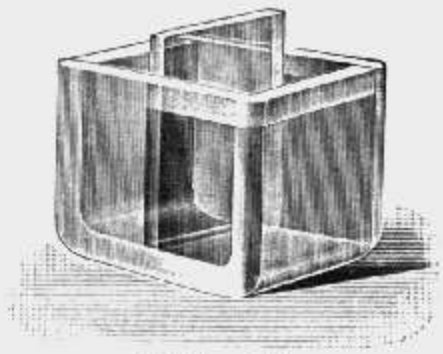
54 015. 3 : 10.

	£ s. d.
54,004. **Carbon Disulphide Prism,** flask form, Figure	0. 16. 0
54,005. — idem, of black glass, with plate glass sides	0. 18. 0
54,006. **Hollow Prism** of solid glass with a perforated aperture and two plate glass discs, Figure (Gan.-Atk. Fig. 535)	0. 14. 0
54,007. **Hollow Prism** after Meyerstein, pierced, Figure, with detachable surfaces and accurately ground angle of 35°, in metal mount, aperture 20 mm (M. P. II, 1, Fig. 159 [177]; W. u. E. phys. Prakt., Fig. 147), for determining the refractive indices of liquids	3. 0. 0
54,008. — idem, with quartz walls	4. 10. 0
54,009. **Hollow Prism** of solid glass, after Steinheil, Figure, with pierced aperture 20 mm diameter, closed by two plane parallel glasses which are pressed on to the glass body	4. 10. 0
54,010. **Hollow Prism on Stand,** with two compartments, Figure, in brass mount	2. 4. 0
54,011. — idem, with three compartments	2. 16. 0
54,012. **Hollow Prism of Crystal Glass,** Figure, assembled with acid-proof cement fused in the fire, for any liquids — alcohol, water, acids, etc.; one side blackened, with carefully ground in glass stopper; outside dimensions: height 75 mm, side 35 mm	0. 10. 0
54,013. — idem, height 90 mm, side 60 mm	0. 16. 0
54,014. — idem, height 100 mm, side 80 mm	1. 0. 0
54,015. **Hollow Prism with Partition Wall,** of crystal glass, Figure, for filling simultaneously with two different liquids, with wood support. Outside dimensions: Height 100 mm, side 60 mm	1. 0. 0

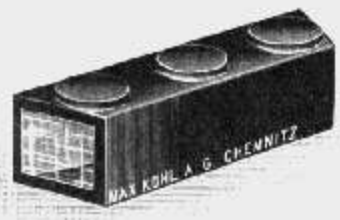
Cf. 1328, 1329, 1330, 1333, 1335, 1334, 1331, 1336.



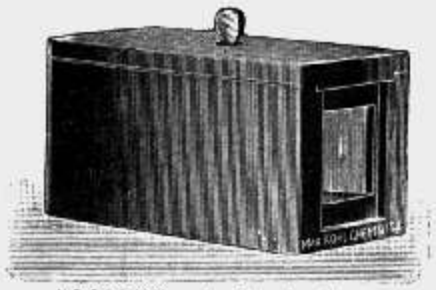
54 019. 1 : 4.



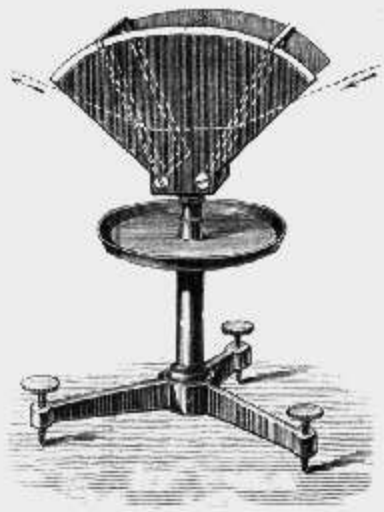
54 020. 1 : 2.



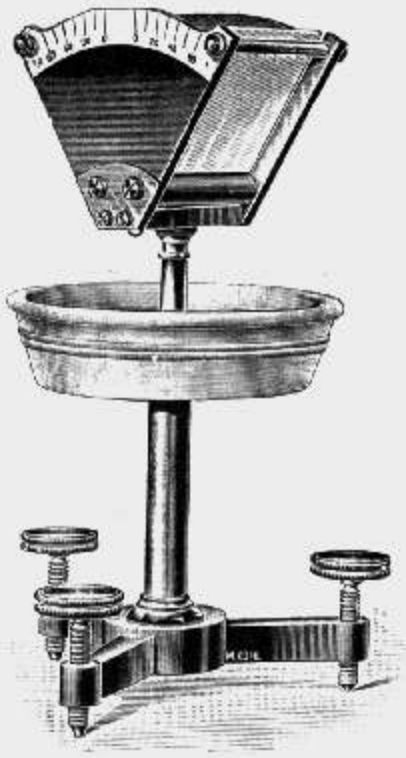
54 029/54 031. 1 : 6.



54 022/27. 1 : 2 — 1 : 4.



54 033. 1 : 6.



54 034. 1 : 8.

	£ s. d.
54,016. **Hollow Prism, trough form,** with loose cover, with one compartment, 50 mm long, 55 mm side	0. 9. 0
54,017. — idem, with two compartments	0. 16. 0
54,018. — idem, with three compartments	1. 0. 0
54,019. — idem, with four compartments, Figure	1. 6. 0
54,020. **Differential Prism (Double Trough)** after Hallwachs, Figure, for determining small differences in refractive ratios of liquids (Wied. Ann. **50**, p. 577; Kohlrausch, Lehrb. d. prakt. Phys., 10th. Edn., p. 260); all three sides traversed by the light are of plate glass	1. 13. 0
54,021. — idem, all three surfaces of plane parallel glass	5. 0. 0

Wernicke Liquid Prisms, Figure:

List No.	**54,022**	**54,023**	**54,024**	**54,025**	**54,026**	**54,027**
Free Aperture, abt. mm	20×20	27×27	34×34	41×41	45×45	50×50
£	**2. 15. 0**	**3. 0. 0**	**4. 0. 0**	**5. 0. 0**	**8. 0. 0**	**13. 0. 0**

The prism is filled with cinnamic ethyl ether; it is mounted in wood to prevent temperature variations; it is supplied with direct or deflected ray.

54,028. — idem, **constructed round;** can be taken apart for cleaning, aperture 30 mm . In this type all cement is eliminated.	5. 0. 0

Direct-Vision Prisms after Königsberger, Figure, filled with durable liquid (Ztschr. f. d. phys. u. chem. U. **22**, 1909, p. 111; Phys. Ztschr. **9**, p. 727):

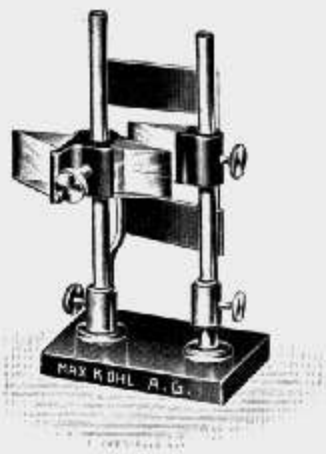
List No.	**54,029**	**54,030**	**54,031**
Free Aperture mm	25×25	40×40	55×55
£	**1. 10. 0**	**2. 10. 0**	**4. 10. 0**

54,032. **Gas Prism** after Biot and Arago, for determining the absolute coefficient of refraction of air and other gases, with barometer gauge, brass mount and stopcock, for setting up on the air-pump (Gan.-Atk. Fig. 536)	3. 0. 0
54,033. **Variable Angle Prism,** Figure, for taking various liquids, simple pattern	2. 2. 0
54,034. — idem, Figure, better construction, with degree graduation	2. 10. 0
54,035. **Prism Apparatus,** Figure, with three prisms for demonstrating the achromatic Prism and the Direct-Vision Prism (W. D. Fig. 298 [281])	2. 8. 0

Diffraction Gratings: see Section "**Diffraction of Light**". Cl. 1338, 298, 1339, 5436, 1340, 1341.



54 068. 1 : 5.



54 035. 1 : 6.



54 036/39. 1 : 5.



54 062. 1 : 4.



54 063. 1 : 6.

Achromatic Prisms, Figure, on stand, arranged for separating the prisms:

	List No.	54,036	54,037	54,038	54,039
	Side-Length, abt. mm	30	35	40	50
	£	1. 8. 0	1. 12. 0	2. 0. 0	2. 8. 0

Prism System after Amici, with **direct vision,** triple, consisting of 1 flint glass prisma and two crown glass prisms:

	List No.	54,040	54,041	54,042	54,043	54,044	54,045
	Side, abt. mm	10	15	20	25	30	35
(a)	**Without Mount** . £	1. 0. 0	1. 10. 0	2. 0. 0	2. 10. 0	3. 5. 0	4. 5. 0
(b)	**With Mount,** Diaphragm and Stand £	2. 0. 0	2. 10. 0	3. 0. 0	3. 10. 0	4. 10. 0	5. 10. 0

— idem, quintuple, consisting of two flint glass and three crown glass prisms:

	List No.	54,046	54,047	54,048	54,049	54,050	54,051	54,052
	Side, abt. mm	10	15	20	25	30	35	38
(a)	**Without Mount** . £	1. 5. 0	2. 5. 0	3. 5. 0	4. 10. 0	5. 15. 0	7. 0. 0	8. 0. 0
(b)	**With Mount,** Diaphragm and Stand £	2. 5. 0	3. 5. 0	4. 5. 0	5. 10. 0	7. 0. 0	8. 5. 0	9. 10. 0

Rutherford's Prisms:

	List No.	54,053	54,054	54,055	54,056	54,057	54,058	54,059
	Aperture, mm	25	30	35	40	45	50	60
	£	2. 10. 0	3. 0. 0	3. 15. 0	5. 0. 0	6. 5. 0	9. 0. 0	12. 10. 0

£ s. d.

54,060. **Model of the Porro Prism-combination** after Weinhold (W. D. Fig. 319) 1. 4.0

54,061. **Adjustable Rotary Stage for setting up any kind of Prism** 0. 16. 0

54,062. **Pyramidal Rectangular Prism,** Figure, of crystal glass, in mount on stand, for producing four spectra 2. 0. 0

54,063. **Crystal Glass Cone.** Figure, in Mount on Stand, for producing a round spectrum (rainbow) 1. 5. 0

54,064. — idem, **of flint glass,** in mount, on Stand 2. 5. 0

54,065. — idem, **of crown glass,** in mount, on Stand 2. 0. 0

54,066. **Crystal Glass Cone,** without mount or stand 0. 10. 0

54,067. **Cone,** after Thompson, for producing a Rainbow, on Stand, cf. Fig. 54,068 . . . 5. 15. 0
The vessel above the cone is filled with cinnamic ethyl ether.

54,068. — idem, without stand, Figure 4. 5. 0

54,069. **Rainbow Apparatus** after Grimsehl (Ztschr. f. d. phys. u. chem. U. **20**, 1907, p. 213), consisting of a glass vessel representing the rain-drop, on Stand, and a receiving screen with gap 2. 0. 0

Large Optical Benches with Accessories for Objectively Projecting the Spectrum, etc.: see further on in list. Cl. 4924, 6107, 1343, 1346, 1347.

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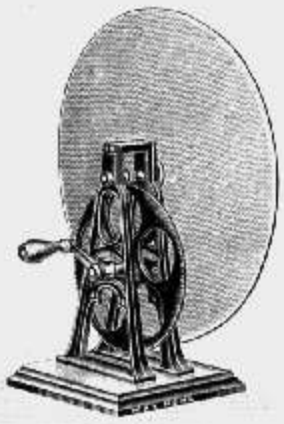
54 070. 1 : 8.



54 076. 1 : 6.



54 072. 1 : 10.



54 078. 1 : 9.

	£ s. d.
* 54,070. **Apparatus for Demonstrating the Spectrum and the Fraunhofer Lines,** Figure, consisting of a flint glass prism of 40 mm side and an achromatic lens 50 mm diam., fitted together on one stand, the prism rotary . . . . . The apparatus can be placed both in front of the heliostat or the projection lantern, as it has a tall adjustable stand.	3. 0.0
* 54,071. — idem, with prism of 45 mm side and achromatic lens 60 mm diameter . . .	4. 0.0
* 54,072. **Apparatus with 7 Mirrors,** Figure, for re-combining the light split up into the spectrum colours; consisting of 7 plane mirrors 55 mm diam., in mounts, movable in all directions, on adjustable stand	4. 0.0
* 54,073. — idem, smaller, with mirrors **40 mm** diameter	3. 0.0
* 54,074. — idem, with three mirrors **40 mm** diameter	1. 10.0
* 54,075. **Laminated Mirror** after Oosting (Ztschr. f. d. phys. u. chem. U. **11**, 1898, p. 132; M. T. p. 186)	2. 10.0
* 52,043. **Oscillating Prism,** Fig. 51,949 B, p. 278, **for mixing the spectrum colours,** for the Whirling Table (M. P., 8th. Edn., II, 1, Fig. 137), prism 60×30 mm; price without Whirling Table	1. 5.0
* 52,044. — idem, prism 70×35 mm, see No. 52,044, p. 285	1. 10.0
52,034. **One Set Colour Discs,** 7 different mono-chromatic discs and one with the seven colours of the spectrum (Gan.-Atk. Figs. 562/64), see No. 52,034, p. 284 . . . . . The mono-chromatic discs are slotted in accordance with Maxwell's method, in order to produce mixed colours and white.	0. 5.0
52,035. **Newton's Colour Disc with the 7 Spectrum Colours,** painted as clearly as possible on a metal disc, giving white when rotated, 120 mm size; see No. 52,035, p. 284 . . .	0. 4.0
52,036. — idem, **larger,** 250 mm diameter, see No. 52,036 on p. 284	0. 6.0
54,076. **Top for Rotating Colour Discs,** Figure, with flywheel and grip, without Colour Disc	0. 10.0
54,078. **Colour Disc with Rotating Apparatus,** Figure . . . . . The coloured sectors are on the back of the disc and are not visible in the illustration.	1. 5.0
51,969. **Cord Gearing** for setting colour discs and the like into very rapid rotation, fitting Whirling Tables Nos. 51,949/51,968, cf. Fig. 51,969, p. 279; without Colour Disc or Whirling Table . . . . . In addition to the Whirling Table and a Colour Disc being necessary for this collection, the larger Cord Pulley of Apparatus No. 51,975 is required, and this Apparatus should be ordered separately if not available.	1. 0.0
* 54,079. **Transparent Colour Disc** (Newton's) with 7 colours on glass, for objective projection, with device for rotating . . . . . The colour disc gives a good white.	1. 0.0

* Can be used with Projection Apparatus.

Cl. 1365, 1361, 1364, 1366.

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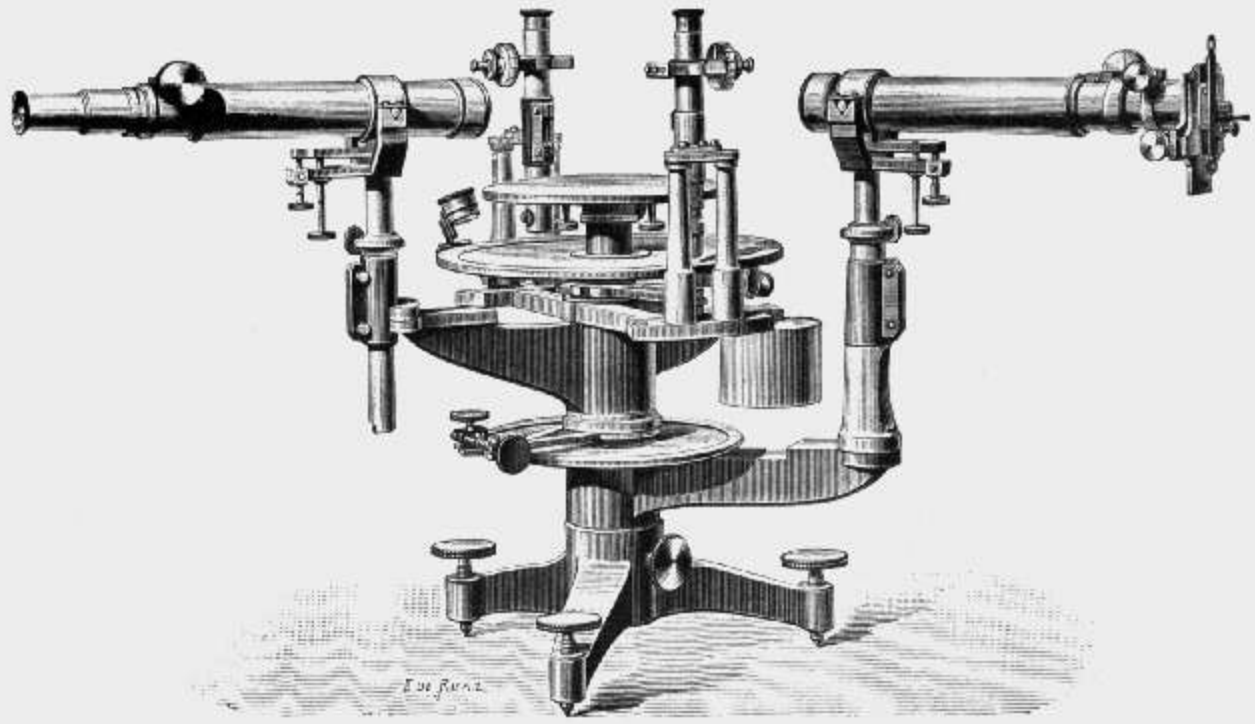
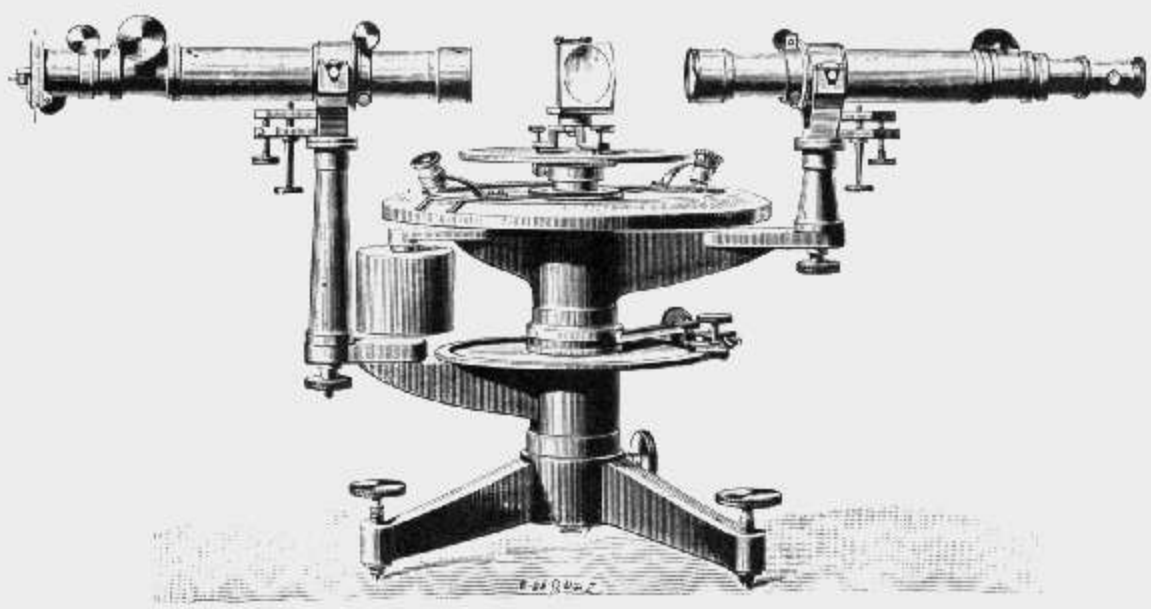


54 080. 1 : 6.



54 081. 1 : 6.

Spectrum Apparatus and Accessories, Spectrometers, Spectographs, etc.

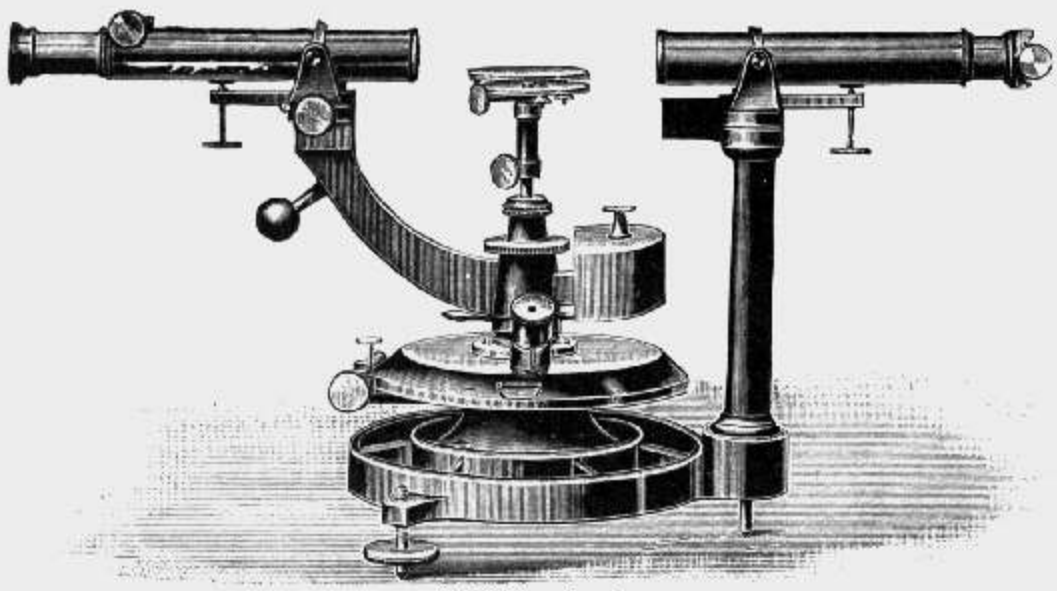
	£ s. d.
54,080. **Large Precision Spectrometer,** Figure, with rotary divided circle 255 mm diameter	75. 0. 0

The divided circle is graduated in $^1/_{12}{}^0$ and has alidade and two microscopes for estimating to 1″. The telescopes, with 33,5 mm aperture, can be adjusted vertically. The entire instrument can be rotated about its vertical axis, has a symmetrical gap with comparison prism, reflecting eyepiece and an adjustable prism of 50 mm.

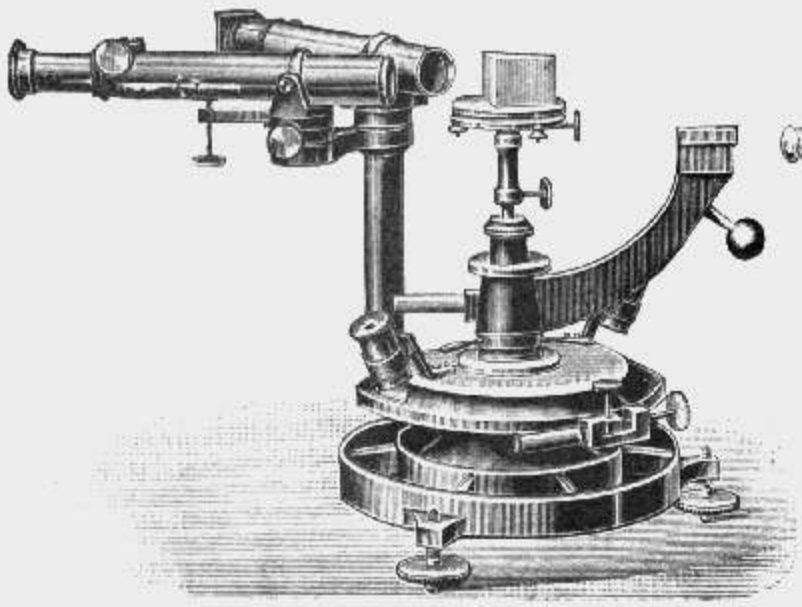
54,081. **Spectrometer** after Bunsen, Figure, with fixed divided circle 270 mm diameter	45. 0. 0

The circle is divided in $^1/_4{}^0$, the vernier reading gives 10″. The objectives have a focal length of 325 mm and aperture of 33,5 mm. The gap with comparison prism opens symmetrically to the right and left. The apparatus has a rotary table for taking a number of prisms. Two oculars (one after Gauss) and a prism pertain to the apparatus. The entire apparatus can be rotated about a vertical axis.

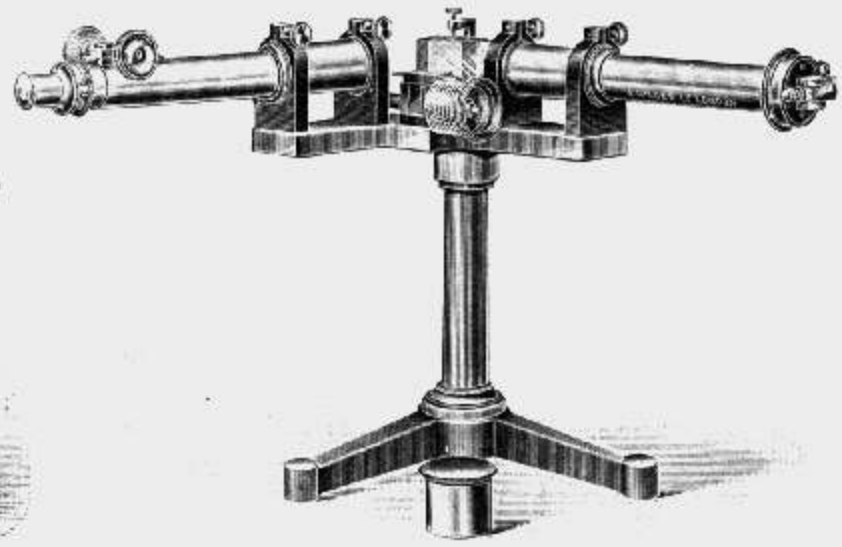
54,082. **Polarisation Outfit** for above, with two nicols and two position circles 100 mm diameter, graduated on silver, vernier for $^1/_{10}{}^0$ and Babinet Compensator for elliptic polarisation	22. 10. 0



54083A. 1 : 5.



54083B. 1 : 5.



54086. 1 : 5.

54,083. **Repeating Spectrometer,** Figs. A and B, with two telescopes of 26 mm aperture and 234 mm focal length, with Gauss Ocular, with concealed circle and arrangement for carrying out goniometric measurements by Wollaston's method . . . . . £ 41. s. 5. d. 0

The circle is divided in $^1/_4{}^\circ$ on silver and permits of readings by a magnifying glass and two verniers to 20″. Fig. A shows the instrument set up for use as a spectrometer, and Fig. B for use as a goniometer.

54,084. — idem, without concealed graduated circle or arrangement to permit of goniometric measurements being made by Wollaston's method 33. 0. 0

A Gauss Ocular is given in for goniometric measurements.

Spectrometer after v. Lang, see Fig. 53,827, p. 482, practical school model for laboratories, with concealed circle and magnifier reading; also adaptable as goniometer, without prism 15. 0. 0

54,086. **Wave Length Spectrometer with variable Deflection,** Figure, especially adapted for rapid and accurate measurements 32. 10. 0

The apparatus has a quadrilateral prism which totally reflects and refracts the light. The stage is arranged to rotate so as to be able to determine the wave lengths of the spectrum-lines observed. The wave lengths are read direct on a spiral drum.

Focal length of observing telescope and of the gap-tube 29.25 cm, aperture 31.5 mm.

54,087. — idem, **with lengthened arm** for the gap-tube in order to be able to place on it a Michelson Echelon Grating (No. 54,090) a Lummer-Gehrcke Plate (No. 54,089) or a Fabry and Perot Air-plate (No. 54,091) 45. 0. 0

54,088. **Micrometer Ocular** for above, for measuring the diameter of the Haidinger Interference-ring System when using the Fabry and Perot Interference Air-plate No. 54,091 as an auxiliary to the Echelon grating and the Lummer-Gehrcke Parallel Plate 8. 15. 0

Diffraction Gratings: see Section "Diffraction of Light". Cl. 1376, 1377, 77 f.

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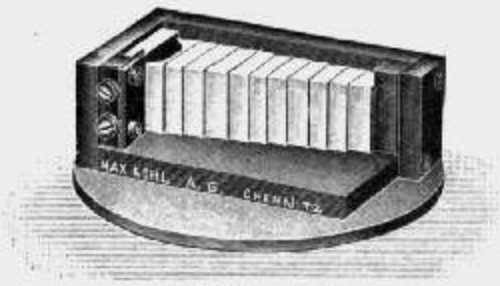
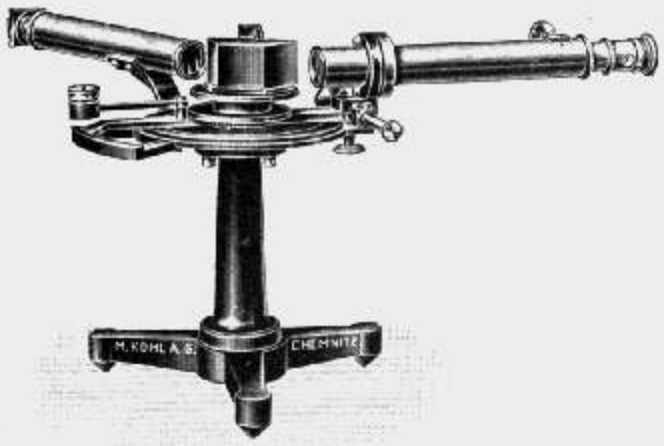
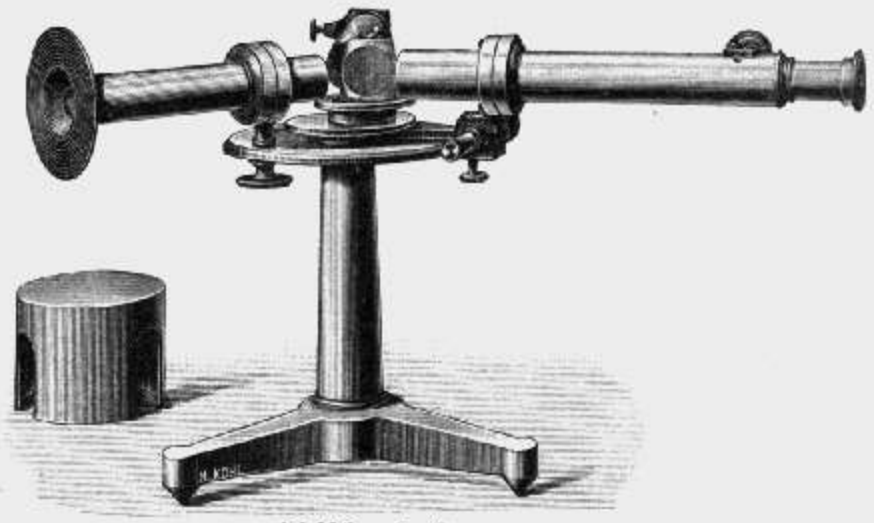
54 089. 1 : 4.



54 090. 1 : 6.



54 092. 1 : 8.



54 095. 1 : 6.

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	£ s. d.
54,089. **Interference Plate** after Lummer-Gehrcke, Figure, in mount, for using ordinary spectroscopes as Interference Spectroscopes, for demonstrating the Zeeman effect, etc.; also specially adapted for Spectrometer No. 54,087, for obtaining high resolving power	12. 10. 0
54,090. **Echelon Grating** after Michelson, Figure, for the same purpose	12. 10. 0
54,091. **Interference Plate** after Fabry and Perot, standard of approximately 10 mm air distance, for measuring wave lengths by utilising Haidinger's Interference **Rings;** can be used with Spectrometer No. 54,087, with quartz hollow cylinder of low temperature coefficient between the boundary plates	11. 5. 0
54,092. **Spectrum Apparatus** with a **Rutherford Prism,** Figure	23. 0. 0

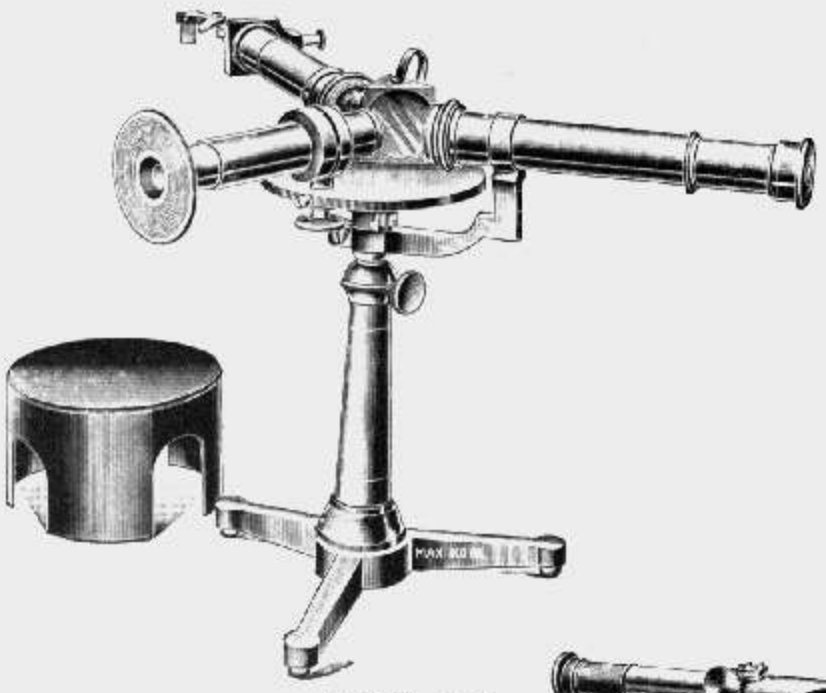
The observing telescope and gap-tube have an aperture of 30 mm and focal length of 312 mm. The telescope is a power 10 instrument; diameter of plate 180 mm; telescope focussed by micrometer screw; arc divided in $^1/_{12}{}^0$ with vernier, in one piece with the alidade of the telescope, permitting a reading of 12″, by which the position of the lines in the spectrum is determined. Gap with micrometer screw and comparison prism. The dispersion from A—H_2 is 14°. The two D-lines are at an angle of 1′ 36″ to each other; the fine nickel line should be plainly visible between these when the instrument is correctly focussed.

54,093. — the same apparatus, with arrangement for convenient reading of the scale parts	26. 0. 0

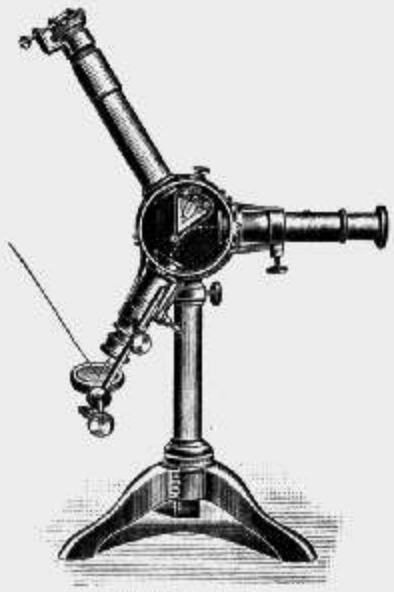
A reading telescope is fixed above the observing telescope and parallel to the same. The former telescope has a right-angled prism at the end and brings to the vision of the observer by reflection the graduation of the divided arc and of the vernier.

54,094. **Spectrum Apparatus,** as No. 54,092, but **smaller** pattern; observing telescope with aperture of 27 mm and focal length of 230 mm, power 8; a gap-tube of the same dimensions; with brass plate on which both tubes are mounted, of 155 mm diameter; graduated arc divided in $^1/_6{}^0$, vernier giving 30″	18. 0. 0
54,095. **Spectrum Apparatus,** Figure, same size as No. 54,092, but instead of having a Rutherford Prism is fitted with a 60° prism constructed of extra heavy flint glass and with a dispersion of 7°. The position of the lines in the spectrum is in this case determined by a telescope with photographic scale instead of by divided circle. The observing tube can be adjusted by micrometer screw. Gap with micrometer screw and comparison prism	14. 0. 0
54,096. **Spectrum Apparatus** with observing telescope and gap-tube of 27 mm aperture and 230 mm focal length, with the scale telescope mounted on a brass plate 135 mm in diameter; observing tube without rack or micrometer screw; gap with micrometer screw and comparison prism	7. 10. 0

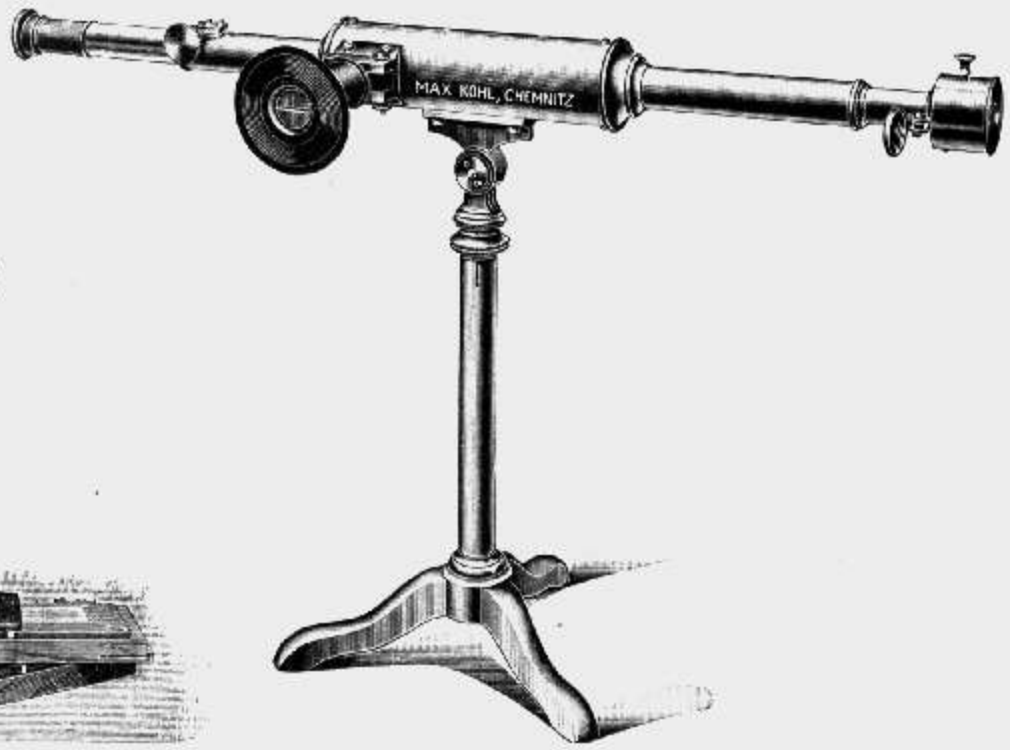
This apparatus is very efficient in spite of its low price; externally it resembles very closely Fig. 54,095.

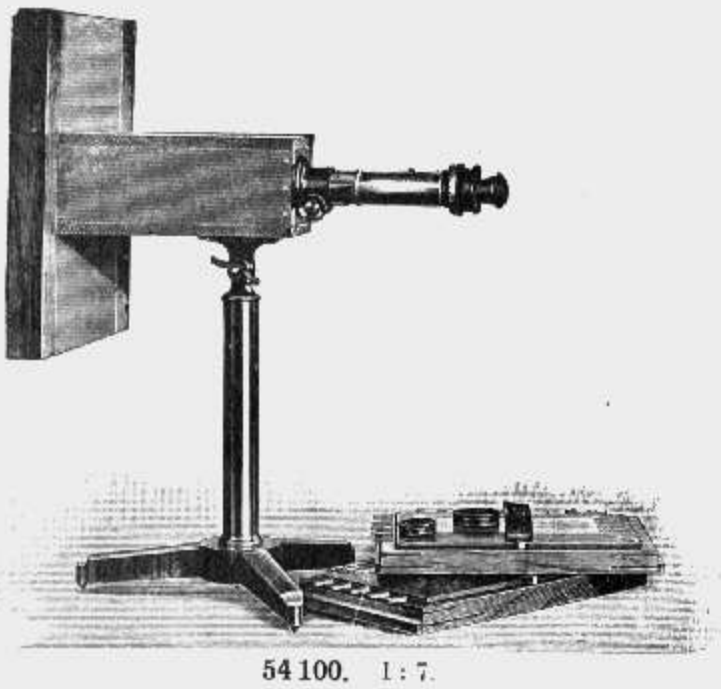


54 097. 1 : 5.



54 099. 1 : 5.





54 100. 1 : 7.

54 101. 1 : 6.

£ s. d.

54,097. **School Spectrum Apparatus,** Figure 4. 10. 0

The apparatus has a 60° prism constructed of medium heavy flint glass and fitted on a brass plate 92 mm diameter on which is mounted the telescope, with scale. The observing telescope and gap tube are placed on the two arms, rotating on a trunnion, and situated underneath the plate. The arm carrying the observing telescope is movable and can be firmly clamped in any position in order to observe the spectrum conveniently. The observing telescope and gap tube have an aperture of 20 mm, a focal length of 150 mm, and a magnification of 5. The gap has a micrometer screw and, for the purposes of better demonstration, a Comparison Prism which can be switched out of operation. Dispersion 4°. The stand has height adjustment.

54,098. — the same Apparatus, but without Telescope and Scale or Comparison Prism 4. 0. 0

Goniometers and Spectrum Apparatus for students' exercises, after Grimsehl (Ztschr. f. d. phys. u. chem. U. **17**, 1904, p. 207), see No. 53,818, p. 481 . . . . . 2. 8. 0

54,099. **Spectrum Apparatus for Chemical and Pharmaceutical Researches,** Figure, arranged for setting up horizontally and vertically 10. 0. 0

When the apparatus is set up vertically both the sunlight and flames at various heights can be observed. A heavy flint glass prism (60°) is enclosed in a tightly fitting cap.

54,100. **Spectrograph,** Figure, consisting of a Spectroscope combined with a Photographic Camera 13×18 cm 12. 10. 0

The spectroscope contains 1 quintuple direct-vision prism, 1 triple collimator objective of 20 mm aperture, 1 single micrometer gap slider with divided drum. The camera can be rotated in the vertical plane and a rack is provided for sharp focussing. The ground glass disc and the dark slide can be displaced vertically so as to admit of 5 exposures being made on one plate. The apparatus is specially suitable for investigating colour-sensitive plates and for teaching purposes.

Cl. 1385, 1387, 1388, 1389.

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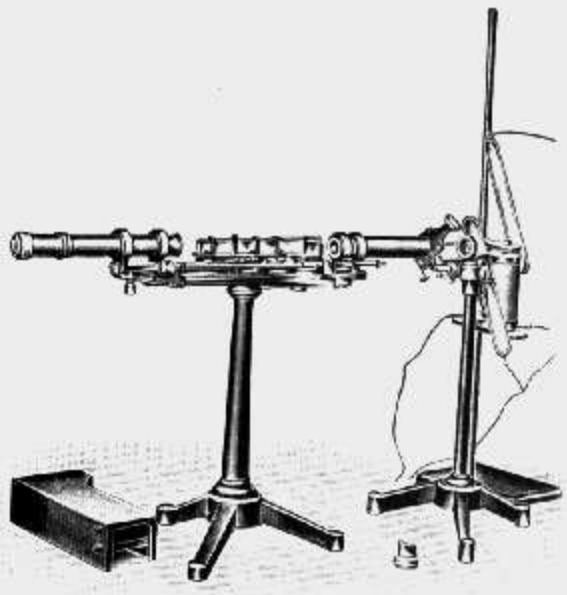
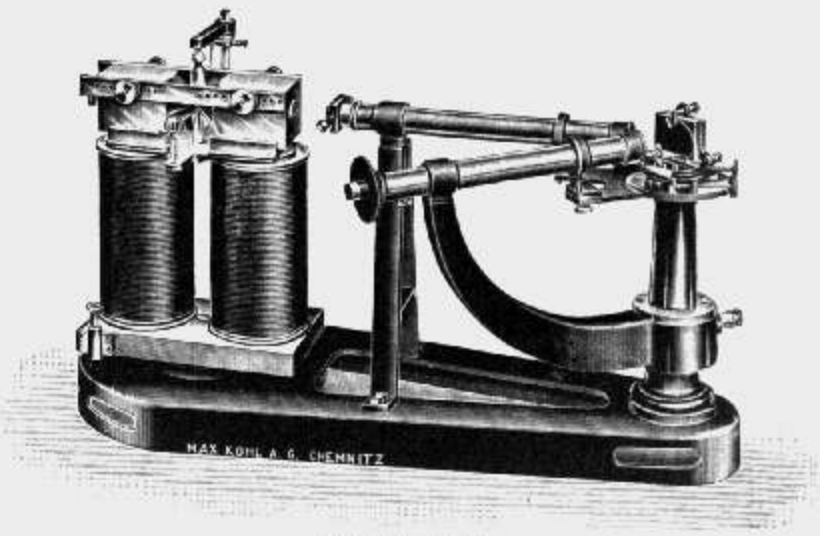


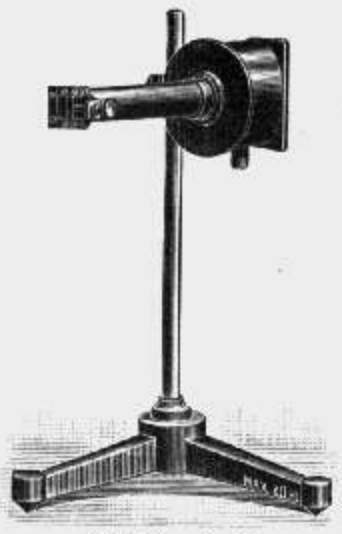
54 103, 54 108. 1 : 8.



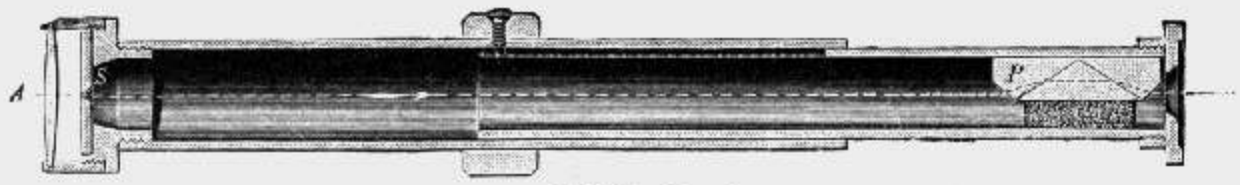
54 110. 1 : 9.

Max Kohl A. G. Chemnitz, Germany.

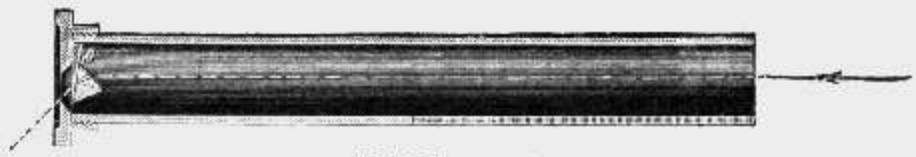
	£. s. d.
54,101. **Direct-vision Spectroscope** after Janssen-Hofmann, Figure (Fr. phys. Techn. II, 2, Fig. 2818 [II, 904])	16. 0. 0
Observing telescope and gap-tube with 22 mm aperture, 182 mm focal length and approx. power 7. Gap with micrometer screw and comparison prism. On the middle cylindrical portion, in which the prism-system is fixed, a telescope with photographic scale is arranged laterally. The movement of the observing tube is carried out by a micrometer screw with a view to controlling the very extended spectrum, while focussing is carried out by rack and pinion. The apparatus is mounted on a stand having universal motion. Dispersion from A—H¹, approx. 9°.	
54,102. — idem, with two prism-systems and twice the dispersion (approx. 18°)	20. 0. 0
54,103. **Interference Spectroscope** after Lummer-Gehrcke, Figure (Verhandl. d. Deutschen Physikal. Gesellschaft **9**, 1907, p. 529), also adapted as an ordinary **spectrum apparatus** with low dispersion and, in conjunction with the necessary accessories, for demonstrating the Zeeman effect	18. 0. 0
The resolving power of this apparatus is extraordinarily high — so great that $^1/_{100}$ of the distance of the D-lines can be resolved. The apparatus has a simple gap, one ocular with cross wires, one plane parallel glass strip and a reflecting prism. It is for use as a low-dispersion spectrum apparatus.	
54,104. **Wollaston Prism,** in Mount, for sliding over the ocular of the Spectroscope	1. 7. 0
54,105. **Wollaston Prism** with $^1/_4$ wave-length plate, in mount	2. 0. 0
54,106. **Spectrum Tube** with H or Hg	0. 7. 0
54,107. **Spectrum Tube Stand with Condenser and Electromagnet** for 6 volts, for demonstrating the Zeeman effect	5. 5. 0
54,108. — idem, with **double Electromagnet,** Figure, for the Zeeman transverse and longitudinal effect	10. 10. 0
54,109. **Interference Spectroscope** as No. 54,103, for use as a Spectrum Apparatus with strong dispersion	32. 0. 0
The apparatus has a second flint glass prism and direct-vision prism body which can be switched into operation, simple gap, one Ramsden ocular of 28 mm and a similar one of 19 mm focal length with cross wires and plane parallel glass strip.	
54,110. **Grating Spectroscope for the Zeeman Phenomenon,** after Weinhold, Figure, with a Rowland Plane Grating and an Electromagnet, for observing in a longitudinal direction and in a direction transverse to the lines of force	60. 0. 0
The apparatus is arranged in such manner that the observing telescope can be shifted over for observations with the right or left eye. The electromagnet can be rotated about its vertical axis and, at the positions in which the magnetic axis coincides with the axial direction of the collimator tube, or perpendicular to this, it can be clamped with a securing pin. If a mercury spectrum tube, fixed between the magnet poles, is illuminated by a spark-coil, it shows the characteristic green line of mercury in a simple manner as long as the magnet is unexcited, but an extended line is shown when the magnet is excited. In addition the observed line of the spectrum is polarised. In observing perpendicular to the lines of force three single lines result (a triplet) which are rendered the most plain when the Sénarmont Prism, given in with the apparatus, is placed on the ocular which, acting as an analyser, shows two spectra which are brought above each other by rotating: two lines then appear in the deflected polarised part, and a single line in the unpolarised. In observing in the direction of the lines of force a doublet is produced consisting of two circular-polarised lines.	



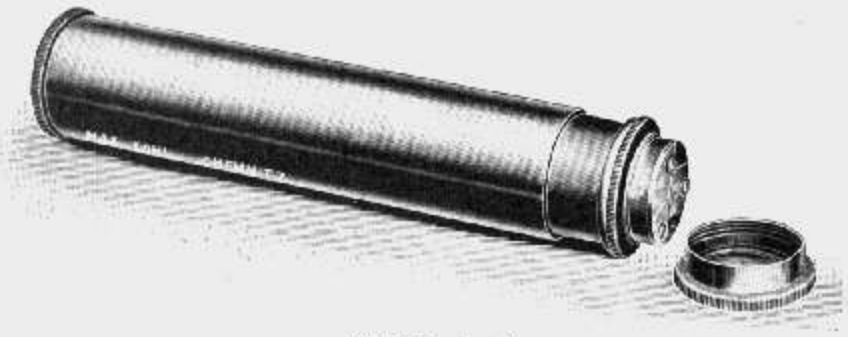
54 112. 1 : 6.



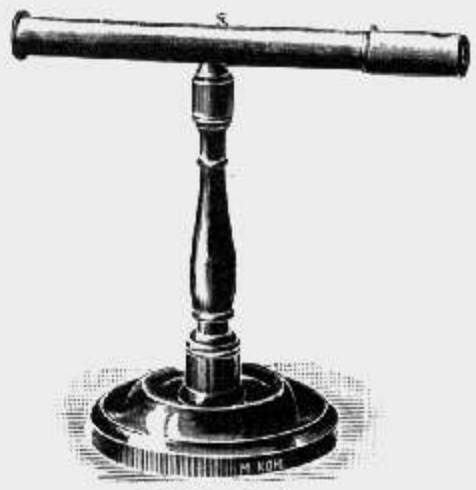
54 113 A. 1 : 2.



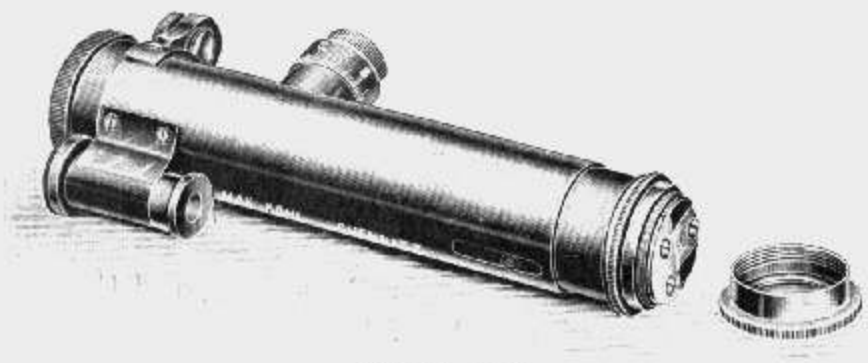
54 113 B. 1 : 2.



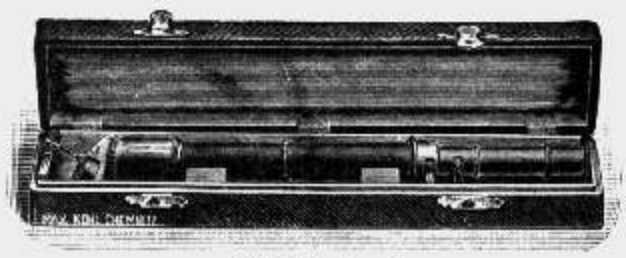
54 117. 1 : 2.



54 116. 1 : 4.



54 118. 1 : 2.



54 119. 1 : 4.

	£ s. d.
54,111. **Spectroscope** after Mousson, very simple (M. P., 9th. Edn., II, 1, Fig. 196) . . . The spectroscope has an adjustable stand, gap with comparison prism and micrometer screw, gap-tube with lens of 160 mm focal length, also an extra heavy flint glass prism.	3. 0. 0
54,112. — idem, without comparison prism, Figure	2. 16. 0
54,113. **School Spectroscope,** Figs. A and B, consisting of a **Gap-tube** with gap and lens and two extensions, one with a direct-vision prism and a second with a **Flint Glass Prism**	1. 15. 0
54,114. **Cap for above** with aperture for containing reagent glasses, with 6 reagent glasses	0. 7. 0
54,115. **Stand for No. 54,113** to enable the apparatus to be tilted	0. 11. 0
54,116. **Students' Spectroscope,** very simple pattern, Figure, with triple prism (direct-vision), non-adjustable gap, on wood stand for convenience of manipulation	1. 6. 0
54,117. **Pocket Spectroscope with Diffraction Grating,** Figure, showing hundreds of lines in the solar spectrum; the D line is split up . . . . . A good imitation of a genuine Rowland Grating is used as Diffraction Grating for the instrument.	3. 0. 0
54,118. **Pocket Spectroscope with Diffraction Grating and Reading Device,** Figure . . . A brilliantly illuminating arrow, visible above the spectrum, can be placed on a difinite line by means of a milled wheel. By means of a special lens, fitted alongside the eyepiece, the position of the arrow can be read off externally on a scale; the readings correspond to the momentary wave-lengths.	5. 0. 0

Cl. 1390, 5949, 5950,
4151, 1393,
4152, 1395.

Max Kohl A. G. Chemnitz, Germany.

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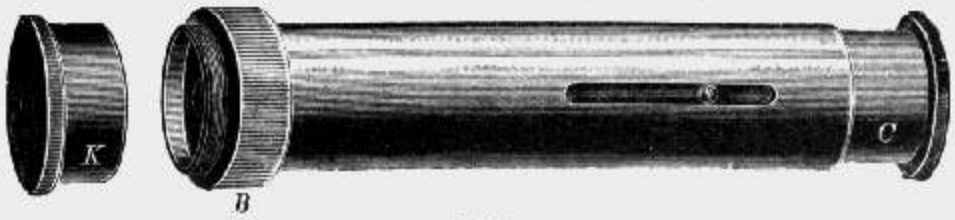
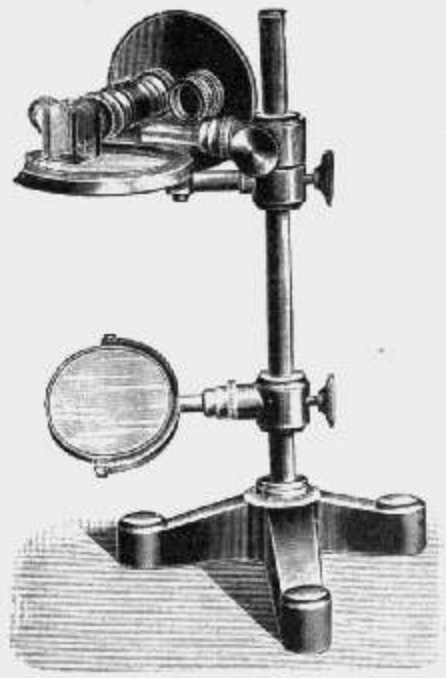
54120. 1 : 1.



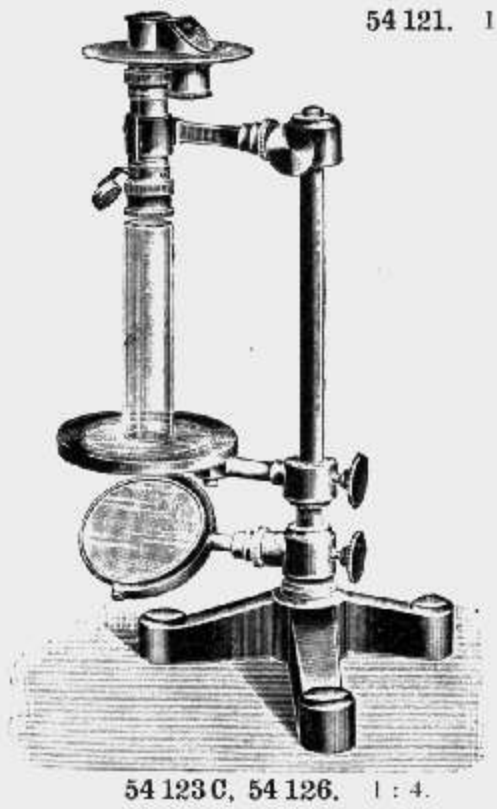
54121. 1 : 1.



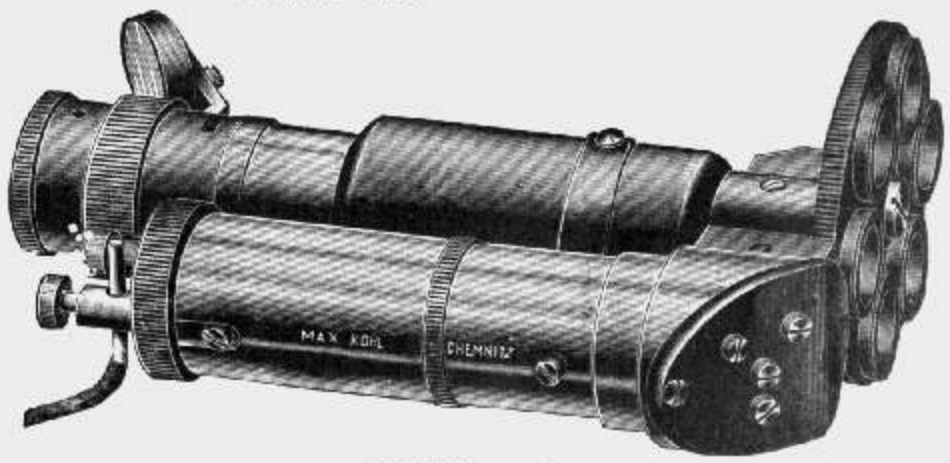
54122, 54121. 1 : 6.



54123B, 54126. 1 : 4.



54123C, 54126. 1 : 4.



54123A. 1 : 1.

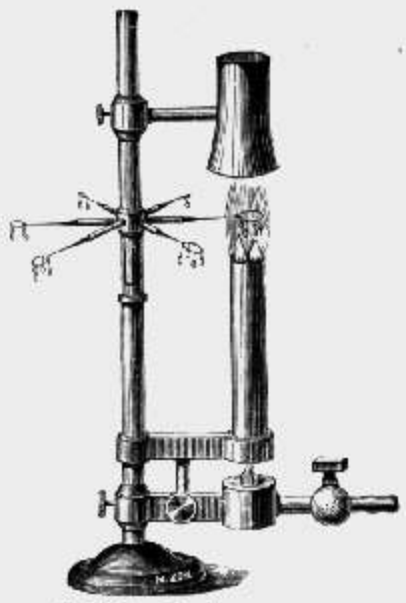
	€ s. d.
54,119. **Pocket Spectroscope** after Hofmann, Figure. . . . . The spectroscope is provided with a telescope of approx. power 4, movable between pivot screws, also with a prism-system of 9° dispersion. The spectrum is consequently greatly extended. The construction is similar to that of the Janssen-Hofmann Spectroscopes and the gap is very accurately constructed and adjustable. With scale and comparison prism, in case.	5. 10. 0
54,120. **Pocket Spectroscope** after Vogel, Figure, with direct-vision prism and with comparison prism in case	2. 5. 0
54,121. — idem, without comparison prism, Figure, in case	1. 13. 0
54,122. **Stand for Vogel Spectroscopes** Nos. 54,120/1, cf. Figure, without Spectroscopes . .	0. 12. 0
54,123. **Pocket Spectroscope** after Browning, Figs. A, B, C, with scale, comparison prism, symmetrical gap and lens disc after Martens, in case . . . . . The gap distance in this instrument is fixed. The sharp focussing for different eyes is brought about by an excentric disc with six lenses of different powers.	4. 15. 0
54,124. **Pocket Spectroscope as No. 54,123,** but with easily removable cap, reflecting prism and Beckmann electric illuminating device, with three dry cells in small box . . .	7. 10. 0
54,125. — idem, with wave-length scale	8. 0. 0
54,126. **Universal Stand,** for use with Nos. 54,120/5, Figs. 54,123 B and C, with illuminating mirror, stage and clamp for the spectroscope, one absorption trough, one absorption tube. Price without Spectroscope . . . . . For investigations on weakly absorbent solutions or on solids the spectroscope is placed vertically — see illustration.	3. 5. 0



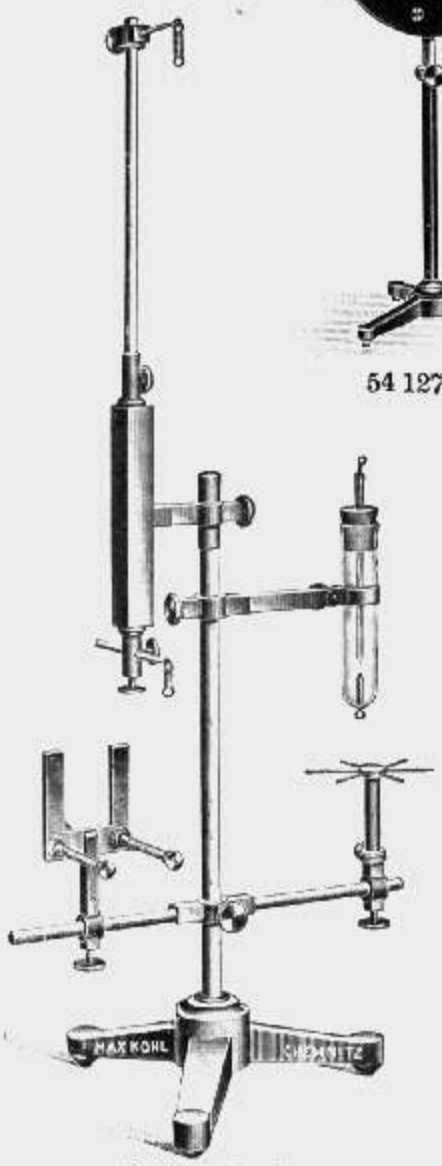
54 127. 1 : 8.



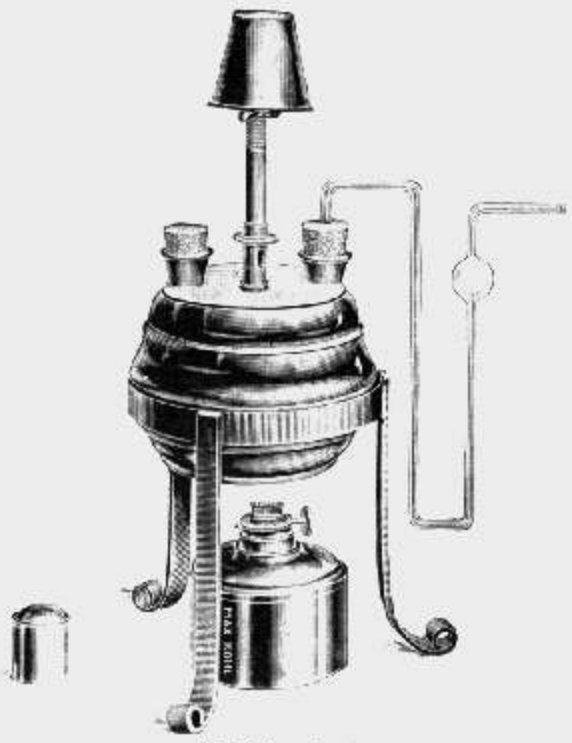
54 132. 1 : 5.



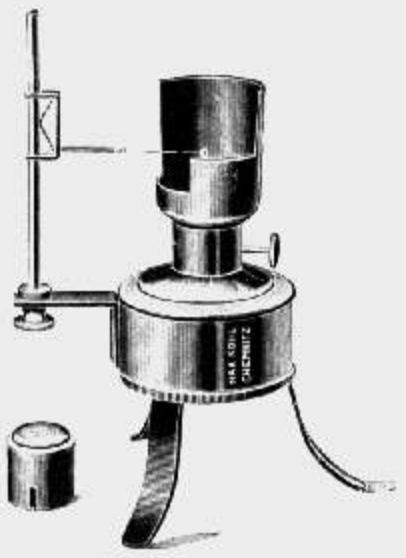
54 131. 1 : 6.



54 128. 1 : 5.



54 133. 1 : 5.



54 134. 1 : 2.

	£. s. d.
54,127. **Double Gap** with micrometer adjustment, Figure, for comparing the luminous intensities of two spectra, for demonstrations . . . . . The colours of one spectrum are conducted through the gap by the aid of a total reflecting prism.	2. 8. 0
54,128. **Universal Stand** for Spectrum experiments, Figure . . . . . The Stand serves for holding small glass troughs, spectrum tubes, the Delachanal and Mermet spark tubes, and as a holder for glass tubes having platinum lugs.	3. 0. 0
54,129. **Small Glass Tube with platinum lugs.** Price per 12	0. 6. 0
54,130. **Stand for holding the small glass tubes** (M. P. II, 1, Fig. 475 [216])	0. 4. 0
54,131. **Burner for Monochromatic light,** after Terquem, Figure	1. 10. 0
54,132. **Burner for monochromatic light,** after Noack, Figure (Ztschr. z. Förd. d. phys. U., 2, p. 67)	0. 16. 0
54,133. **Breitenlohner's Spirit Lamp,** Figure, with Bunsen burner attachment and safety tube, on tripod	0. 16. 0
Spirit Bunsen Burners, substitute for Gas Burners: see Nos. 51,214 and 51,216, p. 209.	
54,134. **Spirit Lamp,** Figure, with adjustable holder for platinum wires, of brass . . .	0. 12. 0
Bunsen Burners: see Nos. 51,184 et seq.	
54,135. **Spectrum Lamp for continuous Vapour Spectra,** after Eder and Valenta, with a rotating platinum wire net which plunges in the liquid (M. P. II, 1, Fig. 479), without platinum net . . . . . The price of the platinum net (based on the current price of platinum) quoted on application.	5. 0. 0

Cl. 5212, 3390, 1409, 1408, 1410, 3391.

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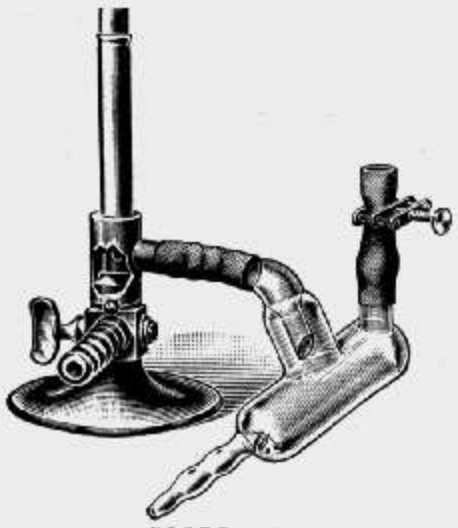
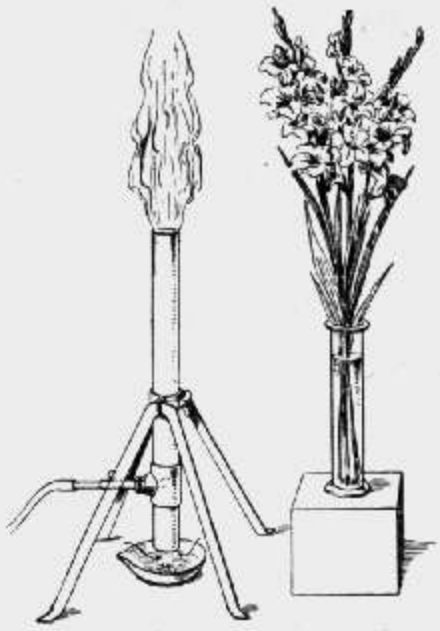
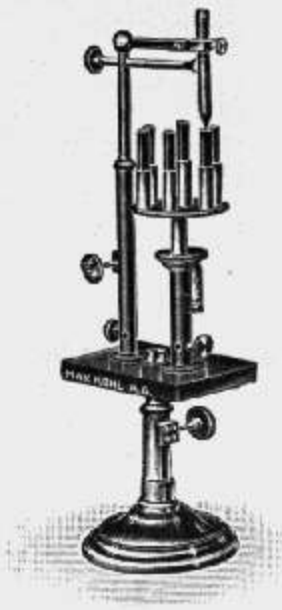


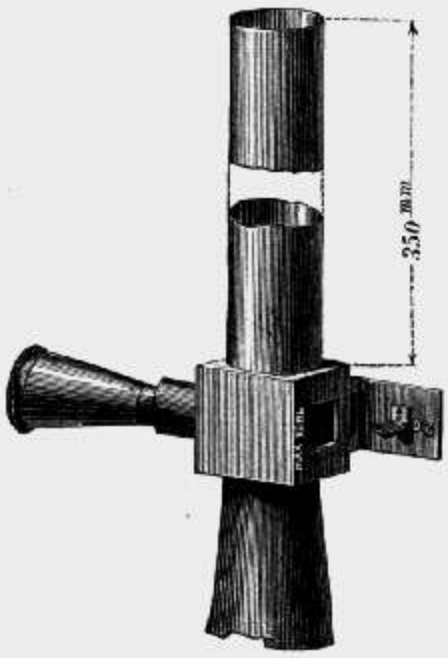
54136. 1 : 3.



54137. 1 : 12.



54143. 1 : 8.



54139. 1 : 6.



54142. 1 : 5.



54144. 1 : 3.

	£ s. d.
54,136. **Spectrum Lamp** with angular pulveriser after Beckmann, Figure (Ztschr. f. phys. Chemie, **40**, p. 470), with burner, rubber tubing and pinch-cock, especially for laboratory work	0. 12. 0
54,137. **Large Spectrum Lamp for chemical pulverisation,** after Beckmann, Figure, for demonstrating the influence of coloured flames on environment (Ztschr. f. phys. Chemie, **57**, 1907, p. 641)	1. 10. 0
54,138. **7 Diaphragms for Relief Spectra** (M. T. p. 187 [188])	1. 4. 0
* 54,139. **Lantern for objective Chemical Spectra,** Figure (W. D. Fig. 295 [278]), for demonstrating the principal spectra by means of sets of Bengal Lights	1. 6. 0
54.140. **Lantern with Nernst Lamp,** after Grimsehl, for optical experiments (Sonderhefte d. Ztschr. f. d. phys. u. chem. U. **1**, p. 53), with lens mount, diaphragms, gap, etc. . .	2. 18. 0
* 54,141. **Collimator Tube with Micrometer Gap** after Grimsehl, on Stand, for demonstrating the spectrum objectively (Ztschr. f. d. phys. u. chem. U. **20**, 1907, p. 209, Fig. 1 C)	1. 4. 0
54,142. **Mitscherlich's Apparatus,** Figure, with 8 glass tubes with platinum wicks, for permanent spectra	1. 6. 0
54,143. **Revolving Device on Stand,** Figure, for observing 6 spectra consecutively, consisting of six carbon rods impregnated with different salts	2. 10. 0
54,144. **Revolving Device for Arc Lamps,** Figure, for rapidly alternating six carbon rods; to be used instead of the lower carbon of the projection arc lamp	1. 0. 0
50,922. **6 bored Carbons with Solid Carbons,** the former filled with salts, for spectrum experiments (see No. 50,922, p. 171)	0. 9. 0

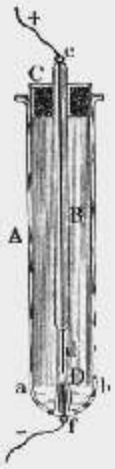
* Can be used with Projection Apparatus.



54145. 1 : 7.



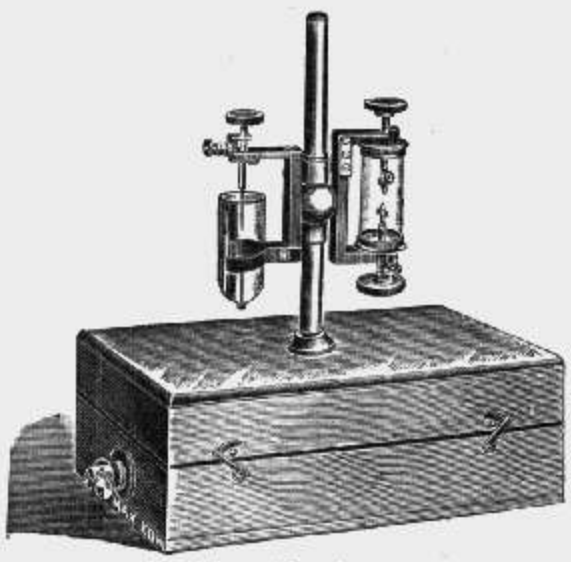
54146. 1 : 8.



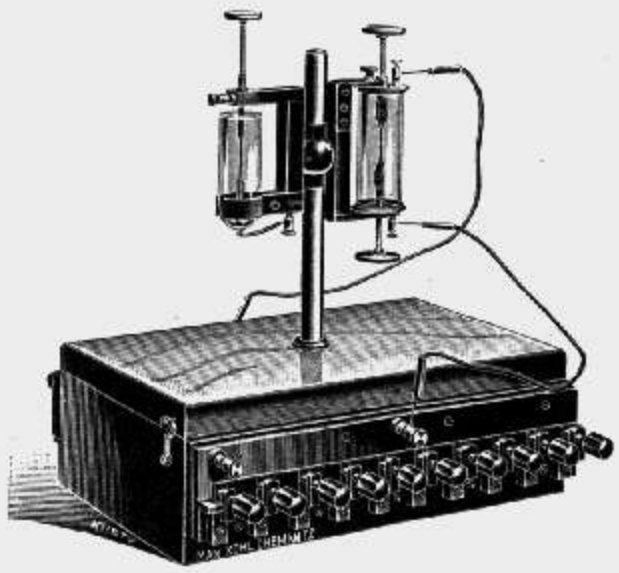
54147. 1 : 2.



54149. 1 : 4.



54150 — 54154. 1 : 8.



54155 — 54159. 1 : 8.

	£. s. d.
54,145. **Apparatus** for investigating Metal Spectra by the aid of the spark intensified by the Leyden Jar, Figure. . . . . There are supplied with the apparatus metal points of copper, brass, iron, aluminium and German silver. For Condensers: see Electricity Section.	1. 12. 0
54,146. — idem, simpler, Figure.	0. 16. 0
54,147. **Spark Tube** after Delachanel and Mermet (**Fulgurator**), Figure (W. u. E. phys. prakt., Fig. 189).	0. 3. 0
54,148. — idem, with stand	0. 12. 0
54,149. — idem, after Vogel, Figure (M. P. 9th Edn., II, 1, Fig. 219)	0. 15. 0

Sparking Pillars for Metal Spectra and Spark Tubes for Liquids, after Browning, **combined with Condenser** for intensifying the spark, Figure.

List No.	**54,150**	**54,151**	**54,152**	**54,153**	**54,154**
For induction Coils with Spark Lengths of mm	60	100	150	200	250
£	**5. 0. 0**	**6. 0. 0**	**9. 0. 0**	**12. 0. 0**	**15. 0. 0**

Sparking Pillars after Browning, Figure, as before, but with device for inserting 2, 4, 6, 8, 10—20 condenser plates for intensifying the spark as desired.

List No.	**54,155**	**54,156**	**54,157**	**54,158**	**54,159**
For Induction Coils with Spark Lengths of mm	60	100	150	200	250
£	**7. 0. 0**	**8. 0. 0**	**11. 0. 0.**	**14. 0.0**	**17. 0. 0**

54,160. **2 Sheet Iron Electrodes** for producing the Spectra of incandescent Vapours (M. T. Fig. 145)	0. 4. 0

Cl. 1415, 1416, 1419, 3838, 1417, 1418.

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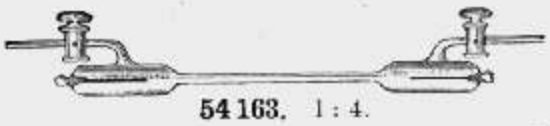
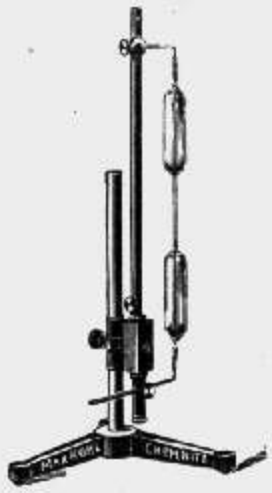
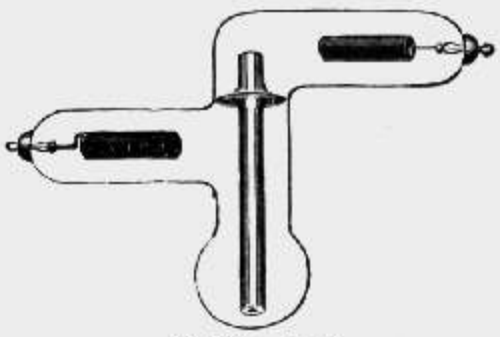
54161. 1 : 4.



54163. 1 : 4.



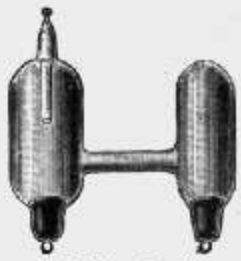
54164. 1 : 8.



54168. 1 : 3.



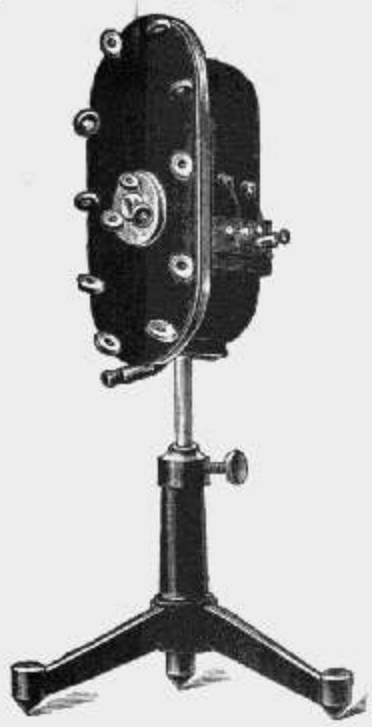
54172. 1 : 4.



54173. 1 : 3.

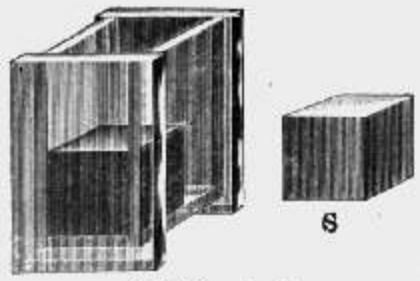


54174A. 1 : 4.



54174B. 1 : 4.

	£ s. d.
54,161. **Spectrum Tube** after Geissler, Figure, thoroughly well constructed, with O, H, N, CO, CO_2, H_2O, Cl, HCl, Br, I, Cy, HCy, NO, NO_2, Carburetted Hydrogen; Solids: S, Se, Hg or Hg_2S . . . . . each	0. 3. 6
54,162. **Spectrum Tube,** filled with argon (A) or helium (He)	0.10. 0
54,163. **Spectrum Tube** with 2 cocks, Figure, for evacuating and filling automatically	0. 5. 0
54,164. **Stand for Spectrum Tubes,** Figure	0.18. 0
63,071. — idem, simpler	0.10. 0
54,165. — idem, after Friedr. C. G. Müller (M. T. Fig. 144)	0.12. 0
54,167. **Spectrum Tube,** end-on pattern, filled with O, H, N, CO, CO_2, H_2O, Cl, HCl, Br, I, Cy, HCy, NO, NO_2, NH_3, SO_2, SO_3, H_2S, $SnCl_2$, etc. . . . . each	0. 5. 0
54,168. **Spectrum Tube with Capillary,** with Cylindrical Electrodes, Figure, for viewing end-on and side-on from both sides, can be supplied filled with the same gases as No. 54,167	0.10. 0
54,169. — idem, filled with argon (A), helium (He) or a mixture of argon and helium	0.18. 0
54,172. **Stand with Fine Motion for Spectrum Tubes,** Figure, for concentric adjustment of the capillary with the spectrum apparatus, vertical fine motion by screw M, horizontal fine motion by lever H, vertical motion by lever V	2. 0. 0
54,173. **Mercury Spectrum Lamp,** Figure	0.10. 0
This lamp generates an intense white light well adapted for optical purposes. It is worked by a not too small induction apparatus and requires no water cooling. The lamp is arranged so that only the cross-section of the capillary tube is utilised; the luminous source then shines as a small circular spot of great intensity.	
54,174. **Mercury Arc Lamp** after Lummer-Straubel, Fig. A, with water box on adjustable stand, Fig. B	4. 0. 0
The lamp requires a pressure of 25—30 volts for working; even if it can stand a considerably higher voltage than this it is not advisable to go above 30 volts if the lamp has to be durable. If it has only to be used for a very short time it will be sufficient simply to fill the box with water; if, however, it is intended to work it for some hours the water must be made to circulate.	
54,174A. **Spare Mercury Arc Lamp,** Figure	1. 5. 0

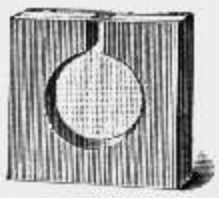


54 179. 1 : 1.

S



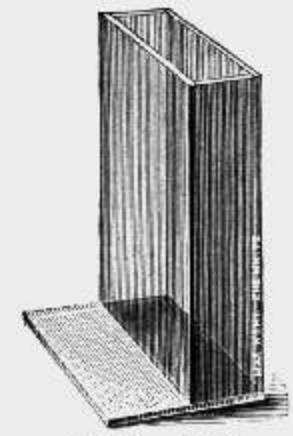
54 181. 1 : 2.



54 183. 1 : 2.



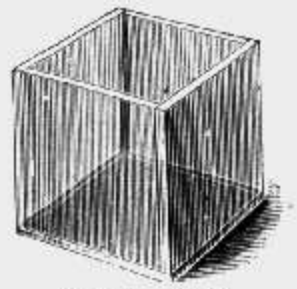
54 192/93. 1 : 5.



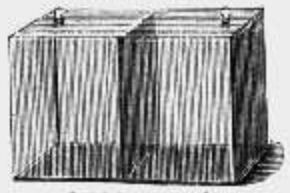
54 180. 2 : 3.



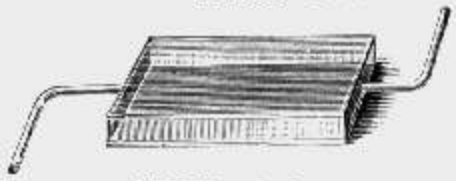
54 189. 1 : 3.



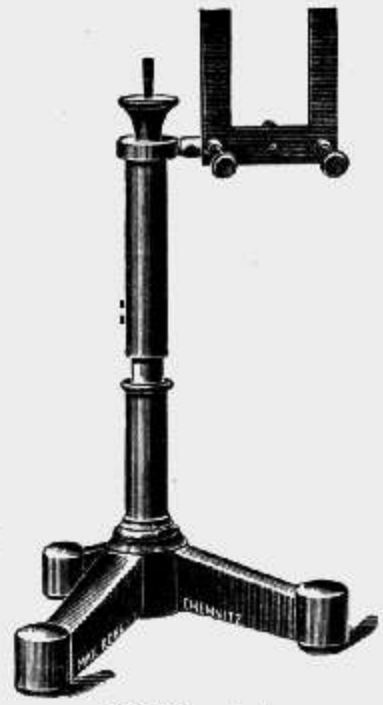
54 187. 1 : 3.



54 190. 1 : 3.



54 195. 1 : 2.



54 196. 1 : 4.

Small Flasks with absorbent Liquids, with parallel walls, **in case:**

				£ s. d.
List No.	**54,176**	**54,177**	**54,178**	
Quantity	6	9	12	
£	**0. 10. 0**	**0. 15. 0**	**1. 0. 0**	

54,179. **Absorption Box** with plane parallel detachable walls and Schulz Glass Block, Figure (M. P. 9th Edn., II, 1, Fig. 241; W. u. E. phys. Prakt., Fig. 250) 0. 18. 0

54,180. **Absorption Box,** rectangular form, Figure, with wide projecting bottom plate and loose cover; inside measurements: 55 × 35 × 10 mm 0. 3. 6

54,181. — idem, U-shaped, Figure; inside measurements: 30 × 20 × 5 mm 0. 2. 0

54,182. — idem, inside measurements: 50 × 20 × 5 mm 0. 2. 6

54,183. — idem, bottle-shaped, Figure; inside measurements: 20 × 4 mm 0. 2. 0

Hollow Crystal Glass Cubes, Fig. 54,187, open on one side:

List No.	**54,184**	**54,185**	**54,186**	**54,187**	**54,188**	
External Size mm	30	40	50	60	80	
£	**0. 1. 6**	**0. 2. 0**	**0. 3. 0**	**0. 4. 0**	**0. 6. 0**	

54,189. **Absorption Box** with lid cemented on and ground-in stopper, Figure, 40 × 40 × 10 mm 0. 8. 0

54,190. **Double Absorption Box,** Figure, for simultaneously observing two different liquids; inside dimensions of each compartment 40 × 25 × 10 mm 0. 12. 0

54,191. **Absorption Vessel,** wedge-shaped, 150 × 4 × 25 mm 0. 12. 0

Prismatic Troughs, Figure, each pair similar. Combined these vessels form an absorption stratum with parallel walls in which, by moving the single troughs, liquid strata of different density can be rapidly produced.

List No.	**54,192**	**54,193**
mm	100 × 40	150 × 50
Per pair £	**0. 12. 0**	**1. 0. 0**

54,194. **Absorption Vessel,** spherical, for gases, on Stand with lateral opening (M. P., 9th Edn., II., 1, Fig. 222) 1. 10. 0

54,195. **Absorption Trough** for filling with Gases, Figure, with two tubes ground in, 55 mm long, 35 mm wide, 10 mm deep 0. 8. 0

54,196. **Stand for holding Absorption Boxes, Troughs, Preparations, etc.,** Figure, with arrangement for raising and lowering by hand and with micrometer. The objects are placed between two spring clamps and can be conveniently set up or removed . . . 1. 0. 0

54,197. **3 Gelatine Plates** for Absorption Experiments (M. T. p. 198) 0. 2. 0

54,198. **3 Coloured Glass Plates** for Absorption Experiments (M. T. p. 198) 0. 3. 0

Cl. 1426, 1428, 1429, 299, 1430, 1432, 1433, 1431, 1434, 1435.

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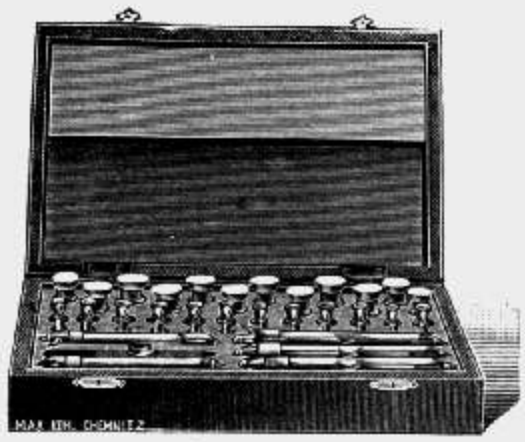
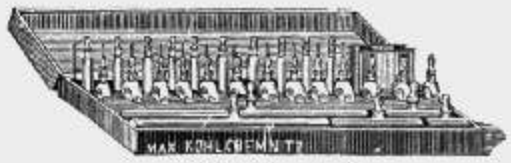
54 199. 2 : 5.



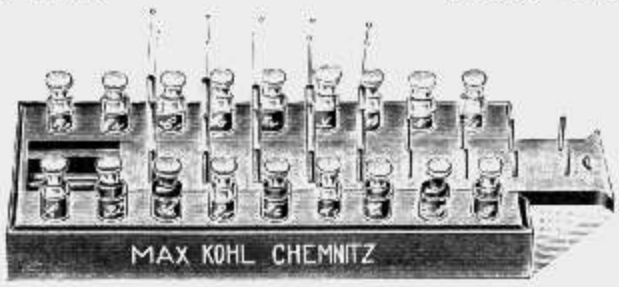
54 203. 1 : 5.



54 214. 1 : 6.



54 217. 1 : 6.



54 218. 1 : 4.



54 221. 1 : 6.

		£ s. d.
54,199.	**Coloured Plate** with Coal-tar colours, for absorption experiments with transmitted light, Figure The slab contains eight different colours and a dark and a light tint for each colour. As shown in illustration, white strips are free between the colours so that the absorption spectrum can be conveniently compared with the pure spectrum.	0. 13. 0
54,200.	— idem, simpler, with only one tint for each colour; the single colours are separated by black strips	0. 6. 0
54,201.	**Absorption Colour Plate** for absorption experiments with reflected light, with seven coloured cross strips	0. 4. 0
54,202.	**Crystal Plates** showing absorption phenomena: Uranite, Chalcolite, Parisite, Zirconium, Didymium Glass . . . . . each £ **0. 6. 0** to	0. 10. 0
54,203.	**Preparations for Spectrum Experiments,** in box, Figure, containing: 6 pairs rods of silver, platinum, aluminium, zinc, copper, iron; 12 small bottles with parallel walls, filled with absorbent liquids; 6 spectrum tubes; 10 small bottles with chlorides; 10 glass tubes with platinum lugs	4. 4. 0

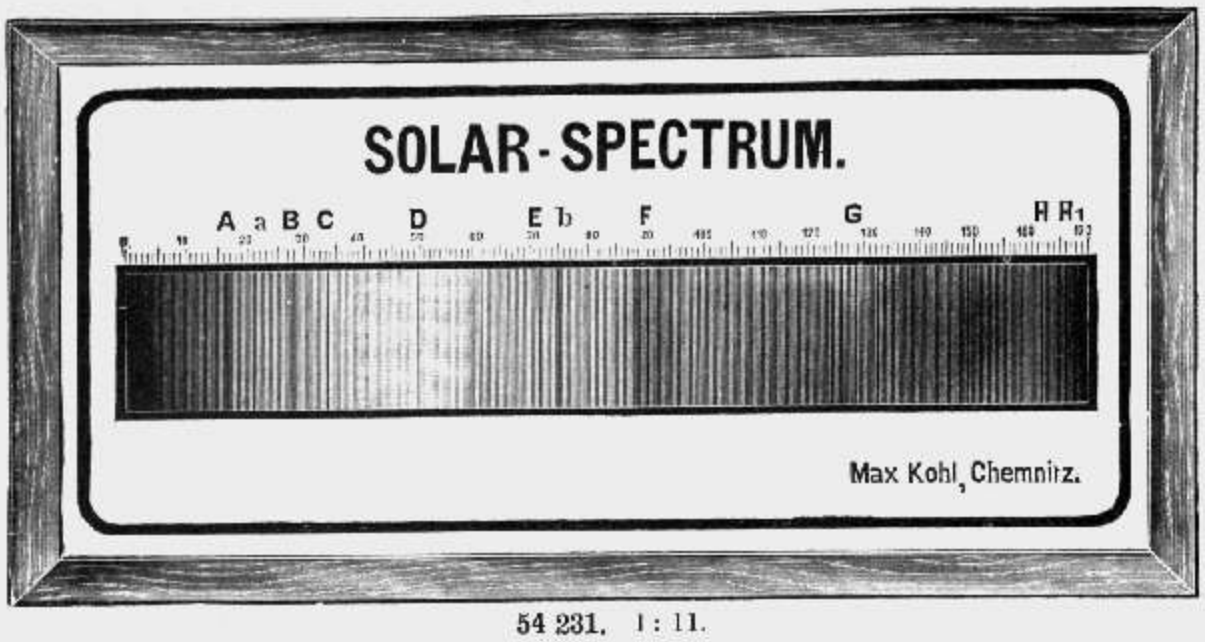
Salts for Spectrum Experiments, chemically pure, in preparation glasses:

List No.	**54,204**	**54,205**	**54,206**	**54,207**	**54,208**	**54,209**	**54,210**
	Na	K	Li	Ba	Sr	Ca	Rb
£	**0. 0. 6**	**0. 0. 6**	**0. 0. 6**	**0. 0. 6**	**0. 0. 6**	**0. 0. 6**	**0. 1. 0**

54,214.	**10 Reagents,** Figure, in small bottles with ground-in stoppers, fitted in block for storing	0. 15. 0
54,215.	— idem, **6 Reagents**	0. 10. 0
54,216.	**Box with Salts and Small Bottles,** of mahogany, containing 10 Salts in small flasks, and 14 small bottles for absorption phenomena	1. 16. 0
54,217.	**Box with Tubes, small Glass Vessels and Reagents,** containing: 5 tubes of 2, 3, 10, 15, 20 cm length with ground end surfaces; a flat glass vessel with detachable parts; 2 glasses filled with NO_2 and Iodine; 10 glasses filled with salts; 12 glasses for absorption phenomena; 10 glass tubes with platinum lugs	3. 12. 0
54,218.	**Collection of 18 Preparations,** Figure, for Spectroscopic investigations, in glass vessels having platinum wires, as follows: $Ba_2Cl_2 + 2H_2O$; $CuCl_2 + 2H_2O$; CsCl; $CaCl_2 + 6H_2O$; KaCl; In_2Cl_6; LiCl; NaCl; $PbCl_2$; RbCl; $SrCl_2 + 6H_2O$; TlCl; Se; $ZnCl_2$; $TeCl_4$ and solutions of Di $(NO_3)_3$; $KaMnO_4$; Er $(NO_3)_3$, in box	2. 4. 0
54,220.	**Apparatus for Reversal of the Sodium Line,** after Bunsen (W. D. Fig. 297 [280]; M. P., 9th Edn., II, 1, Fig. 234)	0. 18. 0
54,221.	— idem, after Weinhold, Figure (W. D. p. 408 [375]), 1 Teclu and 1 Bunsen Burner on one base, and one asbestos slab	0. 16. 0



54 222.
1 : 15.



54 231. 1 : 11.

	£. s. d.
54,222. **Apparatus for reversing the Sodium Line** after Frankland, Figure (M. P., II, 1, Figs. 543 and 544 [231]), with platinum spoon and wire net	1. 16. 0
54,223. **Sodium Tube** for Reversing the Sodium Lines of refractory glass, evacuated with H	0. 10. 0
54,224. — idem, with three bulbs	0. 10. 0
* 54,225. **Bunsen-Burner with Pan and Sheet-iron Cylinder,** after Grimsehl, for reversing the sodium line, for objective demonstration (Ztschr. f. d. phys. u. chem. U. **20,** 1907, p. 209, Fig. 1 [B] and Fig. 2)	0. 14. 0
* 54,226. **Stand with illuminating Tube** for reversing the strontium line, after Grimsehl, for objective demonstration (Ztschr. f. d. phys. u. chem. U. **20,** 1907, p. 211, Fig. 3 [B])	0. 16. 0
54,227. **Table of Spectra** after Kirchoff and Bunsen, containing the solar spectrum and the spectra of K, Rb, Cs, Tl, Na, Li, Ca, Sr, Ba	0. 7. 0
54,228. — idem, containing the spectra of In, C, Bo, Mn, Pb, Cu, Co, Ni, Fe	0. 7. 0
54,229. **Star Spectra Table** after Vogel, containing the spectra of Sirius, β Lyrae, Sun, B. D. 34° 4001, new star in Cygnus, α Orionis, Schjell. 152, and Carburetted Hydrogen Spectrum for comparison	0. 7. 0
54,230. — idem, containing the spectra of a nebula, of Uranus, of a comet, of carburetted hydrogen for comparison, of the Sun's limb and illustration of spectrum of the Sun's limb with strong dispersion (displacement of lines)	0. 7. 0
54,231. **Solar Spectrum,** Figure, painted on linen, with frame, very pretty pattern	3. 10. 0
54,232. — idem, with wood rods for rolling up, as Fig. 52,227, p. 36	3. 0. 0
* 54,233. — idem, **transparent,** coloured	1. 0. 0

Fluorescence.

54,234. **3 Cubes** of fluorspar, uranium and didymium glass, fluorescing blue, green and red respectively, 13 mm side, in box	1. 16. 0
54,235. **Cube of Fluorspar,** fluorescing blue, 13 mm side	1. 0. 0
54,236. — of **uranium glass,** fluorescing green, 30 mm side	0. 2. 0
54,237. — idem, 50 mm side	0. 4. 0
54,238. — of **Didymium Glass,** fluorescing red, 13 mm side	0. 12. 0
54,239. **Holder for Fluorescent Cubes,** Figure, adjustable, **with mount** When ordering kindly state size of cube to be inserted.	0. 18. 0
54,240. **Uranium Glass Plate,** 150 × 60 × 8 mm	0. 5. 0
54,241. — idem, 300×60×8 mm	0. 10. 0
54.242. **Collection for Fluorescence Experiments,** Figure, consisting of 4 hollow glass cubes for liquids, Uranium glass plate, Uranium glass cube, Didymium glass and fluorspar, also condenser lens on stand	3. 10. 0

* Can be used with Projection Apparatus.

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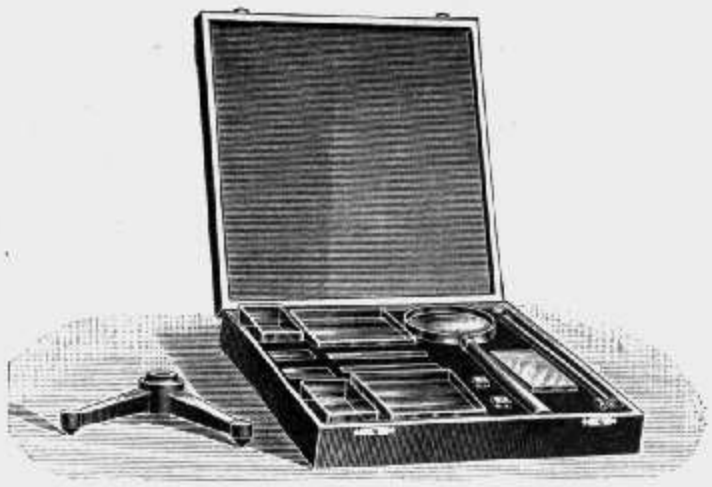
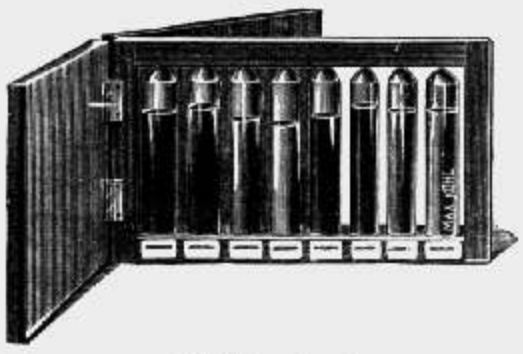
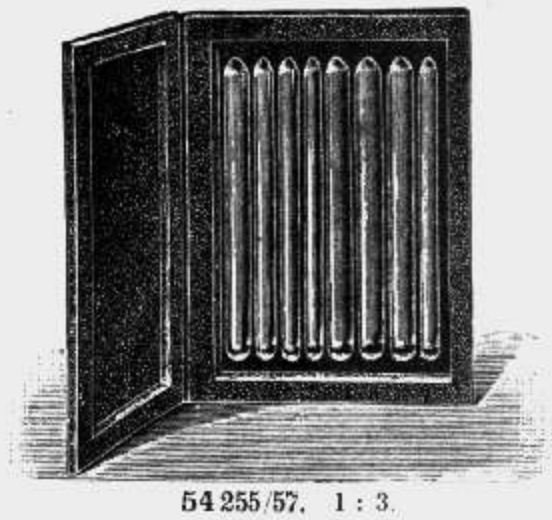
54 239. 1 : 4.



54 242. 1 : 7.



54 244. 1 : 6.



54 255/57. 1 : 3.

Collection of Fluorescent Liquids, Fig. 54,244, named, in wood frame with covers:

List No.	54,243	54,244	54,245	54,246
	6	8	10	12 solutions
£	0. 12. 0	0. 16. 0	1. 0. 0	1. 4. 0

54,247. **Fluorescent Liquids** for filling troughs 100 ccm . . . . . £ s. d. 0. 2. 6

Quartz Lenses, bi-convex, radius of curvature 150 or 300 mm:

List No.	54,248	54,249	54,250
Diameter mm	40	50	60
£	0. 12. 0	1. 0. 0	1. 10. 0

Geissler Tubes with Fluorescence Phenomena: see Section "Electricity".

54,251. **Apparatus for Demonstrating the Fluorescence Spectrum of the Electric Light,** after Stokes (M. P., 9th Edn., II, 1, Fig. 250), consisting of 2 quartz prisms of 30 mm side, ground perpendicular to optical axis, two sides polished; 1 quartz lens 40 mm diameter, 110 mm focal length, bi-convex; and 1 Uranium glass plate 150 × 60 × 8 mm, on stand 8. 0. 0

54,252. **Violet Glass Plate 150 × 150 mm,** for Stokes's Experiment (M. P., 9th Edn., II, 1, p. 360) 0. 6. 0

54,253. **Paper Strip** prepared with barium platino-cyanide, 6 × 4 cm 0. 5. 0

54,254. **Fluorescent Portfolio, with barium platino-cyanide Writing,** in portfolio of blue and yellow glass 0. 5. 0

Phosphorescence.

Phosphorescent Substances, in case, Figure:

List No.	54,255	54,256	54,257
	3	5	7 substances
£	0. 5. 0	0. 7. 0	0. 10. 0

Cl. 5215, 1443, 1444, 1445.



54 258 A. 1 : 4.



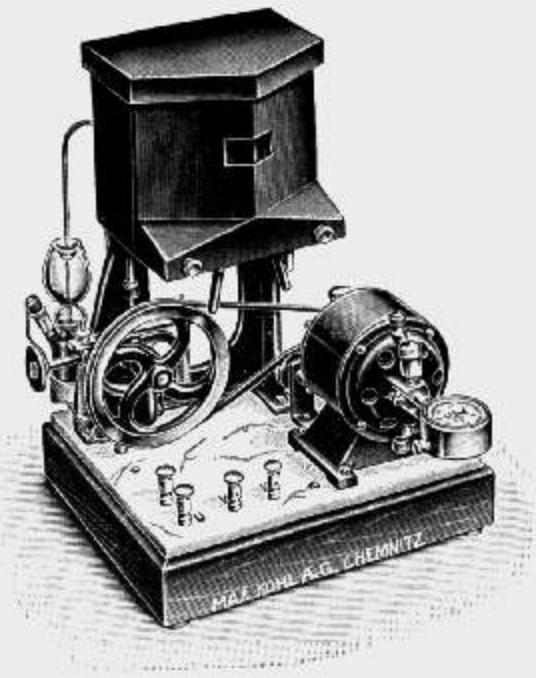
54 258 B. 1 : 4.



54 259. 1 : 8.



54 261. 1 : 6.



54 260. 1 : 7.

54,258. **Case with 6 Phosphorescent Substances,** shown open in Fig. A, and closed in Fig. B . . . . . £ s. d. 0. 12. 0

The case contains six small flat glass tubes sealed up and containing pulverulent substances of different colours which phosphoresce. In the lid there is a small wood slab let in under glass which is coated with a paint which shines a brilliant violet.

54,259. **7 Phosphorescent Substances, in eye tube,** Figure. The back wall can be let down 1. 0. 0

54,260. **NEW. Phosphoroscope** after Lenard, Figure, adapted for single experiments and for demonstration purposes (Hausser, Ztschr. f. Instrkd. **30**, 1910, p. 278), with a preparation holder with 6 preparations, a trough with quartz lid for powdery substances, and a pair of tongs for holding any object; with 110 volt Direct Current Electric Motor, tachometer and motor interrupter 18. 0. 0

The phosphorescent body is illuminated by an electric spark generated from an induction coil of 10—20 cm stroke between zinc electrodes, these electrodes being very rich in light exciting ultra-violet phosphorescence. The duration between lighting and observation is quite small. The apparatus is used when demonstrating from the side illustrated, and in individual experiments from the opposite side.

54,261. **Phosphoroscope** after Becquerel, Figure (M. P., II, 1, Figs. 590—592 [253]), on firm stand 6. 0. 0

54,262. — idem, large pattern, Figure, on cast-iron stand with toothed wheel gearing 20. 0. 0

52,046. **Phosphoroscope arranged to fit Whirling Table:** see Fig. 52,046, p. 284 . . . . . 2. 0. 0

54,263. **Phosphorescent Paint** (Balmain's) can be used in conjunction with water or oil colour. Per half-kilogramme 0. 15. 0

Photography.

54,264. **Folding Camera,** Figure, for plates and films 9 × 12 cm, aluminium body covered fine leather, with double bottom extension, thus allowing the back lens alone to be used. Objective adjustable laterally and vertically; three metal dark slides and introduction to photography. Price with **Extra-rapid Aplanat** 5. 10. 0

The objective has an iris diaphragm and shutter for time photographs of any duration and instantaneous exposures from $^1/_{100}$ to 1 second. The apparatus has a leather bellows, is fitted with a good finder and is arranged for vertical and horizontal pictures. The picture can be focussed either by the scale or on the ground glass screen. Outside dimensions approx. 15.5 × 3.8 × 11.5 cm. For Stands see Nos. 54 288 and 54 289.

Cl. 1446, 1447, 3843, 1448, 5450.

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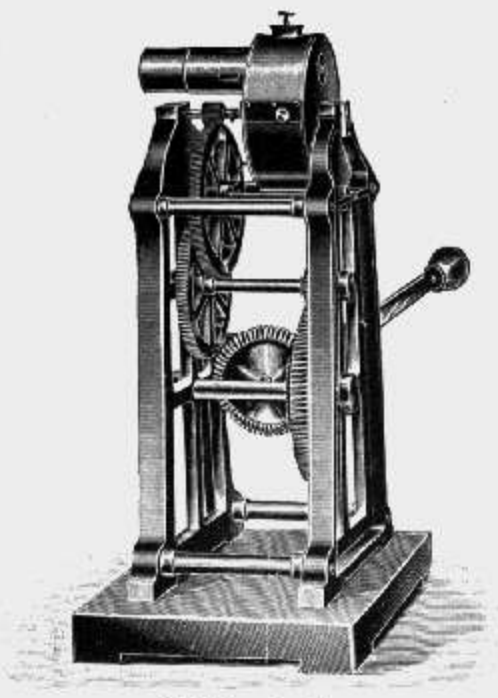
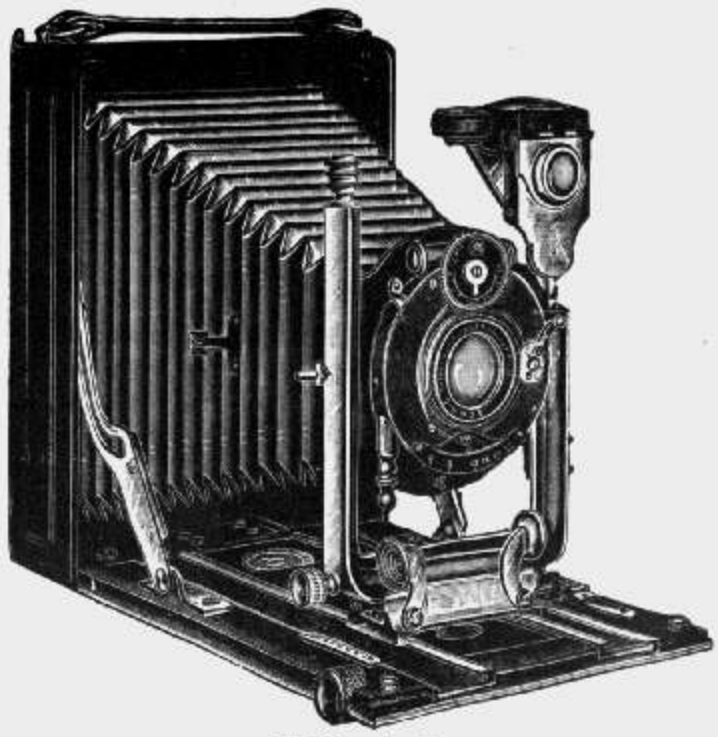


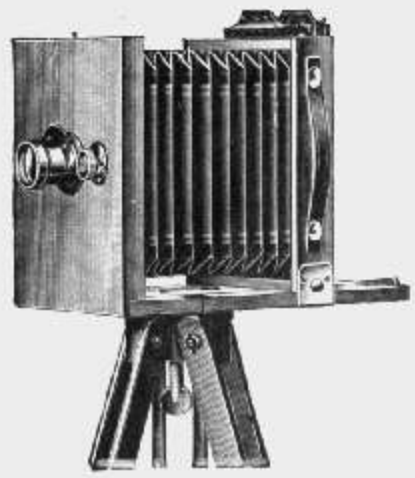
54 262. 1 : 6.



54 264. 1 : 3.



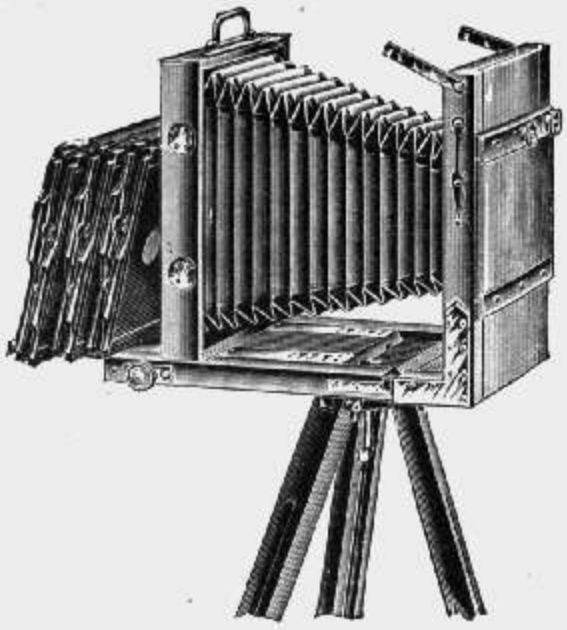
54 269. 1 : 3.



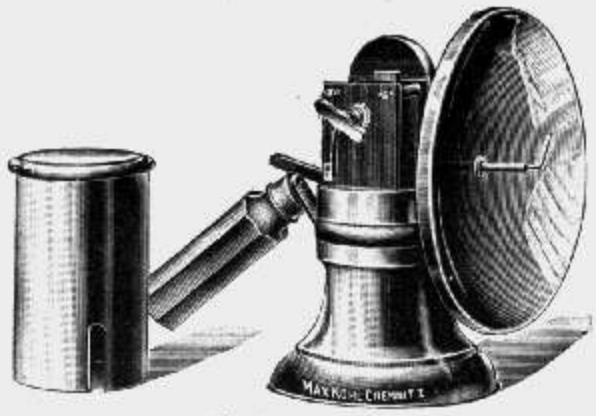
54 272. 1 : 5.

	£ s. d.
54,265. **Folding Camera** exactly as No. 54,264, with **Zeiss Double Amatar 1 : 6.8**	10. 5. 0
54,266. — i d e m, with **Zeiss Double Protar 1 : 6.3**	13. 0. 0
54,267. **Film Pack Slide** for Apparatus Nos. 54,264—54,266	0. 8. 0
54,268. **Cow Hide Bag**	0. 14. 0
54,269. **Stereoscopic Camera,** F i g u r e, for taking sterescopic pictures and ordinary pictures (Panorama form), body of mahogany, leather covered, with triple bottom extension, objective adjustable vertically and laterally, 3 metal dark slides and instructions, with **Extra Rapid Aplanats**	10. 0. 0
The objective has iris diaphragm, shutter for any time exposures and for instantaneous exposures from 1 to $^1/_{250}$th second. The apparatus has a leather bellows, is fitted with a finder and arranged for vertical or horizontal portraits. Focussing can either be carried out by the scale or on the ground glass screen. External dimensions approximately, 18.5 × 5.5 × 13 cm. For Stands, see Nos. 54,288 and 54,289.	
54,270. — i d e m, with **Zeiss Double Amatars, 1 : 6.8**	19. 10. 0
54,271. **Cow Hide Bag**	0. 15. 0
54,272. **Scholars' Stand Camera,** F i g u r e, for plates 9 × 12 cm, walnut body with long calico bellows, shutter for instantaneous and time exposures, for vertical or horizontal pictures, with three double dark slides, stand in two parts, and Periscopic Aplanat and revolving diaphragm	1. 15. 0

Cl. 1449, 5948, 5946, 5945.



54 274. 1 : 6.



54 286. 1 : 4.



54 290. 1 : 5.

	£ s. d.
54,273. **Stand Camera,** cf. Fig. 54,274, for plates 9 × 12 cm, polished mahogany body, calico bellows with leather edges, conical and rotary; objective board having height and lateral adjustment; with plummet, spirit level, three double dark slides; with **Extra Rapid Aplanat,** iris diaphragm, Objective Shutter for time and instantaneous exposures, and tripod stand	4. 0. 0
54,274. — idem, Figure, for plates **13 × 18 cm**	4. 12. 0
54,275. — idem, cf. Fig. 54,274, for plates **18 × 24 cm**	6. 4. 0
54,276. — idem, cf. Fig. 54,274, for plates **24 × 30 cm**	9. 10. 0

54,277. **Bags** of gray sail-cloth, can also be carried as a knapsack.

For Apparatus of plate-size	9×12	13×18	18×24	24×30
£	**0. 10. 0**	**0. 10. 0**	**0. 12. 0**	**0. 18. 0**

Photographic Outfits, containing everything necessary for finishing photographs:

List No.	**54,278**	**54,279**	**54,280**	**54,281**	
For Cameras of plate-size	9×12	13×18	18×24	24×30	cm
£	**0. 9. 0**	**0. 15. 0**	**1. 10. 0**	**2. 6. 0**	

The outfit consists of one dark room lamp, 12 plates, 1 packet Celloidin paper, 25 mounts, developer, fixing bath, toning and fixing bath, papier maché dish, enamel dish, glass dish, glass measure, printing frame, mountant, brush, and instructions.

Supplementary Outfits for Photography:

List No.	**54,282**	**54,283**	**54,284**	**54,285**	
For Cameras of plate-size	9×12	13×18	18×24	24×30	cm
£	**0. 10. 0**	**0. 12. 0**	**0. 14. 0**	**0. 16. 0**	

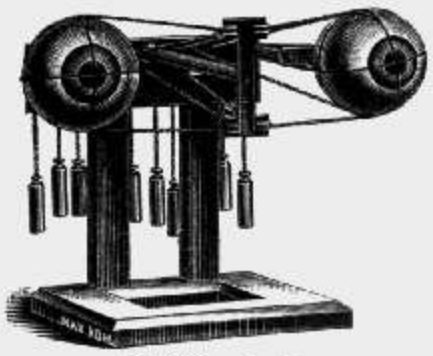
Glass funnel, dropping bottle, plate grips for small plates, plate lifter, small brush, drying clips, draining rack, trimming glass, trimming springs, glossing slab, squeegee, flashlight bag, flashlight powder, filter paper.

54,286. **Magnesium Lamp** with clockwork, Figure . . . . . The clockwork runs 6—8 minutes and can be released and stopped by a lever.	1. 4. 0
54,287. **Spare Magnesium Tape**	0. 1. 6
54,288. **Tripod Stand** for Apparatus Nos. 54,264—54,270, of ash, brass bound	1. 0. 0
54,289. **Tubular Stand** of brass, in five parts; length folded up 36 centimetres	0. 14. 0

For Dark-room Fittings see pp. 79—82.

The Eye and Phenomena of Vision.

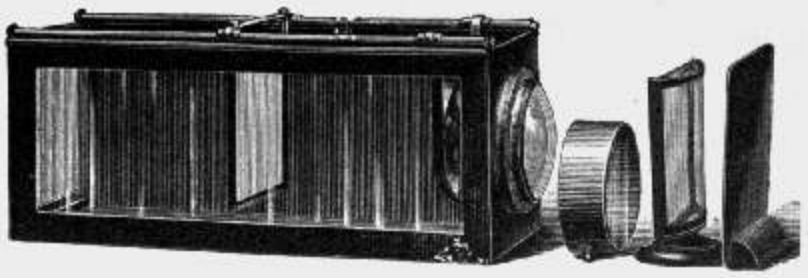
54,290. **Model of the Eye,** after Bock, Figure, 80 mm diameter	0. 10. 0
54,291. — larger, 130 mm diameter	0. 12. 0
54,292. **Ophthalmotrope** after Knapp, Figure, for demonstrating the motions of the eye and the action of the single muscles concerned therein	2. 8. 0



54292. 1 : 5.



54293. 1 : 3.



54294. 1 : 8.



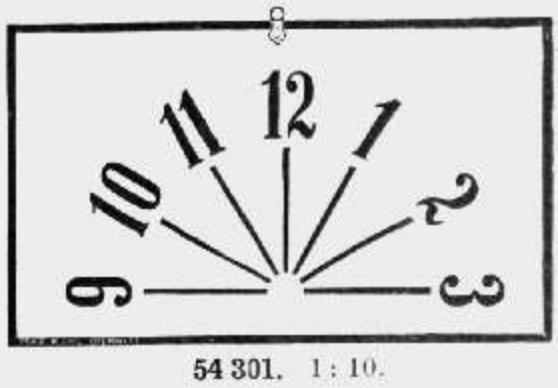
54300. 1 : 2.



54298. 1 : 14.



54299. 1 : 6.

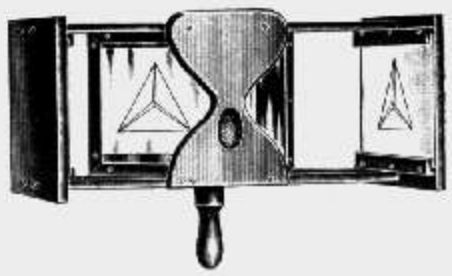


54301. 1 : 10.

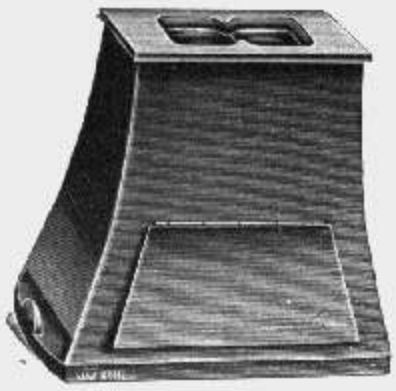
	£ s. d.
54,293. **Device for receiving an Ox's Eye,** Figure, with small stand for the eye lens (W. D. Fig. 300—302 [283—285])	0. 6. 0
54,294. **Optical Eye** after Kühne, Figure, for showing the part of the rays in the eye at a magnification of 10 times, myopia and presbyopia, Scheiner's experiment, the path of the luminous rays after operation for cataract, astigmatism and accommodation of the eye. The trough is arranged for filling with a fluorescent liquid . . . . . Instructions for use are supplied with the Apparatus.	5.10. 0
54,295. **Water Chamber** after Friedr. C. G. Müller (M. T. Fig. 147)	1. 0. 0
54,296. **Optical Eye** after Grimsehl, arranged for filling with water, with diaphragm for the insertion of spectacle lenses. The variations in magnitude occurring in a short-sighted or long-sighted eye when a spectacle lens is inserted can be measured	1.18. 0
54,297. **Glow-lamp Filament,** for use as an illuminating object to the preceding Apparatus	2. 0. 0
54,298. **NEW. Optical Eye** after Lichtenecker, Figure, with adjustable iris diaphragm, movable retina screen, diaphragm tube for shielding disturbing light, a second screen, with handle, in order to enable the position of a retina to be shown rapidly in the short-sighted or long-sighted eye; a convex lens and a concave lens with handle, and a piece of plaster showing the aspect of the interior of the eye	4.10. 0
54,299. **Optical Eye,** Figure, with two spectacle lenses for explaining their action . .	1.16. 0
Lens Apparatus after Dr. Zwick, see Nos. 53,924—53,928, pp. 496 and 497, for explaining myopia and presbyopia and the path of the rays in the eye, with lenses 50 mm diameter, for showing the action of lenses in general and of the camera obscura.	
54,300. **30 Drawings for showing the blind spot,** Figure, after Weinhold (W. D. Fig. 303 [286])	0. 1. 6
54,301. **Astigmatic Test Card** after Dr. Fränkel, Figure, for ophthalmologists and schools, for quickly determining astigmatism	0. 2. 0



54 303. 1 : 9.



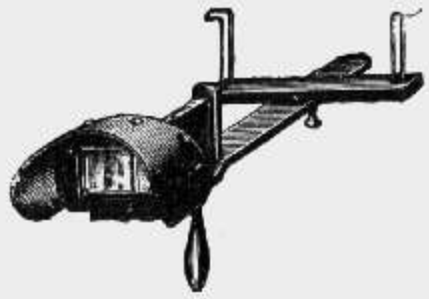
54 304. 1 : 11.



54 305. 1 : 5.



54 306. 1 : 5.



54 307. 1 : 6.

	£ s. d.
54,302. **Device** after Steinhauser, for Scheiner's experiment (M. P., II, 1, Fig. 263 [359]) .	0. 6. 0
54,303. **Apparatus for explaining the plastic Vision of both Eyes and of the Stereoscope,** Figure The distance apart of the two telescopes is variable as is also the place at which the two spheres are set up.	1. 12. 0
54,304. **Wheatstone's Mirror Stereoscope,** with three pairs of drawings, Figure (M. P., II, 1, Figs. 276 and 277 [377])	1. 2. 0
54,305. **Stereoscope** after Brewster, of mahogany, with movable mirror, Figure	0. 5. 0
54,306. — idem, with variable ocular distance, Figure	0. 15. 0
54,307. **Stereoscope,** mounted open, Figure, of polished mahogany	0. 5. 0

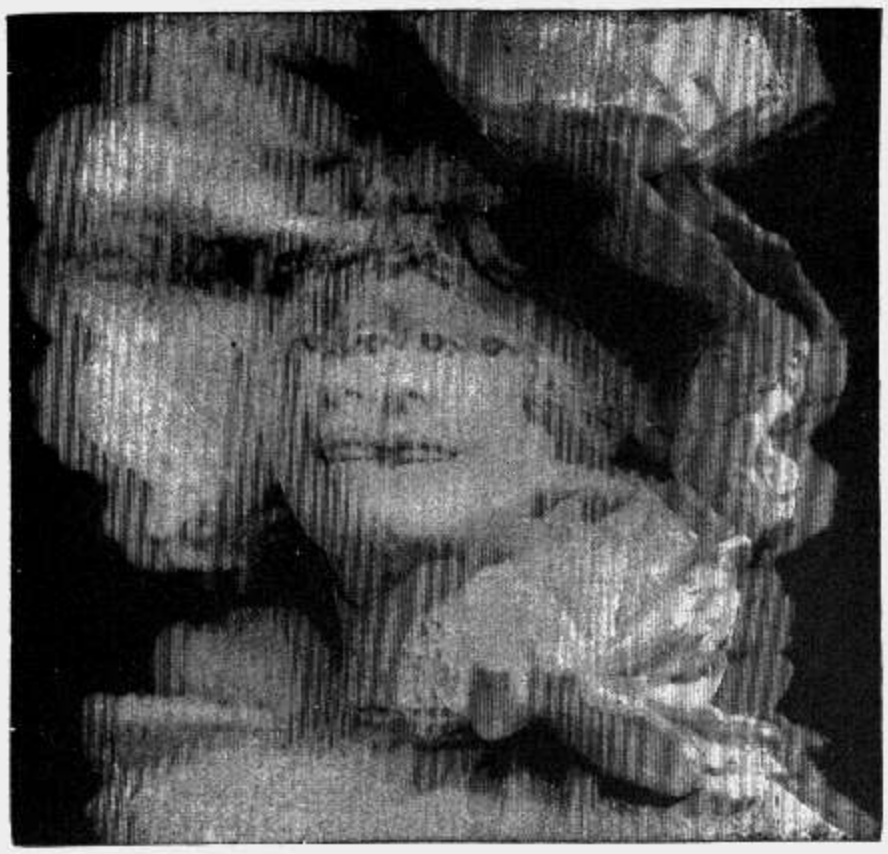
Revolving Stereoscope Apparatus, for rapidly changing the images, with variable ocular distance:

List No.	**54,308**	**54,309**
Arranged for	25	50 views
Without Views £	**2. 2. 0**	**2. 10. 0**

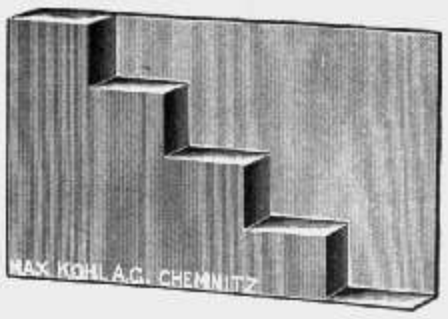
54,310. **Stereoscopic Views** on paper	Each	0. 0. 6
54,311. **12 Demonstrations of Stereoscopic Lustre,** after Martius-Matzdorf		0. 4. 0
54,312. **36 Stereoscopic Drawings** after Martius-Matzdorf, for demonstrating the overlapping of the images, the emulation of the visual fields, the artificially produced movement of the single images, the spatial vision (images of the better-known crystalline forms), the occurrence of stereoscopic lustre from the surface of image (e. g., in reproductions)		0. 8. 0
54,313. **12 Stereoscopic Views of the Firmament** from excellent photographs by Prof. Max Wolf (Heidelburg). First series of 12 plates with explanatory text, in portfolio . .		0. 8. 0
The motions of planets and comets and the motion of the fixed stars can be rendered quite comprehensive by the views. The photographs of the moon's landscape are shown in such great relief that the height of the mountains and depth of the valleys can be gauged.		
54,315. **Stereoscopic View (Girl's Head)** on glass, after Ives, for explaining the spatial vision of both eyes, Figure		1. 10. 0
A grating having black lines is set up in front of the parallax stereogram which is formed of perpendicular lines. The stereogram consists of two images composed of lines; the lines pertain alternately to an image for the left and for the right eye. Each eye sees its view through the spaces of the grating and the result is a plastic image.		
54,316. — idem, with view of moon, specially adapted for also introducing pseudoscopic vision. When the right eye assumes the position intended for the left and *vice versa* the moon appears as a hollow sphere		1. 10. 0

Max Kohl A. G. Chemnitz, Germany.

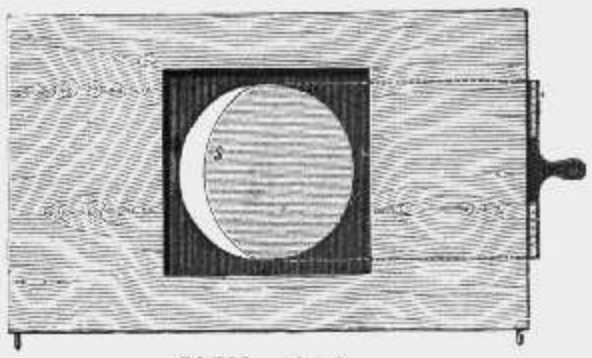
Max Kohl A. G. Chemnitz, Germany.



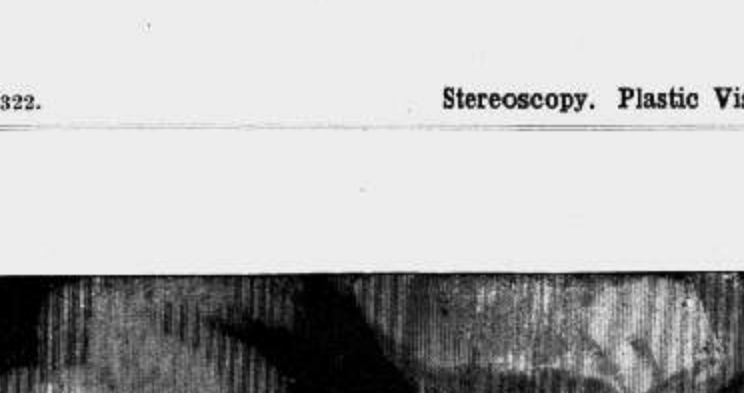
54 315.



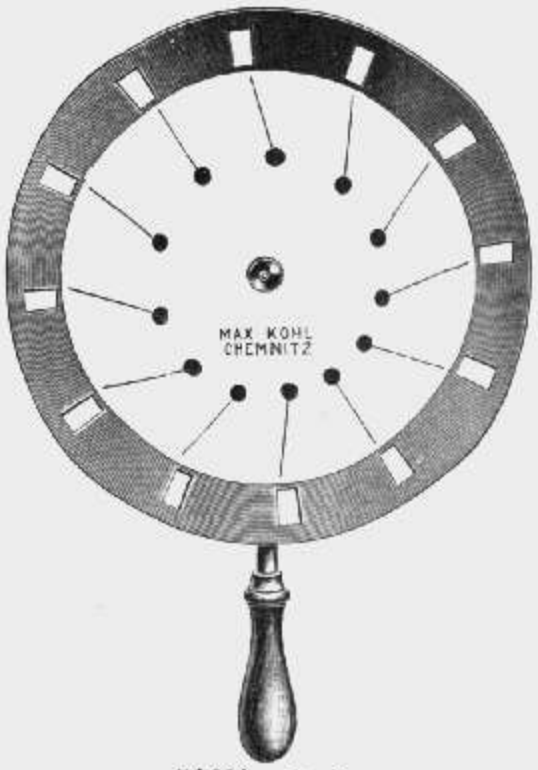
54 318. 1 : 8.



54 319. 1 : 3.



54 320. 2 : 5.

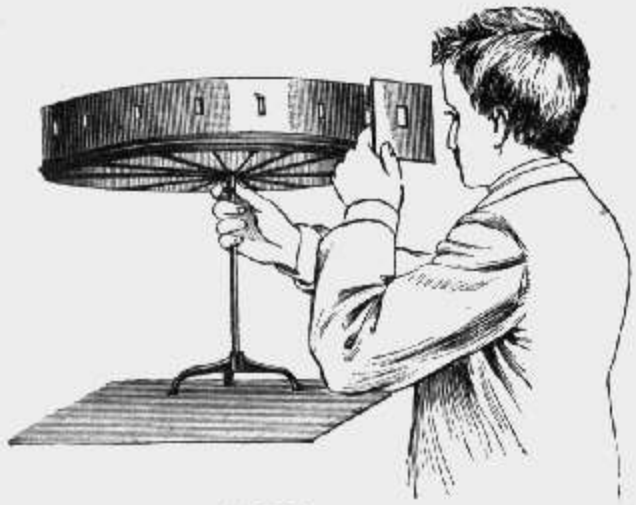


54 322. 1 : 5.

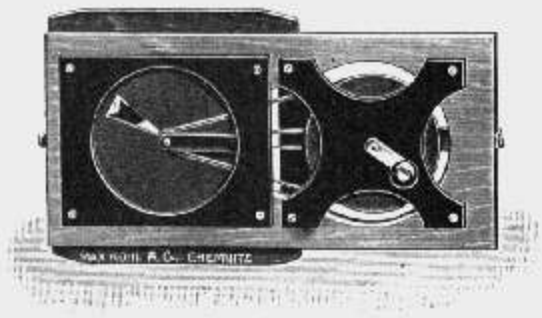
	£ s. d.
54,317. **Schroeder's Step View,** as diapositive (W. D. Fig. 312 A [295 A]) for demonstrating the impression of raised and deepened relief	0. 1. 6
54,318. **Pasteboard Model of the Shroeder Step View,** Figure, for facilitating the perception of the different impressions of relief	0. 4. 0
* 54,319. **Apparatus for imitating the Irradiation of the Moon's Crescent,** Figure (W. D., Fig. 311 [294])	0. 8. 0
* 54,320. **2 Lantern Slides** for demonstrating Irradiation, after Plateau, Figure (M. P., II, 1, Fig. 291 [388 and 389])	0. 3. 0
54,321. **Disc with sectors cut out,** for showing the duration of luminous impression in the eye; for the Whirling Table (W. D. p. 416)	0. 6. 0
54,322. **Stroboscopic Disc,** Figure (M. P., II, 1, Fig. 292 [393])	0.18. 0
Rotating Mirrors: see p. 431.	
53,179. **Stroboscopic Drum (cylinder),** see Fig. 53,179, p. 417, with 18 Quincke Wave Strips	0.18. 0
52,019. — idem, fitting the **Whirling Table:** see No. 52,019, p. 283	0.14. 0
52,020. **Strips alone,** 18 in all, with description: see No. 52,020 on p. 283	0. 6. 0

* Can be used with the Projection Apparatus.

Cl. 3683, 5516, 343, 3397, 1488.



54 323. 1 : 12.



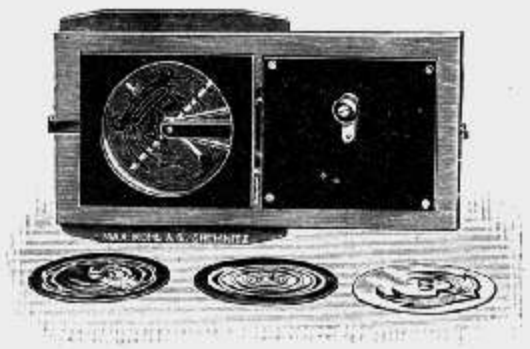
54 324. 1 : 4.



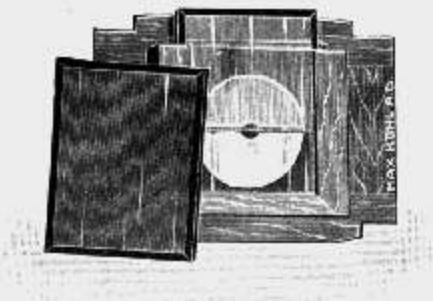
54 325.



54 326. 1 : 4.



54 327. 1 : 4.



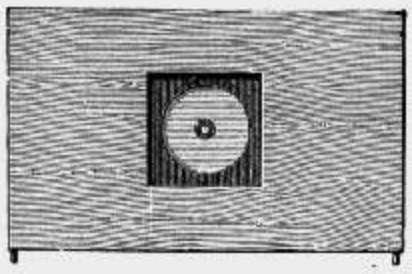
54 328. 1 : 4.

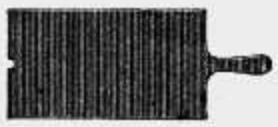
Max Kohl A. G. Chemnitz, Germany.

		£ s. d.
53,302.	**Stroboscopic Disc** after Töpler, with clockwork drive, see Fig. 53,302, p. 432 . . .	3. 0. 0
53,303.	— i d e m, **for hand drive,** see No. 53,303, p. 432	2. 0. 0
54,323.	**Stroboscope** after Anschütz, large pattern, F i g u r e, with 10 rows of views . . .	2. 0. 0
* 54,324.	**Stroboscope,** F i g u r e, for the Projection Lantern, with 1 disc (W. D. Fig. 304 [287])	1. 0. 0
* 54,325.	**3 Extra Discs** for above, F i g u r e, ... each £ 0.2 0	0. 6. 0
* 54,326.	**Projection Stroboscope,** F i g u r e, with 2 discs, showing dancers	1. 4. 0
* 51,067.	**Cinematograph,** see Fig. 51,067, p. 185	7. 10. 0
* 51,068.	**Films for Cinematographs:** 16, 24, 32, 48 m long: see No. 51,068, p. 186 per metre length	0. 1. 6
60,642.	**Lens Disc** after Boys for the stroboscopic analysis of spark discharges: see Fig. 60,642, p. 837	4. 0. 0
* 54,327.	**Anorthoscope** for the Projection Lantern, F i g u r e (Fr. Phys. Techn. II, 2, Fig. 3362 [II, Fig. 881]), with 4 discs with distorted images, which on rotating appear in the correct form but five times as large	1. 6. 0
* 54,328.	**Apparatus for Optical Fatigue and the successive Colour-contrast,** F i g u r e (Fr. phys. Techn. II, 2, Fig. 3497 [II, Fig. 894])	0. 6. 0
	The apparatus consists of a small wood frame and a glass disc half ground and half clear, with a point in the middle. When the eye is fixed on this point for some time and the glass disc quickly drawn away the section which previously was dark appears brighter to the eye. If the image cast on the screen is coloured by the insertion of the coloured glass disc the design appears in the complementary colours when the coloured disc is suddenly drawn away.	
54,329.	**White and Gray Cardboard for Fatigue Phenomena** (M. T. p. 205)	0. 3. 0
54,330.	**6 Different Coloured Pasteboard Squares** with White Seam (M. T. p. 205)	0. 4. 0

* Can be used with the Projection Apparatus.

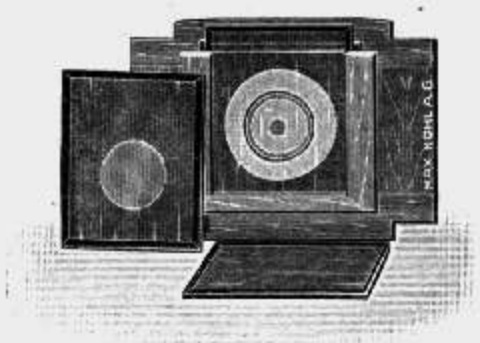
Cl. 1491, 345, 6089, 6082, 6091/93, 6079.



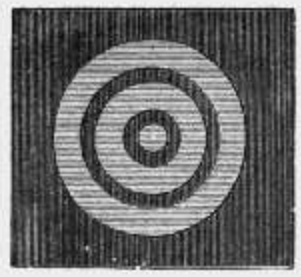




54 331. 1 : 4.



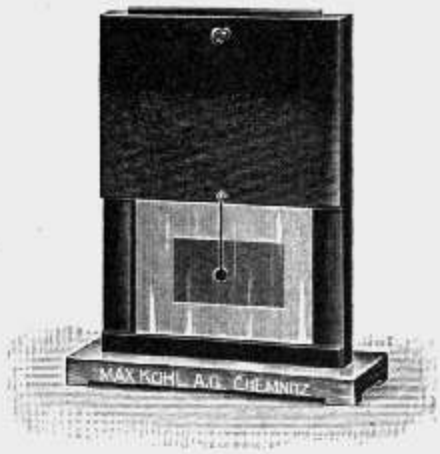
54 332. 1 : 4.



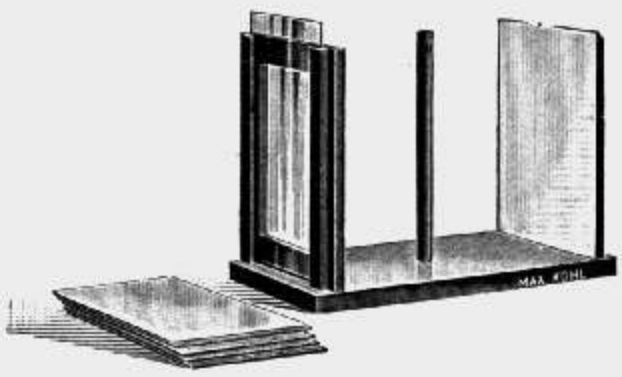
54 333. 1 : 3.



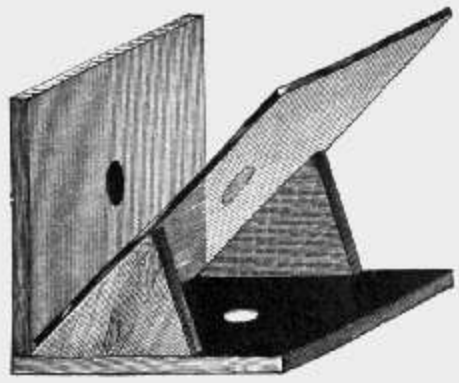
54 334. 1 : 4.



54 336. 1 : 11.



54 335. 1 : 6.

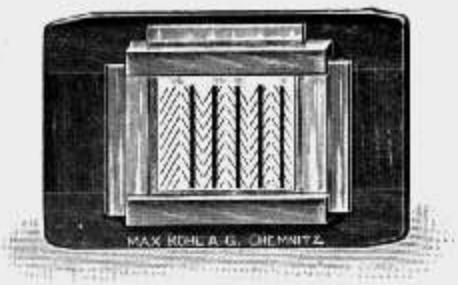


54 337. 1 : 2.

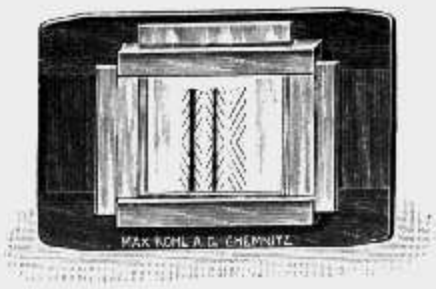
	£ s. d.
* 54,331. **Apparatus for Eye Fatigue and the successive Colour-contrast,** Figure (W. D., Fig. 308 [291])	0.10.0
* 54,332. **Apparatus for Successive and Simultaneous Colour-contrast,** Figure; perception of subjective Colours (Fr. phys. Techn. II, 2, Fig. 3498)	0. 8.0
* 54,333. **2 Coloured Glass Plates for simultaneous Contrast,** $8^1/_2 \times 10$ cm, Figure (W. D. Fig. 310 [293]) . . . . . The plates fit the lantern slide holder of the Projection Lantern.	0. 6.0
54,334. **Apparatus for Showing the Contrasted Colours as Coloured Shadows,** Figure (cf. M. P., II, 1, p. 393 [446]), with 2 coloured plates . . . . . A coloured glass disc mounted in a frame has a round hole and, in front of the latter, a bi-convex lens. In this manner a coloured ground can be covered over on the screen by a white sphere of light. If a rod is held in the latter the half-shades occurring appear in the complementary colours and the principal shades in the more vivid colour of the background. In this experiment the objective head of the lantern must be removed, and the rod held behind the focus of the luminous pencil.	0.12.0
54,335. **Apparatus for Coloured Shadows,** Figure	0.16.0
54,336. **Apparatus for Explaining the subjective Colours,** after Nörrenberg, Figure (M. P., II, 1, Fig. 297 [396])	0.12.0
54,337. **Apparatus for showing the contrasted Colours,** after Ragona Scina, Figure (M. P., II, 1, Fig. 298 [398]), with four coloured glasses	0. 8.0

* Can be used with the Projection Apparatus.

Cl. 6090, 350, 348, 6084, 6088, 1501, 1502.



54 338. 1 : 4.



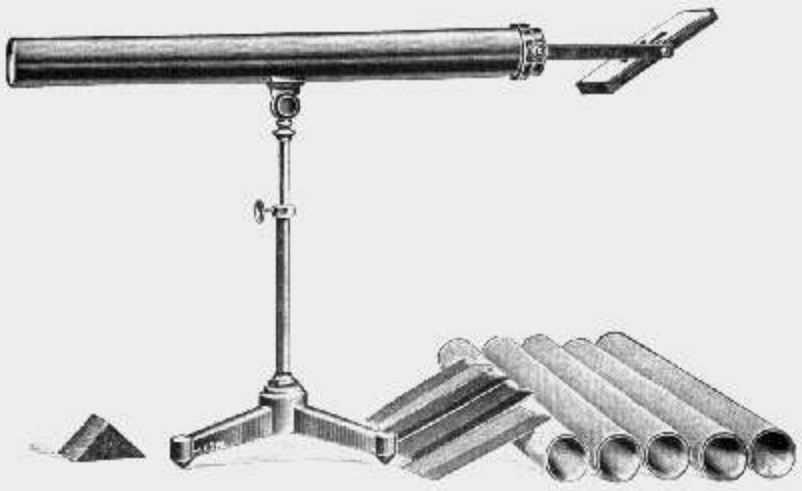
54 339. 1 : 4.



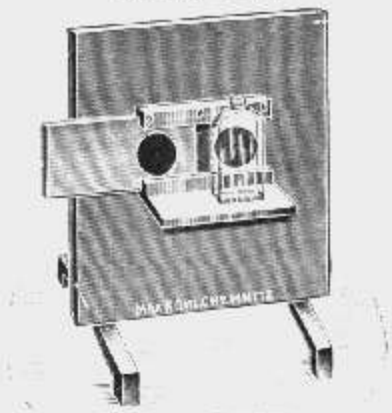
54 340. 1 : 4.



54 341. 1 : 5.



54 344. 1 : 8.



54 345. 1 : 6.

	£ s. d.
* 54,338. **Projection Plate for Optical Illusions,** Figure (W. D. Fig. 313 [296]), consisting of one wood frame and one pair plates showing parallel lines apparently diverging from top to bottom and bottom to top respectively	0. 6. 0
* 54,339. **2 Plates** for above (W. D. Fig. 314 [297]), showing parallel lines apparently bent in the middle	0. 3. 0
* 54,340. **2 Plates** for above (W. D. 315 [298]) four right angles having a common apex showing apparently acute and obtuse in pairs	0. 3. 0
54,341. **Cylindrical Lens with Prism,** of small refractive angle, on stand, Figure (M. P., II, 1, Fig. 137 [153]), for re-combining the light resolved by a prism and for producing complementary colours . . . . . The cylindrical lens is 80 mm diameter. The prism is cemented on to a sliding glass disc in such manner that it can be conducted over the whole width of the lens.	2. 8. 0
54,342. **7 different coloured Gelatine Slabs,** 100 sq. cm., for use as a **colour filter**	0. 6. 0
* 54,343. **2 Plane parallel Glass Vessels for objectively Demonstrating the Colours of Pigment Mixtures** (W. D., p. 425 [392]) 20 mm wide, with 2 pasteboard screens having circular opening.	0. 16. 0
54,344. **Apparatus** after Rosenberg, Figure, for experiments on the dependence of the body colour on the angle of inclination of the incident light (Ztschr. f. d. phys. u. chem. U. 2, 1888/89, p. 38)	1. 10. 0
54,345. **Apparatus for Mixing Coloured Rays and Material Colours,** after Rosenberg, Figure, with 2 paraffin lamps and 2 plane parallel glass vessels for solutions of potassium bichromate and copper sulphate respectively with the addition of liquid ammonia in the surplus (Ztschr. f. d. phys. u. chem. U. 2, 1888/89, p. 296)	1. 16. 0

* Can be used with the Projection Apparatus.

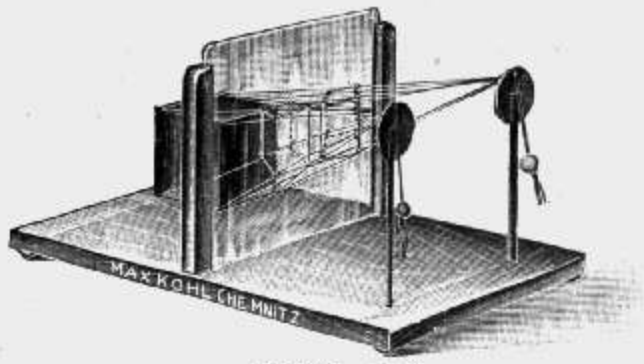
Cl. 6095, 6096, 6085, 1505, 1504, 1506.



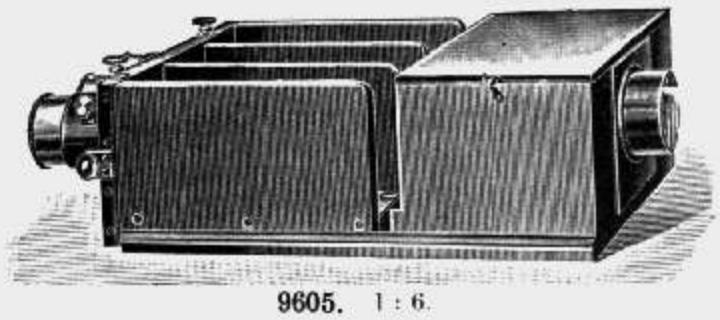
54 346 A. 2 : 5.



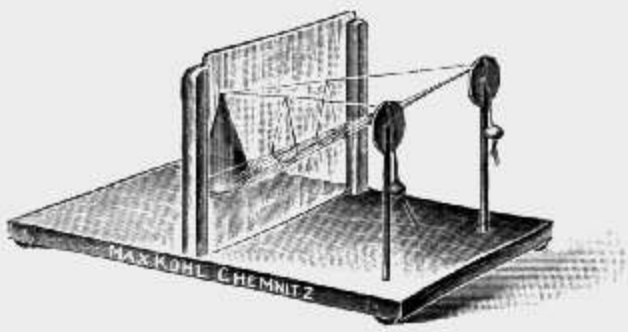
54 346 B. 2 : 5.



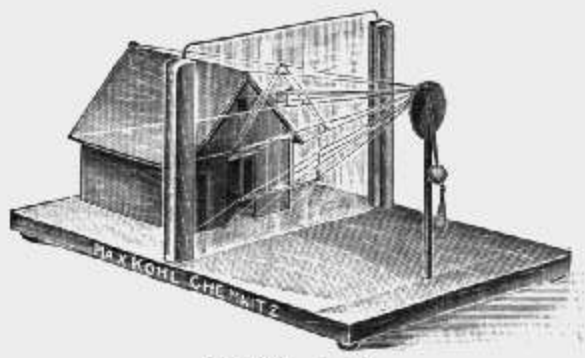
54 352. 1 : 8.



9605. 1 : 6.



54 353. 1 : 8.

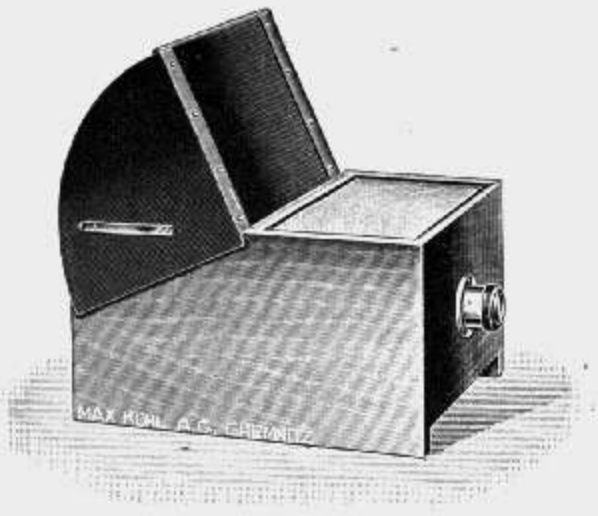


54 354. 1 : 8.

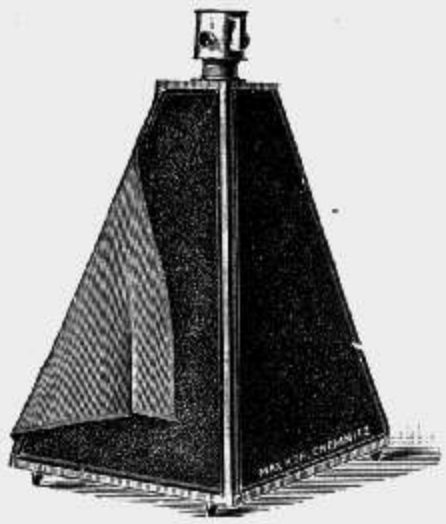
Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
54,346. **2 Colour Discs,** $8^1/_2 \times 10$ cm, for explaining the **Mixing of coloured Lights,** Fig. A, and for demonstrating the **Superposing of layers of Transparent Colours,** Fig. B (Fr. phys. Techn. II, 2, Figs. 3467 and 3495)	1. 5. 0
54,347. **Anaglyphon,** after Ducos du Hauron (**Plastoscope**) (W. D., p. 433) . . . . . The two-colour image is observed through spectacles having a red and a blue glass, and this image appears plastic.	0. 2. 0
* 9605. **Projection Chromoscope** after Ives, for obtaining photographs in natural tints by additive colour synthesis (Fr. phys. Techn. II, 2, Fig. 3484) . . . . . The apparatus can also be used for explaining mixed and complementary colours, absorption phenomena, etc.	13. 0. 0
* 9606. **Photos for above,** 3 diapositives on one plate . . . . . Each	0. 7. 0
Colour Discs and Colour Jackets for use with the Whirling Table, see Nos. 52,034—52,042, pp. 284 and 285.	
54,076. **Top for rotating Colour Discs,** with flywheel and handle: see Fig. 54,076, p. 504 .	0. 10. 0
54,078. **Colour Disc with Rotating Apparatus:** see Fig. 54,078, p. 504	1. 5. 0
* 54,079. **Transparent Colour Disc** after Newton, with 7 colours on glass, for objective projection, with device for rotating: see No. 54,079, p. 504	1. 0. 0
* 54,350. **Colour Top with alternating mixed colour effects**	1. 0. 0
54,351. **Coloured Wool** in Portfolio, pink and orange, for demonstrating the influence of mode of illumination on colour impression (W. D. p. 429)	0. 3. 0
54,352. **Model of the Perspective Images of a Cube,** Figure, with transparent image-plane . . . . . The Cube is placed behind the transparent plane. Its corners are connected with the visual point by cords carried through corresponding perforations in the disc of the image. The connecting lines of the holes in the disc demonstrate the perspective image. The model has two visual points for two different images.	1. 5. 0
54,353. — idem, with **Cone,** Figure	1. 5. 0
54,354. — idem, with **Small House,** Figure, with 1 visual point	1. 5. 0

* Can be used with the Projection Apparatus.



54 355. 1 : 8.



54 356. 1 : 12



54 366. 1 : 6.



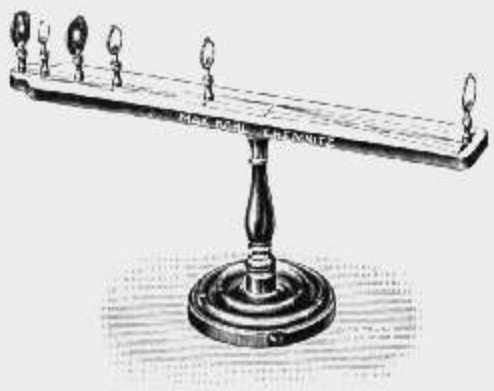
54 367. 1 : 6.



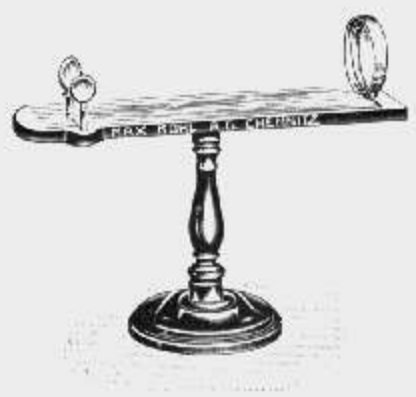
54 368. 1 : 6.



54 358. 1 : 3.



54 369. 1 : 7.



54 370. 1 : 7.

Optical Instruments.

		£ s. d.
54,355.	**Camera obscura,** Figure; size of image 140×100 mm	1. 0. 0
54,356.	**Camera obscura,** Figure, with Chevalier convex prism; size of image 400×400 mm	4. 16. 0
54,358.	**Camera lucida,** after Wollaston, Figure, with extending stand and two shielding glasses	1. 16. 0
54,359.	— without stand or shielding glasses, prism only in metal mount	0. 15. 0
54,360.	**Simple Magnifying Glass,** diameter 20 mm, magnification 10 times	0. 4. 0
54,361.	**Cylindrical Magnifying Glass** (Coddington Glass), **22 mm** diameter	0. 4. 0
54,362.	— idem, **30 mm** diameter	0. 5. 0

Folding Magnifier, 35 mm lens diameter, in horn mount:

List No.	**54,363**	**54,364**	**54,365**
With	1	2	3 Lenses
£	**0. 3. 0**	**0. 4. 0**	**0. 5. 0**

Cl. 6103, 1516, 4530, 4531, 4529, 1517, 4527, 6077.

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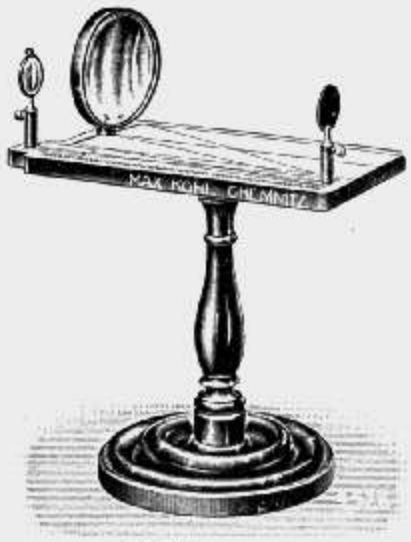
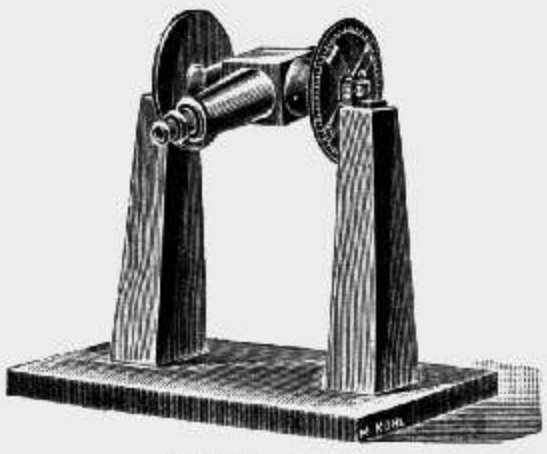
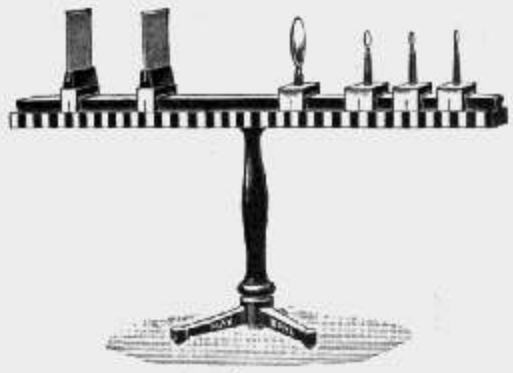


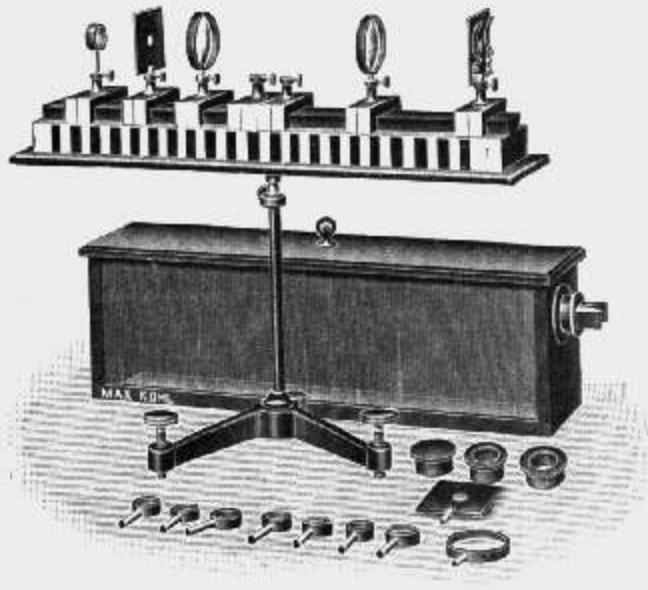
54 371. 1 : 4.



54 372. 1 : 4.

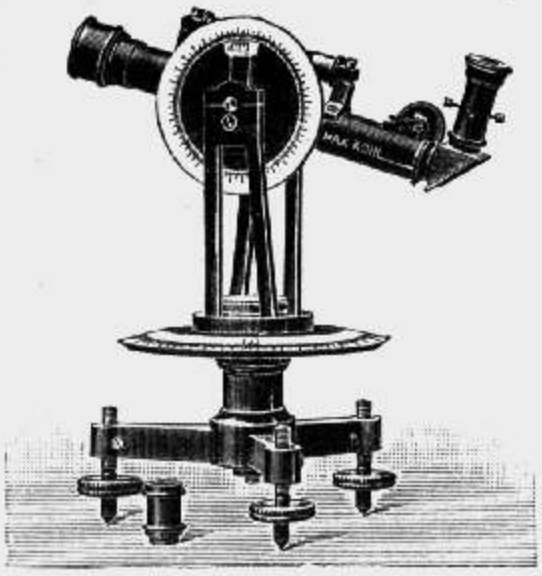


54 374. 1 : 6.

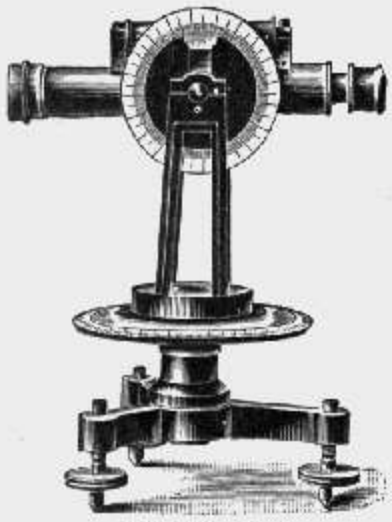


54 379. 1 : 8.

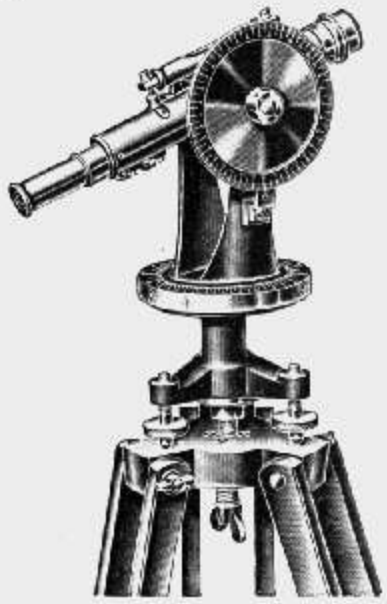
	£ s. d.
54,366. **Model of the Compound Microscope,** Figure, constructed open, on wood base, the path of ray being indicated	0. 15. 0
54,367. **Model of the Galilean Telescope,** Figure, constructed open	0. 8. 0
54,368. **Model of the Astronomical Telescope,** Figure, constructed open	0. 10. 0
54,369. **Model of the Terrestrial Telescope,** Figure, constructed open	0. 16. 0
54,370. **Model of Newton's Reflecting Telescope,** Figure	0. 18. 0
54,371. **Model of the Brachio-Telescope,** Figure, constructed open	1. 0. 0
54,372. **Model of a Meridian Circle,** of wood, Figure, with metal circle and indices, diameter of circles 120 mm	2. 14. 0
54,373. — idem, of metal	5. 8. 0
54,374. **Small Weinhold Optical Bench,** Figure, for Explaining the Microscope, the Astronomical, Terrestrial and Galilean Telescopes, on pillar base; lenses 20 mm diameter, objective 70 mm; all lenses mounted in metal (W. D. Fig. 317 [300])	1. 6. 0
Perforated Cylindrical Pillar: see Nos. 53,688 and 53,689; **Gas Burner:** see No. 53,681a; **Paraffin Burner:** see No. 53,684a; **Ligroin Lamps:** see No. 54,375.	
54,375. **3 Ligroin Lamps,** arranged close together (W. D. p. 440), cf. Fig. 53,626	0. 6. 0
54,376. **Optical Bench as No. 54,374,** without pillar, on two short legs	1. 2. 0
54,377. — idem, on pillar base, but with **larger lenses** (40 mm) and an objective 120 mm diameter	2. 0. 0
54,378. **Small Mirror** on Stand and **Total Reflection Prism** on Sliding Blocks, for demonstrating the Herschel Telescope and the Newton Reflecting Telescope; for use with Optical Bench No. 54,374 or 54,377 (W. D. Fig. 320A and B [302A and B])	0. 16. 0
54,379. **Small Optical Bench with Glass Box,** Figure, for demonstrating the path of rays in lenses, telescopes of different systems and in microscopes, with 11 lenses and 5 diaphragms	7. 0. 0



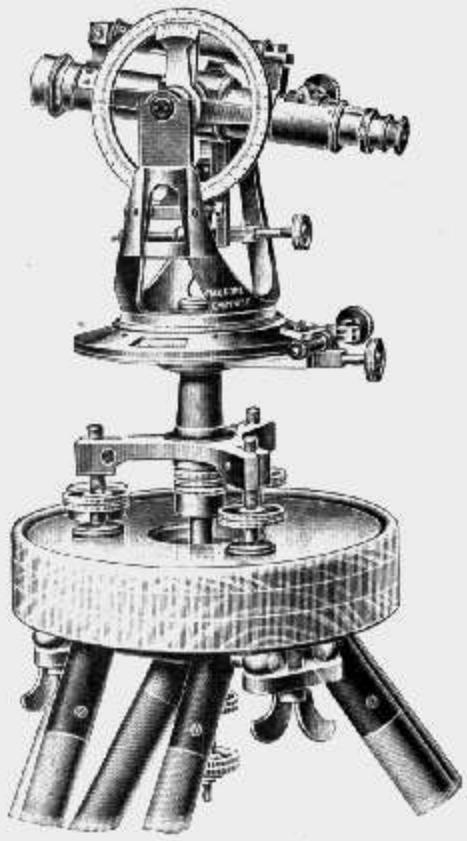
54 382. 1 : 5.



54 380. 1 : 5.



53 385. 1 : 6.



54 386, 54 386 f, 54 386 h. 1 : 5.

54,380. **Model Theodolite,** Figure, of metal, with level and cross-wires, can be used as a sight. The circles are divided in 360° and verniers permit of reading to $^1/_{10}$th °. Circle rotary for repetition, telescope without lenses . . . . . £ 4. 0. 0

54,381. — idem, **with Telescope,** ocular movable by rack and pinion 6. 0. 0

54,382. — idem, Figure, **with Telescope, Ocular Prism, and Sun Glass,** for astronomical observations (M. T. p. 26) 6. 12. 0

54,383. **Stand for Model Theodolites** Nos. 54,380/2 (W. D. Fig. 29), with stem screw . . . 1. 10. 0

54,384. **Carrying Case** for Model Theodolites Nos. 54,380/2, for use in field work 1. 6. 0

54,385. **Model Theodolite for Students' Exercises,** Figure, with **Telescope** and **Carrying Case, Folding Stand, Measuring Chain,** and folding **Measuring Stave** 3 m long. The horizontal circle is 10 cm diameter and the altitudinal circle 9.5 cm 8. 0. 0

54,386. **Theodolite,** cf. Figure, horizontal circle 120 mm diameter divided in $^1/_2{}^0$, verniers giving 1′, graduated on brass, silvered, uncovered. Reading by means of hand glass; telescope 200 mm focal length, power 20, inclusive of bolts and stand with tribrach . 12. 10. 0

Extras: (a) for repetition £ **2. 0. 0**; (b) for telescope axis having clamp and fine adjustment £ **1. 5. 0**; (c) for rotary magnifying glasses £ **1. 4. 0**; (d) levelling bubble £ **1. 4. 0**; (e) for graduating the horizontal circle on German silver £ **0. 15. 0**; (f) for spherical stand with tribrach instead of the bolting stand £ **0. 10. 0**; (g) for graduating the horizontal circle on silver in $^1/_3{}^0$, verniers giving 30″ covered, with rotary magnifiers, £ **4. 5. 0**; (h) for dividing the altitudinal circle in $^1/_2{}^0$ on brass and silvering, verniers giving 1′, £ **3. 0. 0**; (i) for telescopes arranged for throwing back, with adjustable carrier £ **1. 7. 0**.

Cl. 1528, 1527, 6098, 1529.

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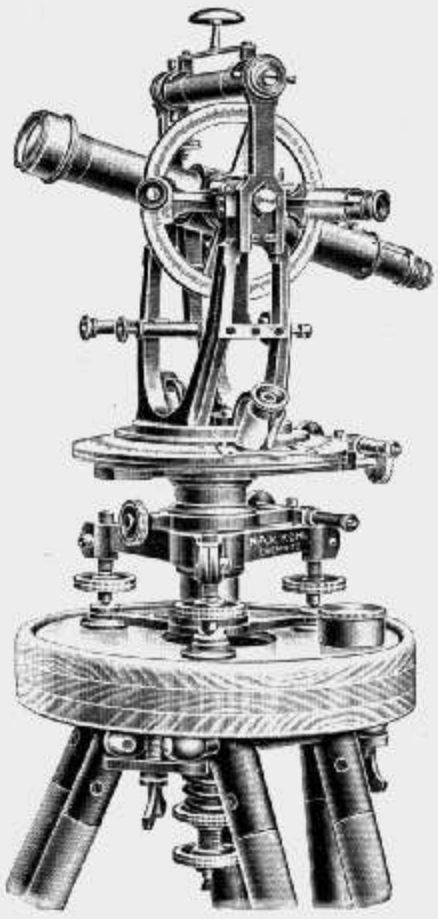
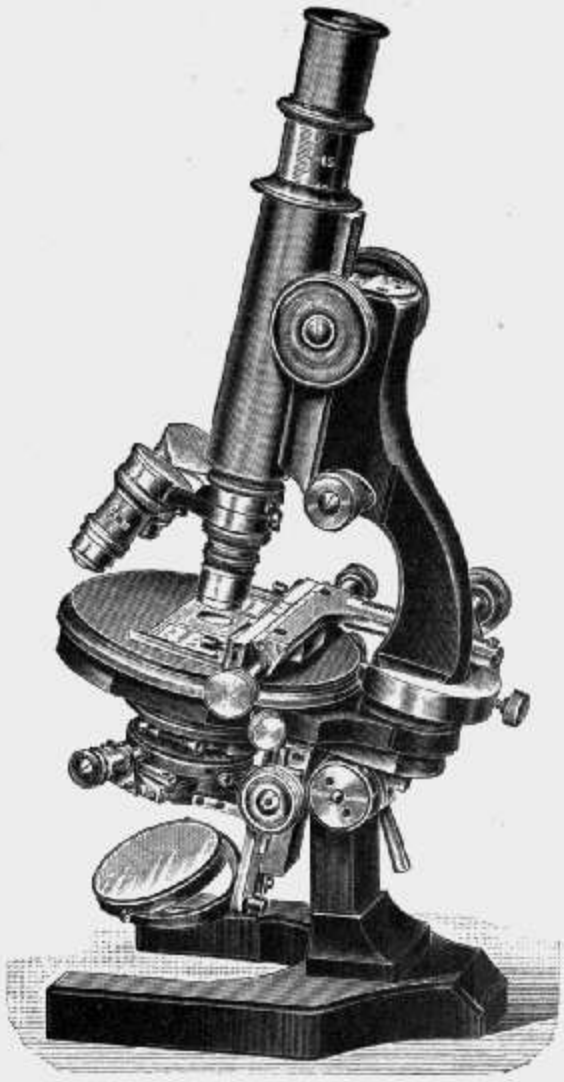


54 387. 1 : 5.



54 388. 1 : 3.

54,387. **Repeating Theodolite,** Figure, with drop-screw, for distance measurements; telescope arranged for tunneling and canting back, with steel axes, rotary magnifiers; **Horizontal Circle** concealed by glass, and silver limb; **Striding Level, round pattern Level** on vernier circle; horizontal circle 140 mm diameter divided in $^1/_3{}^0$, verniers giving 20″; **altitudinal circle** 120 mm diameter in $^1/_3{}^0$, on silver, concealed, with verniers inserted giving 30″, with alidade level and micrometer screw; telescope 250 mm focal length, power 25; with carrying case, shoulder straps and spherical stand . . . . . £ s. d. 35. 0. 0

The telescope has an orthoscopic ocular and a range of 7 km; it is provided with clamp and fine adjustment, being arranged for measuring distances.

Extra Prices: (a) for levelling bubble on telescope £ **1. 7. 0**
(b) „ Transit Level . . . . . £ **1. 14. 0**.

Particulars and prices of Larger Theodolites on application.

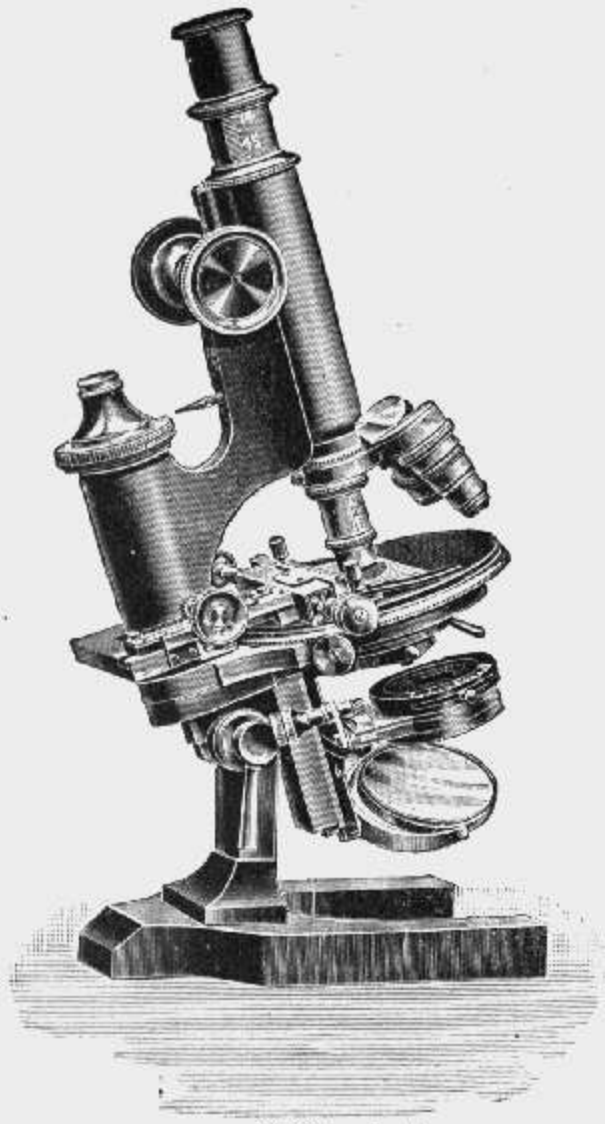
Microscopes.

54,388. **Large Microscope, Stand I,** Figure, with socket for tilting down; round, rotary and centering stage, coarse and fine tube focussing, millimetre graduation on draw tube; large illuminating device, after Abbe; Abbe Indicating Apparatus; optical outfit for 14—1400 diameters, and case 30. 0. 0

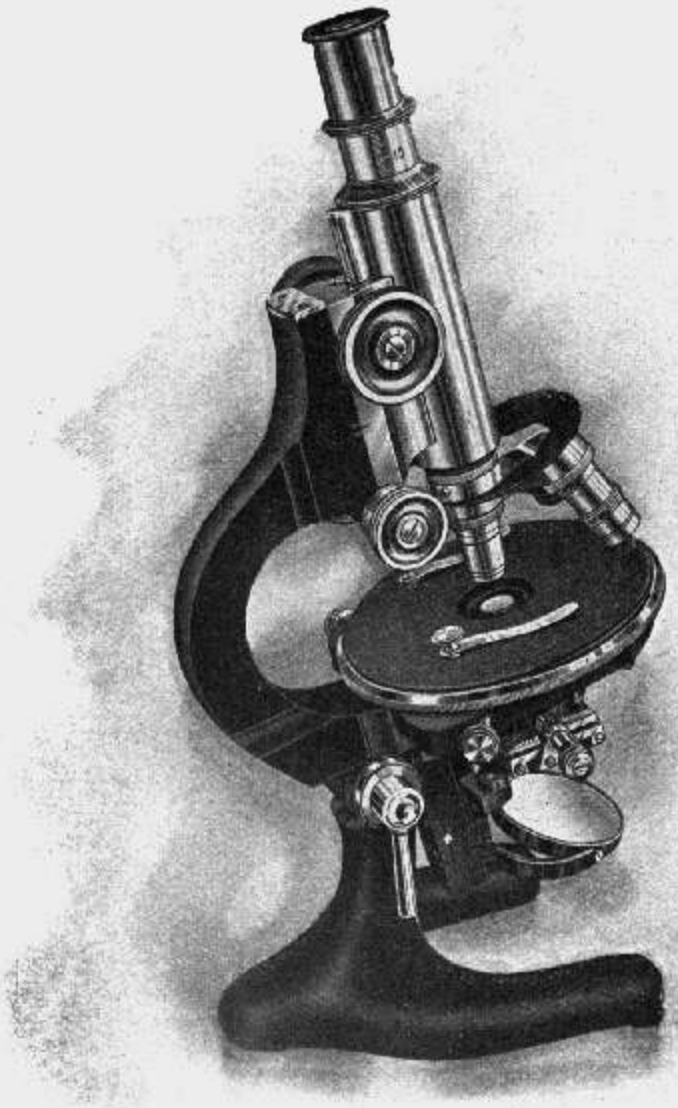
The coarse tube focussing is by rack and pinion, the fine by worm and worm wheel; a complete turn of the worm corresponds to raising or lowering the tube by 0.1 mm. The optical outfit consists of 1 micrometer ocular, 4 Huyghenian oculars, 3 achromatic objectives, 1 homogeneous oil-immersion objective and triple nose-piece.

54,389. — idem, with **fixed stage,** simple illuminating apparatus and simple optical equipment, for 20—1400 diameters, without indicating apparatus 24. 0. 0

For Model Microscopes: see previous section.



54 390. 1 : 3.



54 392. 1 : 3.

	£ s. d.
54,390. **Large Microscope, Stand Ia,** Figure, with canting joint, with round centering stage, coarse and fine tube focussing, millimetre graduation on draw tube; large Abbe Illuminating Apparatus; with iris diaphragm; optical outfit for 26—1400 diameters, together with box	21. 0. 0
The Optical outfit comprises 4 Huyghenian oculars, 3 achromatic objectives, 1 homogeneous oil-immersion, and triple nose-piece.	
54,391. — idem, with **fixed stage,** simple illuminating Apparatus and simple Optical Outfit for 60—800 diameters	19. 5. 0
The optical Outfit is correspondingly simpler. The coarse tube focussing is effected by rack and pinion, and the fine by a low-pitch micrometer screw.	
54,392. **Large Microscope, Stand B,** Figure, with tilting joint, large round centering stage, coarse and fine tube focussing, millimetre graduation on draw tube, large Abbe Illuminating Apparatus, Optical Outfit for 60—1400 diameters, together with box	21. 5. 0
The coarse tube focussing is by rack and pinion and the fine by a worm and worm wheel. The optical outfit comprises 2 achromatic objectives, one homogeneous oil-immersion objective, 1 triple nose-piece and 3 Huyghenian oculars.	
54,393. — idem, with Abbe Illuminating Apparatus of smaller pattern, arranged for raising and lowering	18. 0. 0
54,394. **Large Microscope, Stand Ic,** Figure, with tilting joint, with rectangular fixed stage, base and pillar in one piece, coarse and fine tube focussing, millimetre graduation on draw tube, Abbe Illuminating Apparatus with iris diaphragm, Optical Outfit for 26—1400 diameters, together with box	17. 0. 0
The coarse tube focussing is effected by rack and pinion, and the fine by low-pitch micrometer screw. The Optical Outfit comprises 3 achromatic objectives, 1 homogeneous oil-immersion, 1 triple revolving nose-piece and 3 Huyghenian oculars.	
54,395. — idem, with simple Illuminating Apparatus and simpler Optical Outfit for 60 to 800 diameters	15. 10. 0

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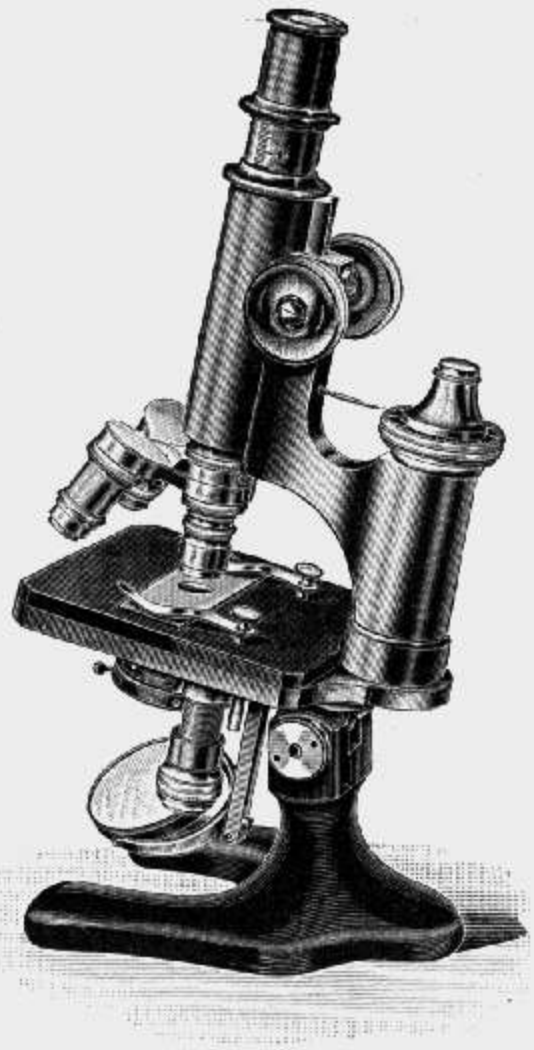
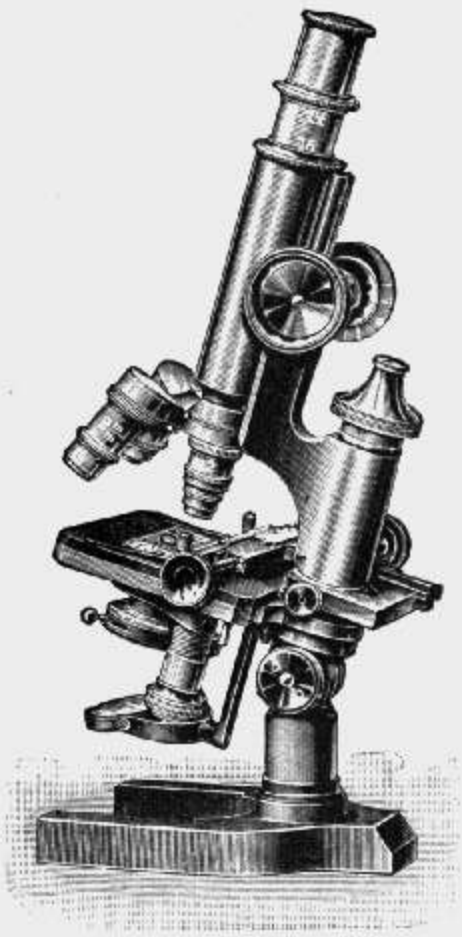
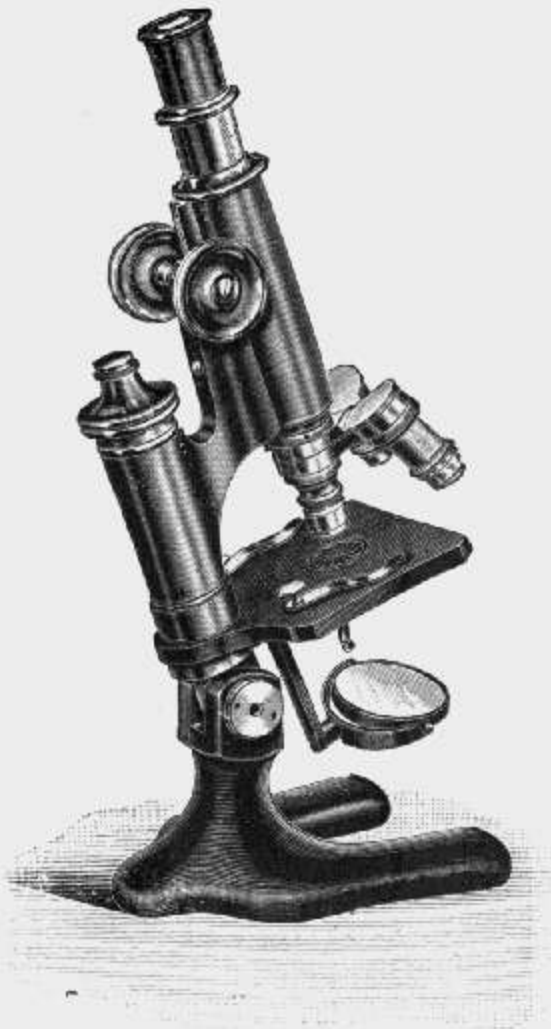


54 394. 1 : 3.

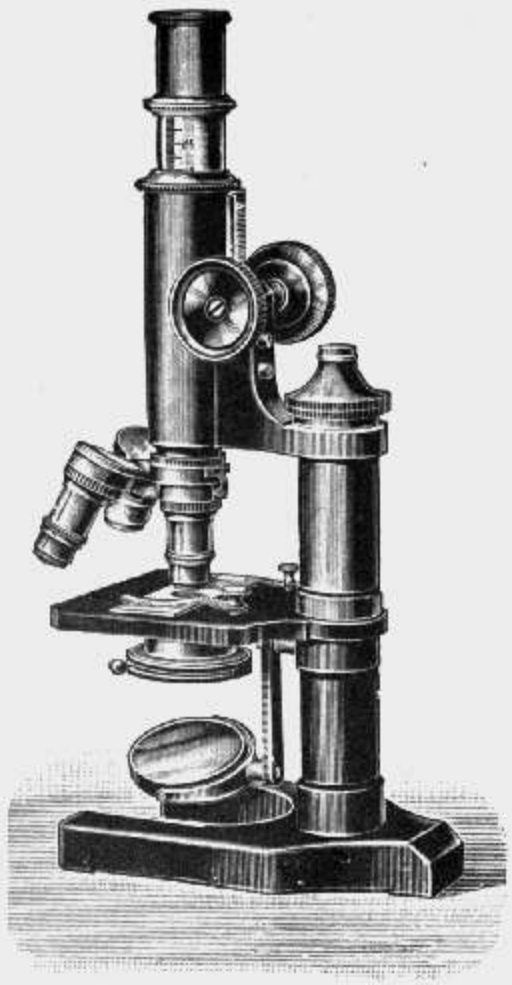


54 396. 1 : 3.

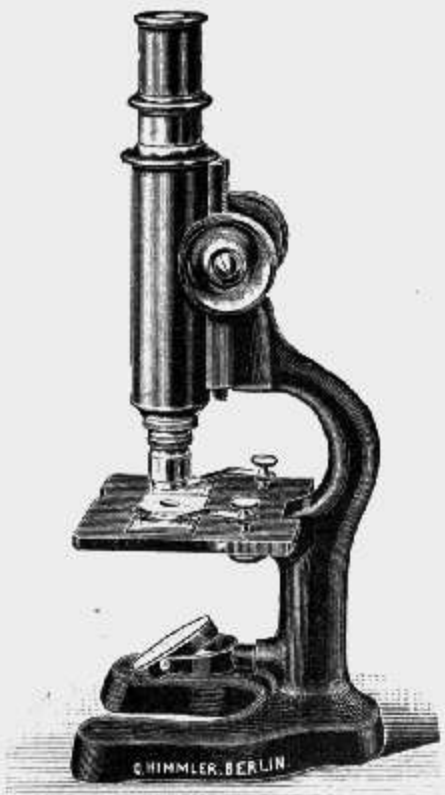


54 400. 1 : 3.

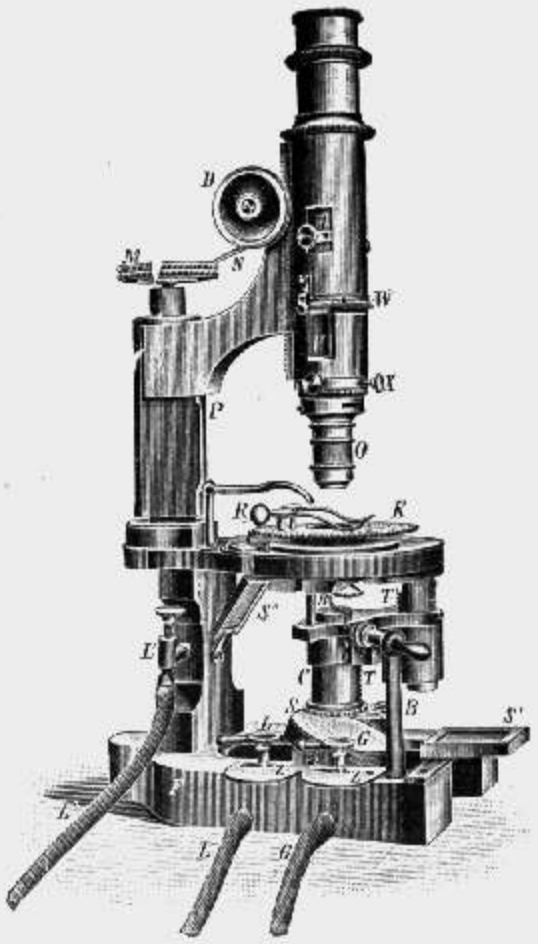
	£ s. d.
54,396. **Medium Microscope, Stand IIa,** Figure, with joint for tilting, large rectangular **fixed stage,** coarse and fine tube focussing, millimetre graduation on draw tube, Abbe Illuminating Apparatus with iris diaphragm, Optical Outfit for 26—1400 diameters, together with box	18. 5. 0
The coarse tube focussing is effected by rack and pinion, and the fine by low-pitch micrometer screw. The Optical Outfit comprises 3 achromatic objectives, 1 homogeneous oil-immersion, 1 triple revolving nose-piece and 3 Huyghenian oculars.	
54,397. — idem, with simple Illuminating Apparatus and simpler Optical Outfit for 60 to 800 diameters	16. 5. 0
54,398. **Medium Microscope, Stand C,** cf. Fig. 54,392, with joint for tilting, rectangular **fixed stage,** coarse and fine tube focussing, millimetre graduation on draw tube, Abbe Illuminating Apparatus, Optical Outfit for 60—1400 diameters, together with box . . .	16. 10. 0
The coarse tube focussing is effected by rack and pinion, and the fine by worm and worm wheel. The Optical Outfit comprises 2 achromatic objectives, 1 homogenous oil-immersion, 1 triple revolving nose-piece, and 3 Huyghenian oculars.	
54,399. — idem, with simple Illuminating Apparatus with iris diaphragm, and simpler Optical Outfit, for 60—800 diameters	15. 0. 0
54,400. **Medium Microscope, Stand IId,** Figure, with joint for tilting, large rectangular **fixed stage,** coarse and fine tube focussing, millimetre graduation on draw tube, Abbe Illuminating Apparatus with iris diaphragm, can be focussed under the stage; Optical Outfit for 60—1400 diameters, and box	15. 0. 0
The coarse tube focussing is effected by rack and pinion, and the fine by small-pitch micrometer screw. The Optical Outfit comprises 2 achromatic objectives, 1 homogeneous oil-immersion objective, 1 triple nose-piece and 3 Huyghenian oculars.	
54,401. — idem, with simple Illuminating Apparatus, and simpler Optical Outfit for 60—730 diameters	12. 0. 0



54402. 1 : 3.



54407. 1 : 3,5.



54409. 1 : 4.

54,402. **Medium Microscope, Stand III,** F i g u r e, not tiltable, with rectangular **fixed stage,** coarse and fine tube focussing, millimetre graduation on draw tube, Abbe Illuminating Apparatus, with iris diaphragm; **Optical Outfit** for 60—1000 diameters, together with box — £ 13. 10. 0

The coarse tube focussing is effected by rack and pinion, and the fine by micrometer screw. The Optical Outfit comprises 2 achromatic objectives, 1 homogeneous oil-immersion objective, 1 triple revolving nose-piece and 2 Huyghenian oculars.

54,403. — i d e m, with simple Illuminating Apparatus with iris diaphragm, and simpler Optical Outfit for 60—730 diameters 10. 0. 0

54,404. **Medium Microscope, Stand IV,** with rectangular **fixed stage,** coarse focussing by sliding tube, fine focussing by micrometer screw, millimetre graduation on draw tube. Abbe Illuminating Apparatus with iris diaphragm, Optical Outfit for 60—1000 diameters, together with box 12. 0. 0

The Optical Outfit consists of 2 achromatic objectives, 1 homogeneous oil-immersion objective, and 2 Huyghenian oculars.

54,405. — i d e m, with simple Illuminating Apparatus, and simpler Optical Outfit, for 60—730 diameters 9. 0. 0

54,406. — i d e m, without Illuminating Apparatus, with concave and plane mirror, with Optical Outfit for 70—575 diameters 5. 15. 0

54,407. **Laboratory Microscope, Stand V,** F i g u r e, focussing by fine rack and pinion motion, large stage, draw tube, concave and plane mirror, with 2 achromatic objectives and 2 Huyghenian oculars, for 20—280 diameters 4. 10. 0

54,408. — i d e m, simpler, tube without extension, with triple objective, 2 Huyghenian oculars, and box 3. 5. 0

54,409. **Crystallisation Microscope** after Lehmann, for observing the physical behaviour of preparations, specially of **liquid and apparently live crystals,** cf. Fig. 54,409, with heating and cooling device, for observations in direct and polarised light, with simple Optical Outfit with micrometer ocular and 2 objectives, with arrangement for testing the axial emissions in converging light 30. 0. 0

The Stand has two stages rotary about the optical axis. The lower one is concealed and has

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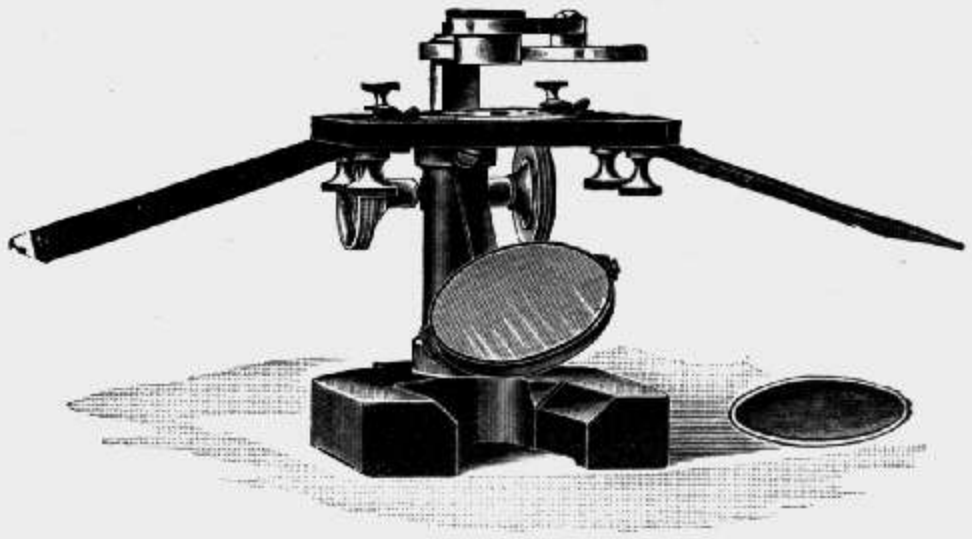

54 415. 1 : 3.

a graduation of 360°; it can easily be rotated and rapidly returned to the zero position. Two blow-tubes can be fixed to the stage for cooling the preparations, a rapid and fine temperature regulation being rendered possible by this means. Three mirrors are used as polarisers; the illuminating mirror is arranged to rotate so that rapid change is possible from direct to parallel, polarised illumination. The burner has a regulating air and gas lead. The tube possesses a rack and pinion coarse focussing and micrometer screw fine focussing.

Supplied with the instrument are two burners, two blow-pipes, one blue glass, three plano-convex lenses as cover glasses (for determining the refractive index), one heater, one double bellows, and one mahogany case for storing the instrument.

£ s. d.

Projection Microscopes as suggested by Lehmann: see Nos. 51,057—51,061, p. 183.

54,410. **Mineralogical Stand,** with tongs objective changer having three inset rings, achromatic objectives Nos. 1, 3 and 6, oculars I and III, micrometer ocular II, also gypsum and mica plates $^1/_4$ wave-length 19. 0. 0

The coarse focussing is secured by rack and pinion, and the fine by micrometer screw. The tube has a graduation and a centering head with locking gap for taking gypsum and mica compensators.

The tube analyser can be switched in and out of the path of the rays. The condenser and polariser can be raised and lowered by a lateral screw. The change from converging to parallel light is done by a quarter-turn of a lateral knob and the polariser can be taken out of the condenser lens. The stage is graduated in $^1/_1{}^0$ and permits of reading by vernier accurately to $^1/_{10}{}^0$. The surface of the stage has a position-finding graduation.

54,415. **Large Preparation Stand,** Figure, with heavy horse-shoe shape base, stage 100 × 100 mm with glass plate and hollowed metal trough; focussing by rack and pinion; cheeks for supporting the hands. With movable mirror, lens system comprising 3 aplanatic magnifiers, for magnifications of **8, 14 and 20** 4. 0. 0

54,416. — idem, with 2 aplanatic magnifiers for **8 and 14 diameters,** and with a **Preparation System** consisting of 3 aplanatic lenses (as objective) and an achromatic ocular, for 15, 20 und 30 diameters when not using ocular, and 40, 60 and 100 with use of ocular. 5. 0. 0

Auxiliary Apparatus for Microscopes.

54,417. **Micrometer Ocular,** with lateral slot for inserting the micrometer 0. 12. 0

54,418. **Ocular Glass Micrometer,** for inserting in the ocular, **5 mm = 100 divisions** . . . 0. 4. 0

54,419. — idem, **5 mm = 50 divisions** 0. 3. 0

54,420. **Object Micrometer, 1 mm = 100 divisions,** glass graduation 0. 6. 0

54,421. **Ocular Net Micrometer** for counting objects strewn over the field of view, in mount, distance apart of lines 0.5 mm 0. 5. 0

54,422. **Indicating Apparatus** after Abbe 2. 2. 0

54,423. **Microtome,** simple pattern, for freehand cutting 0. 18. 0

The specimen is clamped in a cylinder which can be screwed 10 mm below the surface of the table. One graduation of the micrometer screw is equivalent to raising the object 0.01 mm. The blade of the knife is guided over the glass table, the diameter of which is 70 mm.

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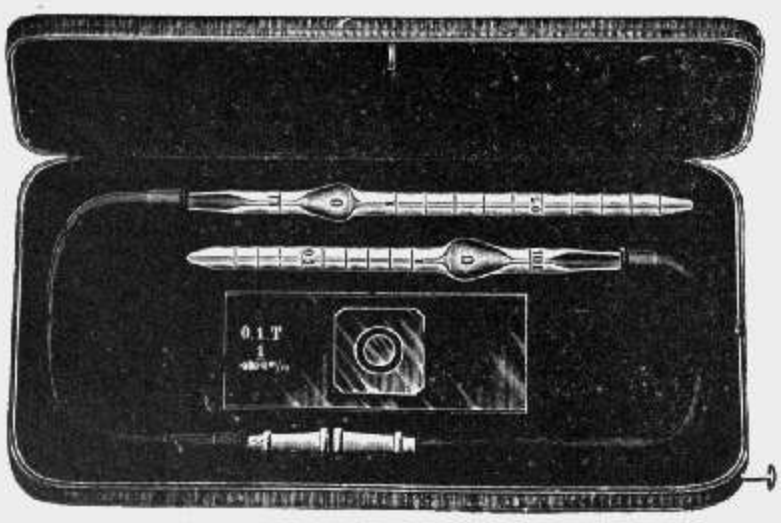

54427. 1 : 2.



54432. 2 : 3.



54440. 1 : 4.

	£ s. d.
54,424. **Microtome Knife,** fitting Microtome No. 54,423	0. 4. 0
54,425. **Slide-rest Microtome** with automatic arrangement for raising the specimens 0.005 mm or multiples of this, without cutter . . . . . The cutter slider is conducted to and fro after the manner of a lathe slide-rest thus rendering manipulation rapid and certain. The clamping device for the specimen is arranged movable on two intersecting axes.	6. 0. 0
54,426. **Microtome Cutter** after Jung, for preceding Microtome, 16 cm long	0. 18. 0
Heating Boxes for embedding specimens in paraffin quoted for on application.	
54,427. **Hematometer** after Thoma, F i g u r e, with counting chamber and calibrating pipette for white and red blood corpuscles	1. 10. 0
54,428. **Polarisation Apparatus** for investigations on minerals and foodstuffs, analyser with divided circle . . . . . If this apparatus is not ordered at the same time as the Microscope, the instrument must be sent to us.	3. 0. 0
54,429. **Gypsum and Mica Plates,** set of 8	0. 18. 0
54,430. **Object Carrier** with hollow ground out 16 mm diameter . . . . . Per 10	0. 2. 0
54,431. **Object Carrier,** 76 × 26 mm, with ground edges . . . . . Per 100	0. 3. 0
54,432. **Cover Glass Calipers,** F i g u r e . . . . . The graduation gives hundredths of a millimetre direct. Range, over 5 mm.	1. 10. 0

Cover Glasses, square, 0.14—0.17 mm thick:

List No.	**54,433**	54,434	54,435	54,435 a
Length of Side mm	15	18	20	24
Per Hundred £	**0. 1. 6**	**0. 2. 0**	**0. 2. 6**	**0. 3. 6**

— i d e m, **round:**

List No.	**54,436**	54,437	54,438	54,439
Diameter mm	15	18	20	24
Per Hundred £	**0. 1. 6**	**0. 2. 3**	**0. 2. 9**	**0. 3. 6**

51,062. **Collection of Microscopical Preparations for School Use,** 50 specimens in small bag, with description: see No. 51,062, p. 184	1. 15. 0
51,063. — i d e m, **50** specimens (different collection): see p. 184	1. 18. 0
Glass Rods, Platinum Spatulæ and small Scoops, etc. quoted for on application.	
Materials for Microscopy, as Canada Balsam, Lacquer, etc., of the best quality.	
54,440. **Set of Accessories for Microscopy,** F i g u r e, case containing a razor, spatula, 2 small knives, straight and bent scissors, forceps, 2 preparation needles, 2 lancets	0. 15. 0
54,441. — i d e m, **case with razor,** spatula, small knife, 2 preparation needles, scissors, forceps	0. 12. 0
54,442. — i d e m, **case with small knife,** scissors, forceps, 2 needles	0. 7. 0

Microscopy Lamps: see pp. 20 and 71.

Cl. 1555, 4842, 1558.

Max Kohl A. G. Chemnitz, Germany.

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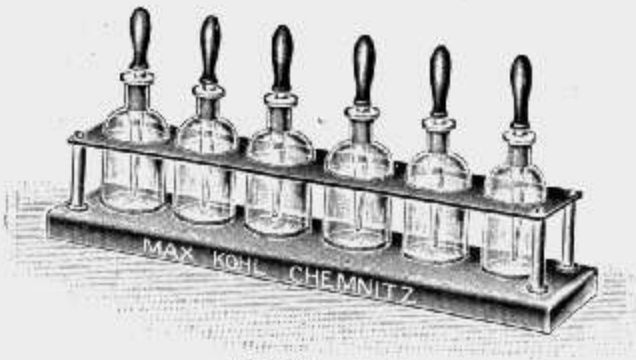
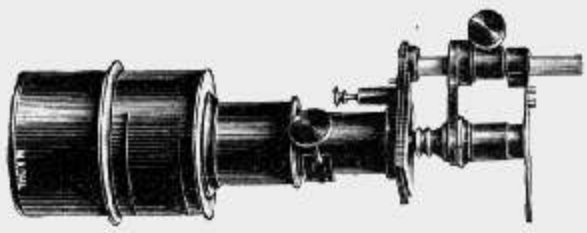
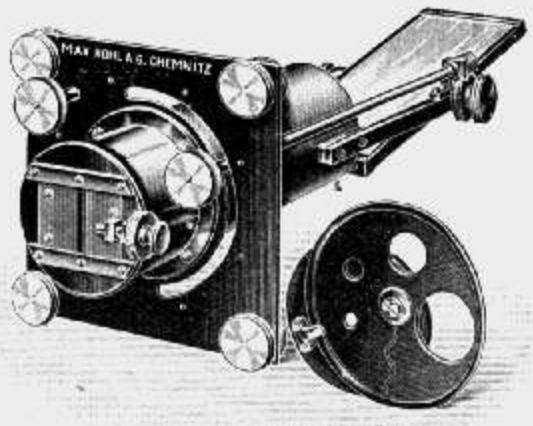


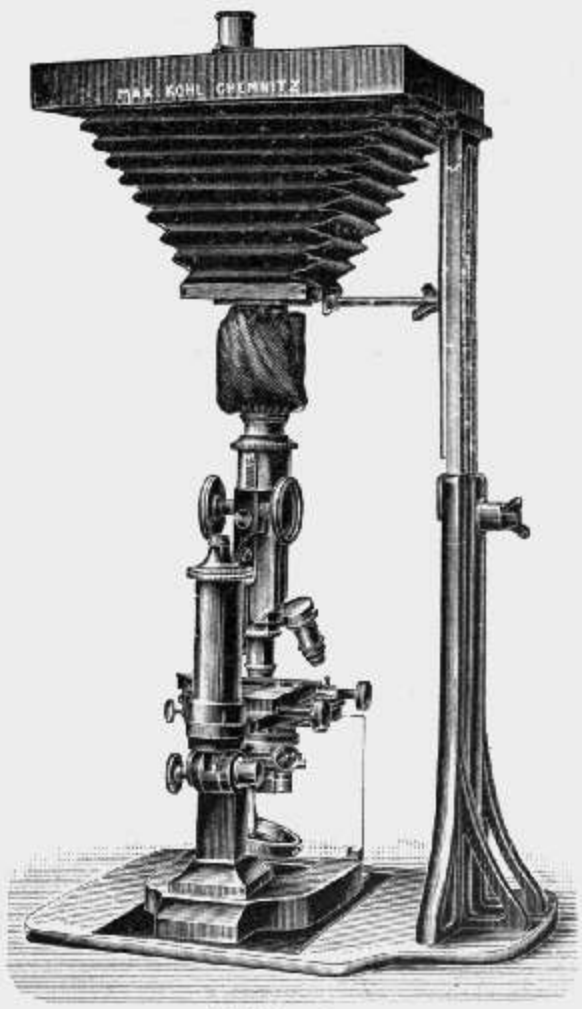
54 443. 1 : 5.



54 448. 1 : 6.



50 212. 1 : 7.



54 444. 1 : 4.

	£ s. d.
54,443. **6 Small Coloured Bottles** in Stand with Droppers which serve as stoppers, Figure, for making coloured microscopical specimens	1. 0. 0
54,444. **Micro-photographic Apparatus,** Figure, with 2 dark slides, 1 ground glass and 1 transparent plate, 1 ground glass plate on stand, yellow, green and blue glass discs: price without microscope stand	6. 0. 0

Two metal columns sliding in each other are mounted on an iron base, the camera resting on these columns. Any microscope stand can be used with the apparatus. By sliding the camera it is possible to compensate for the in equality in height of the different stands. The diaphragms which can be slipped into the neck of the camera fix the limits of the image on the plate. A magnifier placed above the camera permits of fine focussing. The slides are suitable for plates 9 × 12 and 13 × 18 cm.

54,445. **Focussing Stage** or above	0. 15. 0
54 446. **Auer Lamp with Reflector**	0. 18. 0
54,447. **Illuminating Lens** 100 mm diameter, on stand	1. 4. 0

Solar Microscopes.

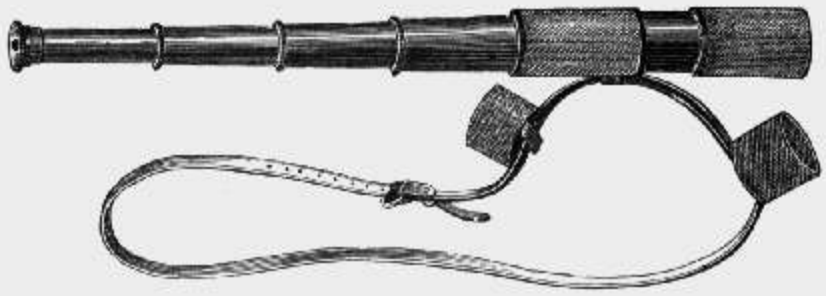
54,448. **Solar Microscope,** Figure, constructed entirely of brass, arranged for fitting on one of the heliostats Nos. 50,205—50,212, with alum trough for absorbing the heat rays; the objective and illuminating lenses are focussed by two racks having sloping teeth, thus securing quite uniform motion. For objective see Nos. 54,453—54,455 .	6. 0. 0
54,449. **Solar Microscope combined with Heliostat No. 50,212,** Figure. Solar Microscope as before, Heliostat for screwing to the shutter; with horizontal toothed-wheel motion; mirror actuated by endless screw; with one attachment having a straight gap and one attachment with rotary disc which contains a wavy gap and holes of different size . .	12. 0. 0

Tables for Microscope work: see Nos. 50,362—50,367, pp. 69 and 70.

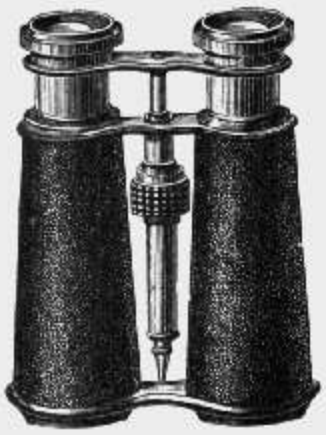
Cl. 3804, 1565, 1566, 1569.



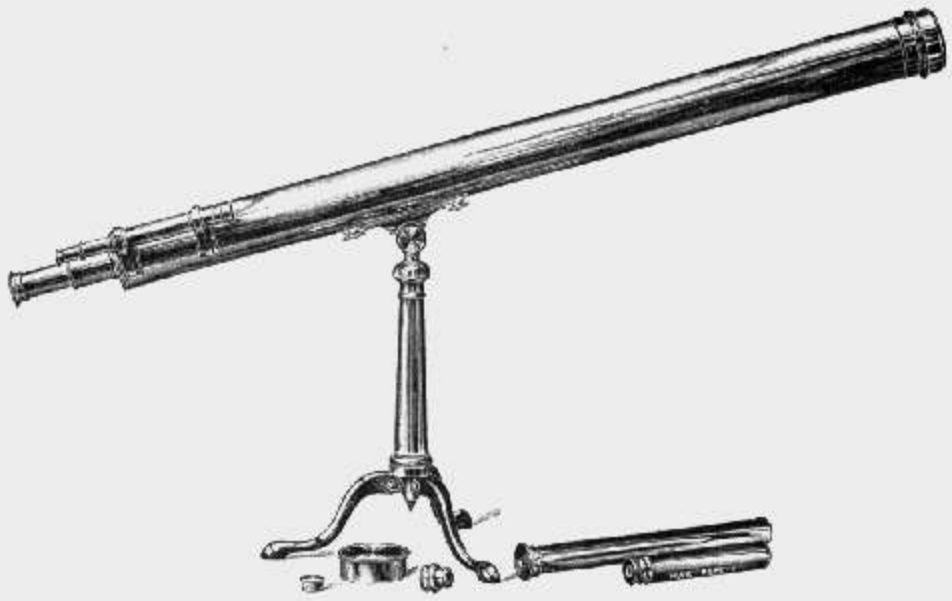
54 457. 1 : 2.



54 461 — 54 463. 1 : 4 — 1 : 8.



54 460. 1 : 3 — 1 : 4.



54 470. 1 : 15.

	£ s. d.
54,450. **Solar Microscope combined with Wall Heliostat No. 50,208,** for wall thickness to 54 cm	12. 10. 0
54,451. — i d e m, with Wall Heliostat No. 50,209, for wall thickness of 60 cm	13. 5. 0
54,452. — i d e m, with Wall Heliostat No. 50,210 for 78 cm wall thickness	14. 0. 0

Objectives for preceding Solar Microscopes:

List No.	**54,453**	**54,454**	**54,455**
Size	1	2	3a
£	**0. 18. 0**	**0. 18. 0**	**1. 4. 0**

51,054. **Revolving Nose-piece for 2 Objectives,** for rapidly changing the magnification . . .	0. 16. 0
51,055. **Revolving Nose-piece for 3 Objectives**	1. 2. 0
54,456. **Microscopical Specimens** . . . . . Each **7 d., 10 d., 1 s. 0 d.** and Complete price list on application. See also Nos. 51,062—51,063.	0. 1. 6

Hand Telescopes.

Goerz "Triëder" Binoculars, F i g u r e:

List No.	**54,457**	**54,458**	**54,459**
Power	6	8	12
Weight	360	515	590 grams
£	**6. 10. 0**	**7. 0. 0**	**9. 10. 0**

54,460. **Field and Opera Glasses,** F i g u r e, with 6 and 12 lenses. Prices according to style and quality . . . . £ **0. 15. 0, 0. 18. 0, 1. 0. 0, 1. 4. 0, 1. 7. 0, 1. 10. 0, 1. 13. 0** to	5. 0. 0

Telescopes with extensions, with strap; F i g u r e:

List No.	**54,461**	**54,462**	**54,463**
Diam. of Objective mm	29	36	43
£	**1. 0. 0**	**1. 5. 0**	**2. 0. 0**

Cl. 1524, 1523, 1525, 1567.

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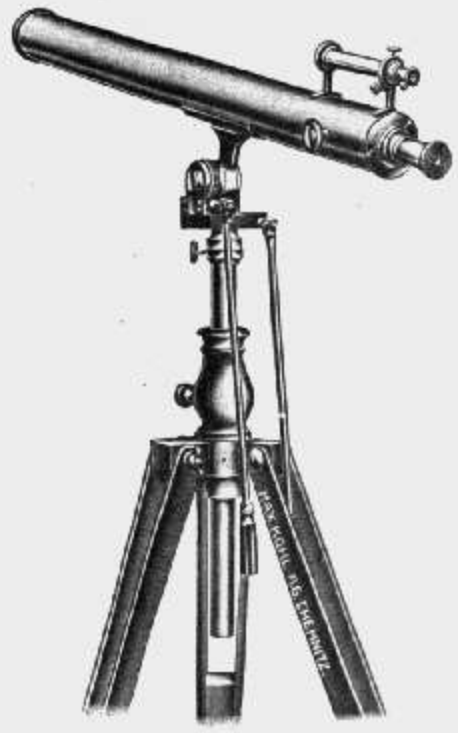
54 472, 54 472 a. 1 : 16.



54 473, 54 473 a, 54 473 b. 1 : 11.

Astronomical Telescopes.

Telescopes, Fig. 54,470, on metal stands having horizontal and vertical hand motion, in lock-up box:

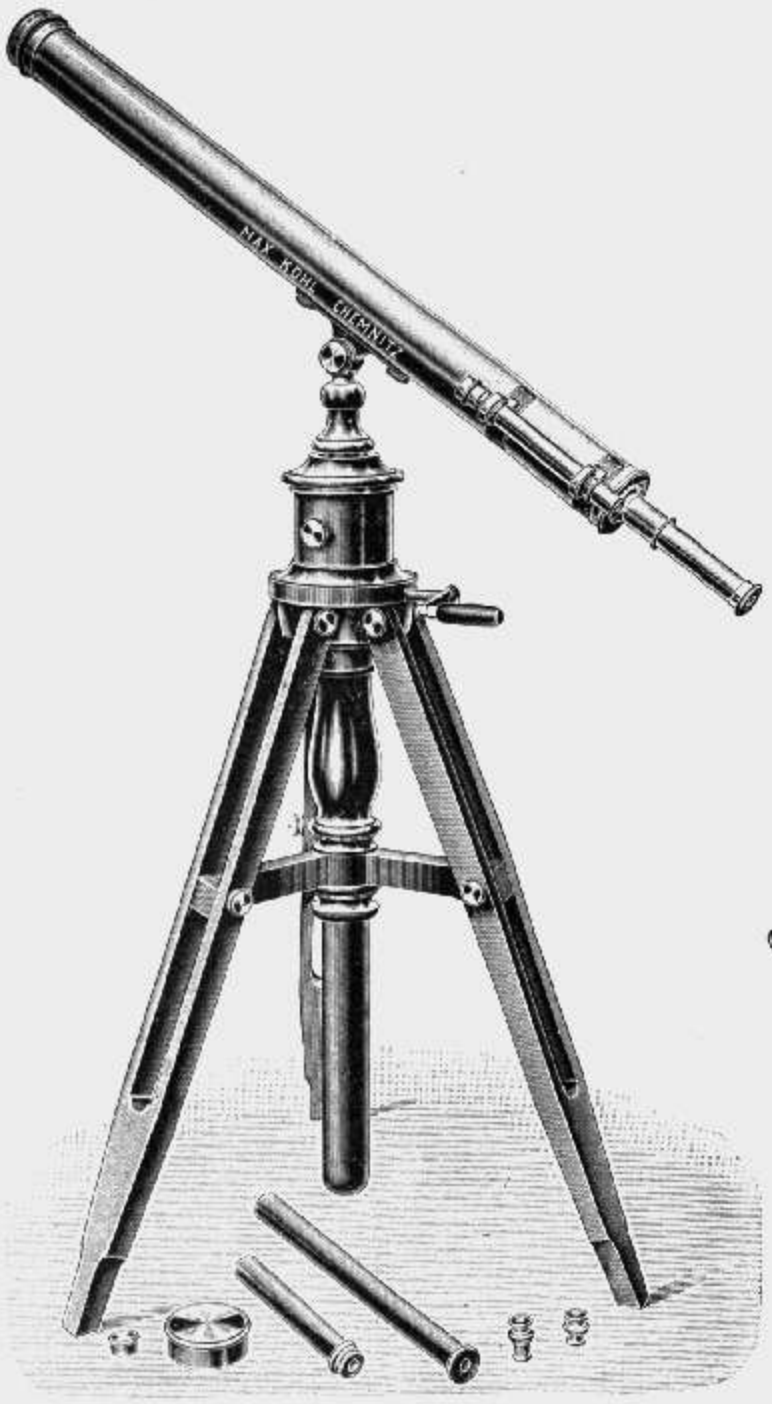
List No.	Diameter of Objective mm	Number of Oculars terrestrial	Number of Oculars astronomical	Powers terrestrial	Powers astronomical	Without Finder £ s. d.	a) Extra Price for Finder £ s. d.	b) Extra Price for Fine Motion £ s. d.
54 464	36	1	—	22	—	**4. 0. 0**	**2. 5. 0**	**6. 0. 0**
54 465	41	1	—	24	—	**5. 0. 0**	**2. 5. 0**	**6. 0. 0**
54 466	48	1	—	28	—	**6. 10. 0**	**2. 5. 0**	**6. 0. 0**
54 467	59	1	1	34	48	**10. 0. 0**	**2. 5. 0**	**6. 0. 0**
54 468	68	1	2	42	60, 90	**12. 10. 0**	**2. 5. 0**	**6. 0. 0**
54 469	75	1	3	50	48, 72, 108	**16. 10. 0**	**2. 5. 0**	**6. 0. 0**
54 470	82	1	3	50	56, 84, 126	**21. 0. 0**	**2. 5. 0**	**6. 0. 0**

The fine motion listed under (b) permits of pointing in a horizontal and vertical direction, cf. Fig. 54,473.

Telescopes with simple Wood Stand, for setting up on the floor, Fig. 54,472, tube in case.

List No.	Diameter of Objective mm	Number of Oculars terrestrial	Number of Oculars astronomical	Powers terrestrial	Powers astronomical	Without Finder £ s. d.	a) Extra Price for Finder £ s. d.	b) Extra Price for Fine Motion £ s. d.
54 471	68	1	2	42	60, 90	**12. 10. 0**	**2. 5. 0**	**5. 0. 0**
54 472	75	1	3	50	48, 72, 108	**15. 0. 0**	**2. 5. 0**	**5. 0. 0**
54 473	82	1	3	50	56, 84, 150	**19. 10. 0**	**2. 5. 0**	**5. 0. 0**

The fine motion listed under (b) permits of setting in a horizontal and vertical direction, cf. Fig. 54,473.



54 474 a. 1 : 13.



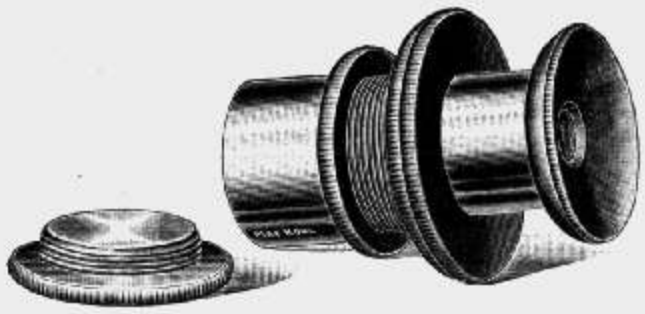
54 488. 1 : 14.

Telescopes with heavy Wood Tripod Stands, Fig. 54,474, for setting up on the floor, up-and-down motion by crank, horizontal and vertical hand motion for telescope; **with Finder:**

List No.	Diam. of Objective mm	Number of Oculars terrestrial	Number of Oculars astronomical	Powers terrestrial	Powers astronomical	a) With Finder £ s. d.	b) Extra Price for Fine Motion £ s. d.
54 474	82	1	3	50	56, 84, 126	**27. 10. 0**	**7. 0. 0**
54 475	95	2	4	60, 90	48, 72, 108, 162	**34. 0. 0**	**7. 0. 0**
54 476	109	2	4	66, 100	54, 80, 120, 180	**47. 10. 0**	**7. 0. 0**
54 477	122	1	5	66	88, 132, 198, 264, 330	**62. 10. 0**	**7. 0. 0**
54 478	135	1	5	72	96, 144, 216, 288, 360	**70. 0. 0**	**7. 0. 0**
54 479	148	1	6	52	78, 104, 156, 234, 312, 390	**87. 10. 0**	**7. 0. 0**
54 480	162	1	6	56	84, 112, 168, 252, 336, 420	**105. 0. 0**	**7. 0. 0**

The fine motion listed under (b) renders it possible to set the instrument in a horizontal and vertical direction, cf. Fig. 54,473.

54,481. **Parallactically Mounted School Telescope** after Archenhold, with achromatic objective 54 mm aperture, ocular focussing with rack and pinion, objective cap with aperture (which can be closed) for solar observations, a power 36 **terrestrial** ocular and a 48 power



54 500. 1 : 1.



54 501. 1 : 3.

astronomical ocular, with smoked glass, stand for erecting at the height of the table, and box . . . . . £ s. d. 9. 0. 0

If desired, instead of supplying the terrestrial eyepiece, 2 astronomical eyepieces (power 24 and 96 respectively) are provided with the instrument. The axial system is arranged for a mean polar height of 50°, but the polar height can be varied between 48° and 53°.

54,482. **Graduated Circle** for right ascension and declination, reading to 1° . . . . . Extra 1. 10. 0

54,483. **Ocular Prism** for observing objects in the neighbourhood of zenith 0. 15. 0

54,484. **Astronomical Eyepiece** for powers 32, 72, or 120 . . . . . Each 0. 15. 0

Telescopes, mounted parallactically and balanced, with metal stand, Fig. 54,488, for setting up at table height, with lock-up box for the tube.

List No.	Diameter of Objective mm	Number of Oculars terrestrial	Number of Oculars astronomical	Powers terrestrial	Powers astronomical	With compound Fine Motion, without Finder £ s. d.	a) Extra Price for Finder £ s. d.
54 485	48	1	—	28	—	**20. 0. 0**	**2. 5. 0**
54 486	59	1	1	34	48	**22. 10. 0**	**2. 5. 0**
54 487	68	1	2	42	60, 90	**25. 0. 0**	**2. 5. 0**
54 488	75	1	3	50	48, 72, 108	**27. 10. 0**	**2. 5. 0**
54 489	82	1	3	50	56, 84, 126	**30. 0. 0**	**2. 5. 0**

Telescopes with Zeiss Optical Outfits, on wood stand, with rack and pinion height-motion, tube and accessories in box, stand-head in sail-cloth bag.

List No.	Diameter of Objective mm	Number of Oculars terrestrial	Number of Oculars astronomical	Powers terrestrial	Powers astronomical	Without Finder £ s. d.
54 490	70	1	4	47	41, 57, 82, 114	**37. 10. 0**
54 491	80	1	4	44	48, 67, 97, 134	**42. 10. 0**
54 492	90	1	4	50	54, 75, 108, 150	**52. 10. 0**

Useful Auxiliaries:

54,493. **Fine Motion** in azimuth and altitude 10. 0. 0

54,494. **Power 8 Finder** 5. 0. 0

54,495. **Change Device** 1. 12. 0

54,496. **Zenith Prism** 3. 10. 0

54,497. **Herschel Solar Prism** 5. 5. 0

54,498. **Ocular Spectroscope** 1. 16. 0

54,499. **Ring Micrometer** 1. 12. 0

54,500. **Dynameter** after Ramsden, Figure, for direct determination of the power of a telescope (M. P., 9th Edn., II, 1, p. 872) 1. 0. 0

Interference and Diffraction.

52,045. **Glass Balloon with Glycerine-soap Solution,** after Eisenlohr, for showing Newton's Rings in thin liquid films, Fig. 52,045, p. 284, for the Whirling Table 0. 7. 0

* 54,501. **Small Metal Frame for Soap Solution,** Figure, for demonstrating the colours of thin plates (Graetz, „Das Licht und die Farben", Fig. 65; W. D. p. 445) 0. 2. 0

* Can be used with the Projection Apparatus.

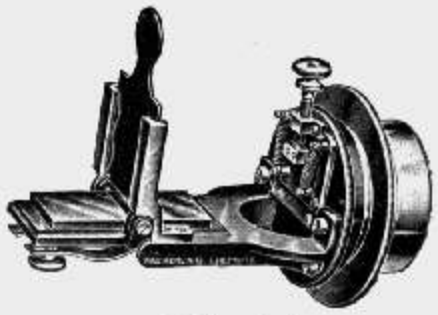
Max Kohl A. G. Chemnitz, Germany.



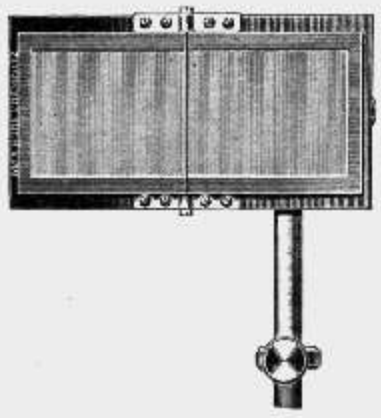
54 509 — 54 512. 1 : 7.



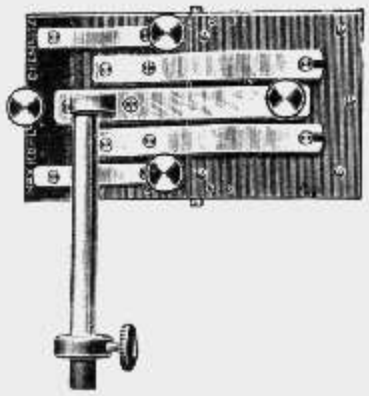
54 504. 1 : 2.



54 514. 1 : 3.



54 517 A. 1 : 2.



54 517 B. 1 : 2.

	£ s. d.
54,502. **2 Glass Discs clamped together,** with layer between, **for demonstrating interference in wedge-shape air plates** (M. T. p. 211; M. P. 10th Edn., II, 1, Fig. 608)	0. 4. 0
54,503. **2 Gold Leaves between Glass Plates,** one appearing green and one blue when light is transmitted	0. 3. 0
54,504. **Comparison of Superficial Colours,** after Hartl, Figure; in reflected and incident light the colours of the four different thin plates appear in the complementary colours (Ztschr. f. d. phys. u. chem. U. **20,** 1907, p. 133)	0. 8. 0

* **Newton's Colour Glasses,** in brass mounts, with 6 pressure screws, for observing the interference rings in a subjective and objective manner:

List No.	**54,505**	**54,506**	**54,507**	**54,508**
Diameter mm	70	100	120	150
£	**0. 16. 0**	**1. 0. 0**	**1. 4. 0**	**1. 12. 0**

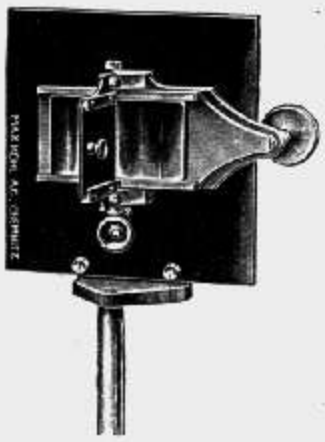
* — idem, **rotary on stand,** Figure.

List No.	**54,509**	**54,510**	**54,511**	**54,512**
Diameter mm	70	100	120	150
£	**1. 12. 0**	**1. 18. 0**	**2. 4. 0**	**2. 10. 0**

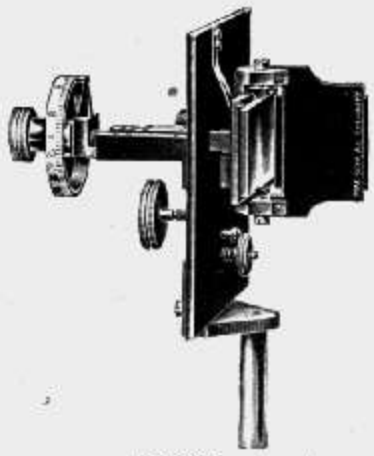
54,513. **Colour Ring Apparatus for Students' Exercises,** after Grimsehl, for determining wavelengths by the aid of Newton's Colour Rings: comprising a reflector, a spectacle lens, a small auxiliary apparatus and an attachment for producing monochromatic light for Bunsen burners (E. Grimsehl, Ausgewählte Schülerübungen, Fig. 11)	0. 14. 0
* 54,514. **Interference Apparatus for Fresnel's Mirror Experiment,** Figure, for screwing into the objective holder of the Projection Apparatus, in place of the objective, with adjustable gap, adjustable black mirrors and diaphragm; for Projection Apparatuses having 43 mm diam. objective	4. 0. 0
This apparatus considerably facilitates the carrying out of Fresnel's Experiment, since the gap and mirrors are combined ready for use.	
* 54,515. — idem, for Projection Apparatuses having **55 mm** diam. objective	4. 0. 0
* 54,516. — idem, for Projection Apparatuses having **60 mm** diam. objective	4. 0. 0

* Can be used with the Projection Apparatus.

Max Kohl A. G. Chemnitz, Germany.



54 525 (54 540). 1 : 4.



54 523. 1 : 4.



54 530. 1 : 7.



54 531. 1 : 6.

Max Kohl A. G. Chemnitz, Germany.

£ s. d.

* **Fresnel's Mirror Apparatus,** Figs. 54,517 A and B, with two black ground mirrors; one mirror centered by three screws, the other adjustable relatively to the others by fine screw, **on Stand:**

List No.	**54,517**	**54,518**	**54,519**
Size of Mirrors mm	30×40	40×50	50×60
£	**2. 2. 0**	**2. 8. 0**	**3. 0. 0**

Fig. 54,517 A shows the front, and Fig. 54,517 B the back of the interference mirror.

* — i d e m, simple, with cemented, ground mirrors:

List No.	**54,520**	**54,521**	**54,522**
Size of Mirrors mm	30×40	40×50	50×60
£	**1. 4. 0**	**1. 12. 0**	**2. 0. 0**

* 54,523. **Interference Mirror** after Fresnel, F i g u r e, with parallel micrometer motion, micrometer screw with drum and graduation, on stand, most carefully constructed 7. 0. 0

* 54,524. — i d e m, without micrometer motion 4. 16. 0

* 54,525. **Ocular Micrometer** after Fresnel, F i g u r e, for measuring interference bands, on stand 6. 0. 0

54,526. **Fresnel's Mirror for Students' Use,** after Grimsehl, for determining the wave length of light, with gap, micrometer graduation and two mounts (E. Grimsehl, Ausgewählte Schülerübungen, Figs. 2 and 3) 0. 14. 0

Lenses: see No. 53,932 b.
Adjustable Gaps: see Nos. 54,530—54,535.

* 54,527. **Interference Apparatus** after Grimsehl, constructed on the Lloyd single mirror principle, thus doing away with adjustment of the mirrors. The direct and the reflected image of the gap are used together for interference (Ztschr. f. d. phys. u. chem. U. **20,** 1907, p. 217). The gap with micrometer screw for adjusting and screw for narrowing and widening are on stand 3. 10. 0

54,528. **Screen with ground glass disc** and millimetre graduation for determining wave length; for use with red and blue glass discs, and especially with the preceding Grimsehl Interference Apparatus (Ztschr. f. d. phys. u. chem. U. **20,** 1907, p. 218) 1. 10. 0

54,529. **Interference Apparatus** after Classen, for demonstrating the phenomena before a large audience; interference is produced by reflection on two glass plates (Hassack-Rosenberg, Projektionsapparate, p. 230; Classen, Natur des Lichts, Fig. 9) 2. 10. 0

54,530. **Adjustable Gap,** F i g u r e, with diaphragm screen, **on stand,** cf. No. 50,985 . . . 1. 3. 0

54,531. — i d e m, **with Micrometer Screw,** F i g u r e, **on Stand,** cf. No. 50,986 . . . . . 1. 13. 0

* Can be used with the Projection Apparatus.

Small transparent Projection Screen: see No. 51,003, p. 179.



54 532. 1 : 9.



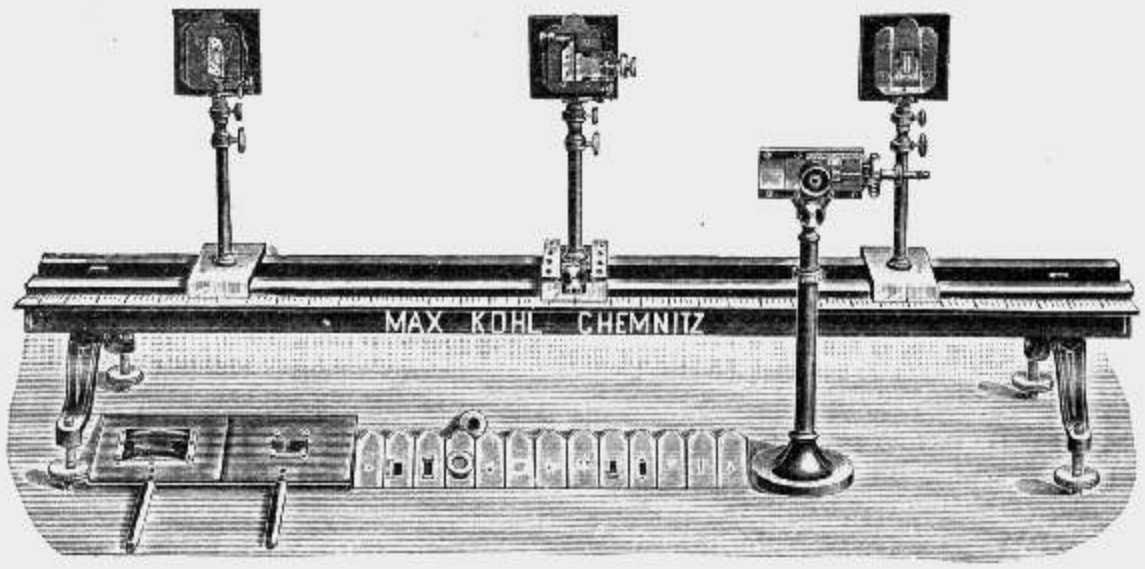
54 539. 1 : 2.



54 536. 1 : 10.



54 537. 1 : 4.



54 540 A. 1 : 9.

	£ s. d.
54,532. **Adjustable Gap,** can be used vertically and horizontally, Figure, on Stand . .	1. 6. 0
54,533. — idem, **with Micrometer Screw**	1. 16. 0
54,534. **Adjustable Gap with iris diaphragm,** cf. Fig. 50,988, p. 176, **on stand;** the length of the gap can also be altered by the iris diaphragm	2. 11. 0
54,535. — idem, **with Micrometer Screw**	3. 1. 0
Adjustable Gaps for the Projection Lantern: see under Nos. 50,985—50,988a, pp. 175 and 176.	
54,536. **Interference Prism (bi-prism)** after Fresnel, Figure, with diaphragm (M. P., 10th Edn. II, 1, Fig. 604), 30×40 mm, on Stand	1. 8. 0
54,537. **Billet's Half-lenses,** Figure, plano-convex, adjustable by micrometer screw, on stand, 60 mm diameter (M. P. II, 1, Fig. 605 [587])	2. 10. 0
54,538. **Lens of short focal length,** for observing the interference bands, on Stand	0. 16. 0
54,539. **Analyser** after Delezenne, Figure, with two small parallel mirrors, for the interference bands, in brass mount with haft	1. 8. 0

Cl. 3408, 1581, 326[3], 1583, 308.

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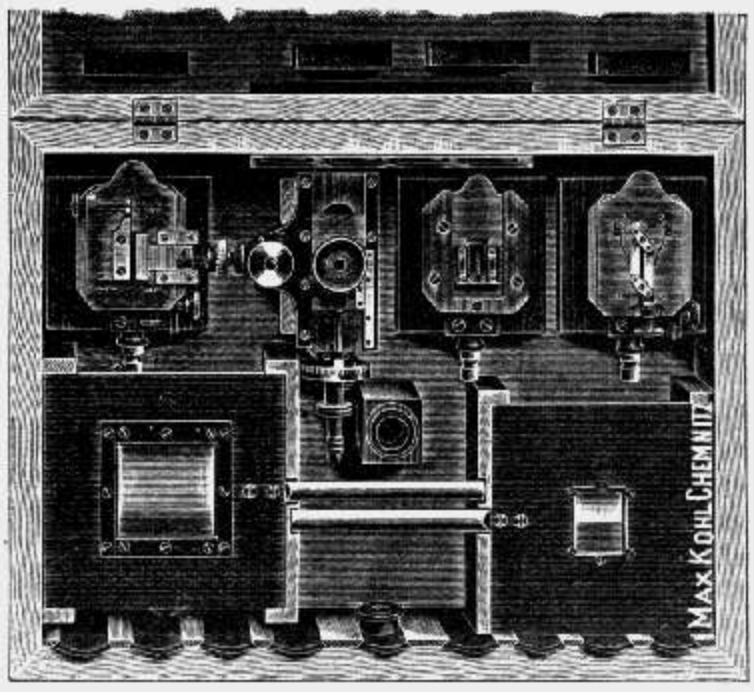
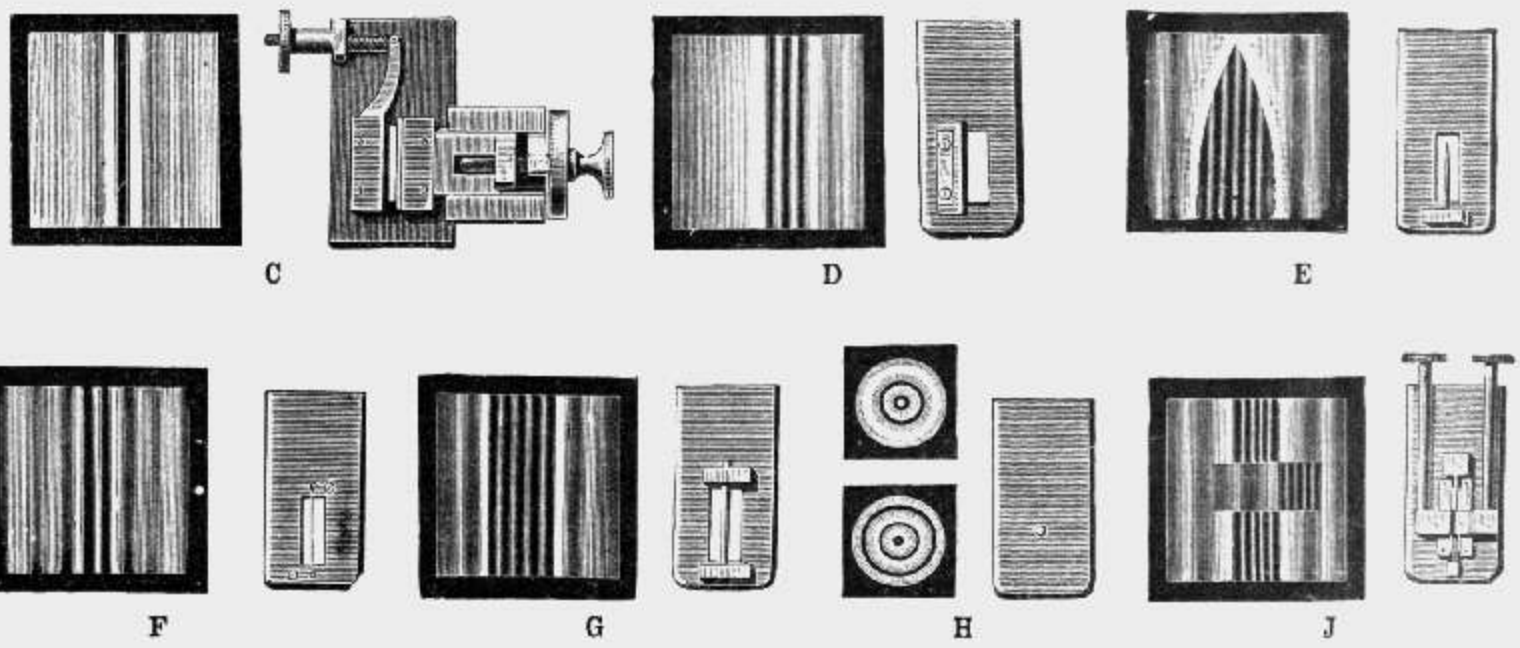


54 540 B (54 668). 1 : 6.



54 541. 1 : 8.



54 540 C — J. 1 : 3.

* 54,540. **Large Optical Bench for Interference and Diffraction Experiments,** Figs. 54,540 A—J and 54,525, with auxiliary apparatus and box for same; for use with the Heliostat or Projection Lantern . . . . . £ s. d. 27. 0. 0

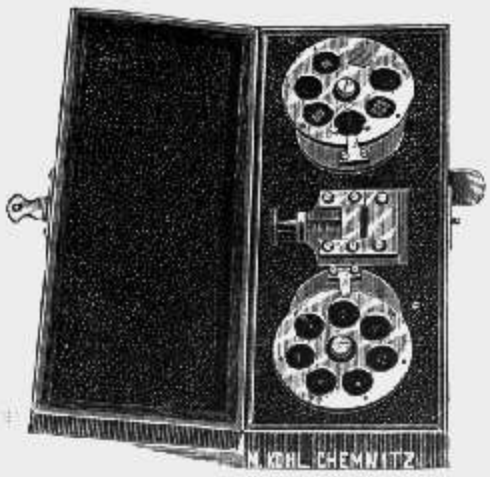
The bench is of iron, 1.20 m long, and is provided with levelling screws. It has a graduation in millimetres. Each of the three sliders has an index, one of these indices having cross motion for accurate adjustment. The screens fitted for taking the various gaps, gratings, apertures, lenses, etc. can be adjusted vertically on the pillars, in addition to being adjustable laterally. The following pertain to the bench: 1 cylindrical lens, 1 interference prism, 1 Fresnel ocular micrometer (Fig. 54,525) for measuring wave length, with red observation glass; 1 double adjustable rotary micrometer gap, Fig. C; 1 rotary gap with screw adjustment, 1 rotary double grating on glass, 3 screens for taking 12 diaphragms having apertures of different shape and with gratings and gaps of different width. The set of diaphragms consists of: 1 diaphragm with sharp edge, Fig. D; 1 diaphragm with thick needle, Fig. E; 1 slot diaphragm with a hair, Fig. F; 1 diaphragm with a thick opaque fibre, Fig. G; 1 diaphragm with a small round aperture for Grimaldi's experiment, Fig. H; 1 diaphragm with large round aperture; 1 diaphragm with aperture half covered over with mica, Fig. J; 1 diaphragm with rhombic aperture, 1 diaphragm with triangle of holes, 1 diaphragm with two holes, 1 diaphragm with network of holes, and 1 diaphragm with a row of holes.

* 54,541. **Diaphragmic Disc** with 9 Schwerd apertures for diffraction phenomena, Figure, rotary, on Stand, for use with sunlight or electric light 1. 10. 0

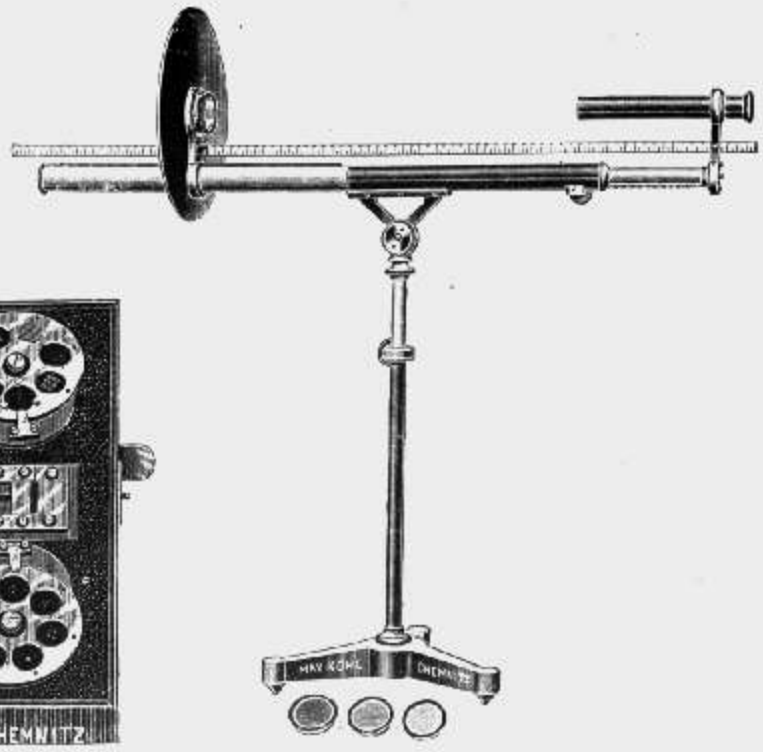
* Can be used with the Projection Apparatus.



54 544 A. 1 : 6.



54 544 B. 1 : 4



54 547. 1 : 10.

	£ s. d.
53,907. **Cylindrical Lens,** in mount, on Stand, 60 mm diameter, for observing the Fresnel diffraction bands (M. P. II, 1, p. 793 [944])	1. 4. 0
53,908. — i d e m, 80 mm diameter	1. 10. 0
54,544. **Diffraction Apparatus,** Figs. A and B, consisting of an achromatic telescope of 30 mm aperture, on Stand	7. 10. 0
The following pertain to above: 1 gap attachment with micrometer screw, 2 attachments with rotary diaphragm discs having the following apertures: 1 round hole, 2 round holes, 3 round holes, 4 round holes, 1 triangle, 1 rectangle, 1 rhomb, 1 row of holes, 1 sieve, 1 double gap, 1 triple gap, 1 wire grating, 1 grating on glass (1 cm in 100 parts), 2 rhombs. The sets of gaps and diaphragms are contained in a case, Fig. B.	
54,545. — i d e m, with larger telescope having aperture of 40 mm, gap with micrometer screw and divided drum, fitted with finer glass grating and a larger number of diaphragms	11. 0. 0
In addition to the diaphragms listed in previous item, this apparatus contains: 1 rotary diaphragm disc with: 1 hole 0.4 mm diameter, 1 crossed wire grating, 1 needle, 1 hair, 1 small rod, 1 sharp edge, 1 small rod half covered with mica for showing the distortion of the interference bands.	
54,546. **Nickelled Metal Sphere,** on stand, for producing a luminous point by reflection of sunlight	0. 16. 0
54,547. **Diffraction Apparatus for determing the wave length of light,** after Hoffmann, F i g u r e (Ztschr. f. d. phys. u. chem. U. **14**, 1901, p. 32), with three coloured discs	6. 0. 0
The apparatus consists of an optical bench fixed on a stand and rotating about a horizontal axis, on which are placed a grating with observation tube and a diaphragm having a screen. These apparatus are capable of movement along the bench. The diaphragm consists of 3 parallel 0.5 mm wide gaps of different length placed at distances apart of 10 mm. Covers with coloured discs can be placed on the diaphragm. Three of these coloured discs (red, green and blue) are supplied with each apparatus.	
54,548. — i d e m, after Grimsehl (Ztschr. f. d. phys. u. chem. U. **17**, 1904, p. 135) . . .	2. 10. 0
54,549. — i d e m, **for Students' Use,** after Grimsehl, comprising Nernst Lamp on stand, diaphragm with aperture, 4 coloured glasses, small optical bench, glass micrometer (E. Grimsehl, Ausgewählte physikalische Schülerübungen, Figs. 8—10)	2. 15. 0

Glass Gratings:

List No.	**54,550**	**54,551**	**54,552**	**54,553**	**54,554**	**54,555**	**54,556**	**54,557**
Lines to 1 cm	50	100	200	300	500	1000	2000	3000
£	**0. 5. 0**	**0. 7. 0**	**0. 14. 0**	**1. 2. 0**	**1. 16. 0**	**2. 16. 0**	**3. 10. 0**	**4. 0. 0**

54,558. **Double Grating, in Brass Mount,** rotary one above the other, F i g u r e, 1 mm in 13 parts	0. 18. 0
54,559. **Wire Grating**	0. 10. 0

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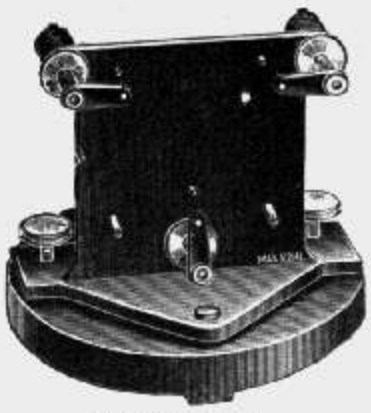
54 558. 2 : 3.



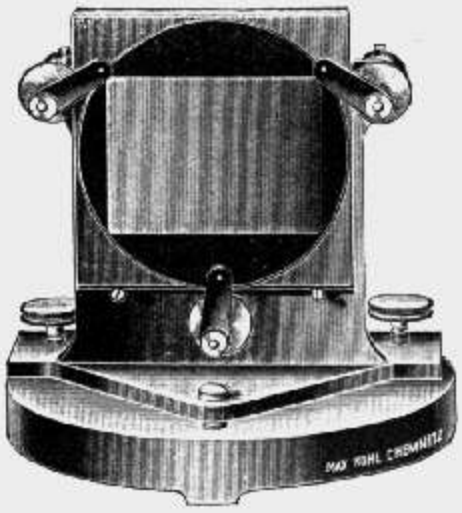
54 563. 1 : 5.



54 568. 1 : 3.



54 561. 1 : 2.



54 566, 54 568. 1 : 2.



54 576. 1 : 3.

	£ s. d.
54,560. **Photographed Grating** after Nobert, 3 cm wide with lines 3 cm long; 1000 lines to 1 cm	0. 18. 0
On account of its brightness this grating is well adapted for demonstration purposes, but not for accurate measurements.	
54,561. **Copy of a genuine Rowland Grating,** Figure, **50 × 35 mm** area of grating, in case	1. 4. 0
54,562. — idem, **smaller, 25 × 20 mm** area of grating	0. 15. 0
54,563. — idem, between two glass prisms inclined 7° and 32 mm square, Figure .	2. 0. 0
54,564. **Photographed Diffraction Grating,** cemented as a lantern slide between glass plates, 115 lines to the millimetre, area 63 square millimetres	0. 10. 0
54,565. — idem, photographed area 25 × 25 mm	0. 5. 0
54,566. **Diffraction Grating** after Henry A. Rowland, with 14,438 rulings to one inch, Figure, plane or concave, of the highest perfection	Price on application
As a rule we keep a number of such gratings in stock; kindly state requirements.	

Stands for Rowland's Diffraction Gratings, Figs. 54,568, accurately constructed:

List No.	54,567	54,568	54,569	54,570	54,570a
Suitable for Gratings of	1.4″	2.5″	4″	5″	6″
£	**2. 10. 0**	**3. 10. 0**	**4. 0. 0**	**4. 10. 0**	**5. 0. 0**

Fig. 54,566 shows the stand with the grating set up on it.

— idem, simple pattern:

List No.	54,571	54,572	54,573	54,574	54,574a
Suitable for Gratings of	1.4″	2.5″	4″	5″	6″
£	**0. 12. 0**	**0. 18. 0**	**1. 4. 0**	**1. 10. 0**	**1. 16. 0**

* 54,575. **Phase Reversing Plate,** after R. W. Wood, consisting of a glass plate covered with a large number of concentric rings of different fineness and acting as a lens, 180 cm focal length (Phil. Mag. 1898, p. 511)	0. 10. 0
The plate of 180 cm focal length gives an image of the arc at a distance of approximately 2.5 m from an arc light regulator at a distance of approx. 4 m. The plate of 40 cm focal length can be used as landscape objective with the aid of a weak convex lens.	
* 54,576. **Circular Photographed Grating,** Figure, graduated area 76 mm diameter, about 200 lines to the millimetre	1. 0. 0
If an image of the arc of an electric projection lamp is cast on the screen and if the circular grating is placed on it centrally in front of the objective, an annular rainbow results.	

* Can be used with the Projection Apparatus.

Cl. 1588, 3685, 1590, 1591, 1589, 3686.

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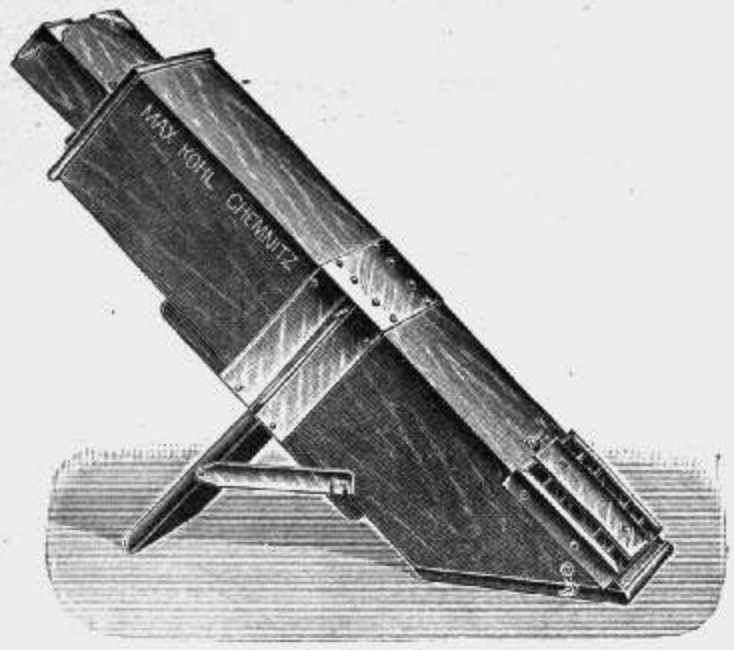
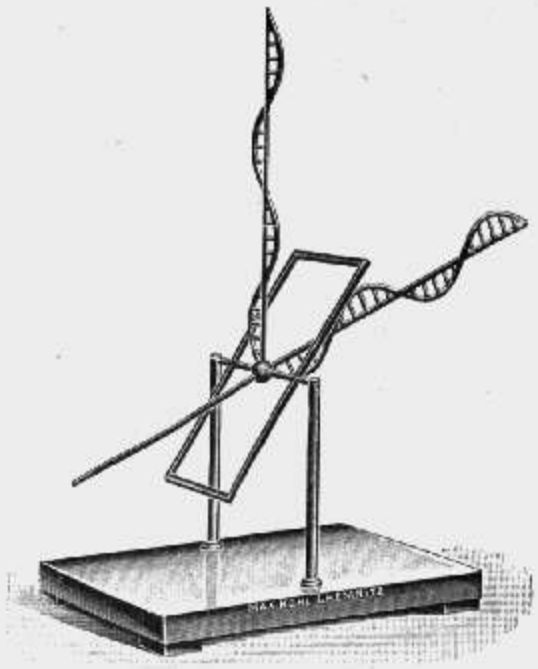


54 577. 1 : 8.



54 585. 1 : 2.



54 588. 1 : 6.

	£ s. d.
54,577. **Diffraction Chromoscope** after Ives, cf. Figure, with binocular objective and with 6 image plates, size of image approx. 6.5 cm	5. 0. 0
The photo plates are made by Wood's process; they consist of three superposed photographed grating plates each of which has small grating surfaces corresponding to the individual shapes of the image. The gratings of the three plates have graduation of different widths thus producing spectra of different lengths. If lateral illumination is applied to an image plate in the apparatus, the portions of the image plate, which contain only one portion of the grating, cast a definite colour of the spectrum towards the point at which the eye is situated; immediately two or three gratings act simultaneously on the eye, the eye itself perceives a corresponding mixed light. At the places on which the image plate contains no grating the light is not diffracted and no luminous rays pass through the plate to the eye, since the source of light is situated laterally to the photo plate; consequently these portions appear black. The image plates can also be used for objective demonstration (cf. B. Donath: Additive Farbenwiedergabe nach Wood mit Hilfe von Beugungsspektren, Brunswick, 1906, pp. 125 et seq.).	
Diffraction Chromoscopes for Projection: see Nos. 51,066 and 51,066a, p. 185.	
Interference Plate after Lummer-Gehrcke: see No. 54,089, p. 507.	
Echelon Grating after Michelson: see No. 54,090, p. 507.	
Interference Air Plate after Fabry and Perot: see No. 54,091, p. 507.	
54,579. **Photographs of the Solar Spectrum,** after H. A. Rowland	7. 10. 0
Sulliman's Journal of Science, 1887/8. Complete series of 10 plates, size 90 × 30 cm, drawn on lines, provided with the normal wave length scale as corrected by Rowland. The series contains all wave lengths from 300 to 695 $\mu\mu$.	
54,580. — A single plate	0. 18. 0
54,581. **Extra Plate** of the B lines in same size	0. 18. 0
54,582. **Extra Plate** of the D lines, same size	0. 18. 0
The B lines have an expansion of 600 mm, the D lines a distance of 75 mm.	
54,583. **4 Extra Plates** with the carbon lines . . . . . Each £ 0. 18. 0	3. 12. 0
* 54,584. **Dust Glass** for colour rings, very pretty experiment by means of the Projection Lantern	0. 4. 0
The objective head should be removed from the lantern and a diaphragm having a small round aperture placed in front of the condenser; a bi-convex lens of approx. 50 cm focal distance should now be placed in the luminous pencil so as to render the rays convergent. The dust glass is held immediately behind the lens.	
* 54,585. **Reflecting Stephanoscope** after von Lommel, small pattern, for demonstrating interference of diffracted light, Figure (Fr. phys. Techn. II, 2, Fig. 2877 [II, Fig. 844])	0. 16. 0
* 54,586. — idem, **larger,** for objective demonstration	1. 6. 0

Polarisation of Light.

54,587. **Polariser and Analyser** after Macé de Lépinay, for explaining the polarisation of light on a vibrating fibre which is actuated by an electromagnetically driven tuning fork, 1.5 m long (Ztschr. f. d. phys. u. chem. U. 2, 1888, p. 87; W. D., p. 454 [416]) . .	11. 0. 0
54,588. **Model for Explaining Polarisation by Reflection and Refraction,** Figure	0. 18. 0
The different directions in which the ether particles vibrate are demonstrated by small cross rods.	

* Can be used with the Projection Apparatus.

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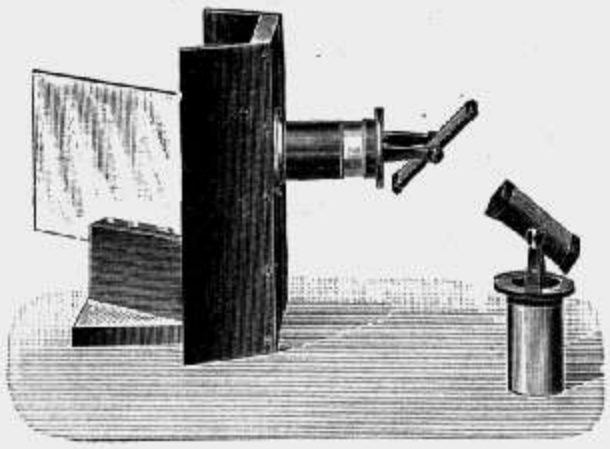
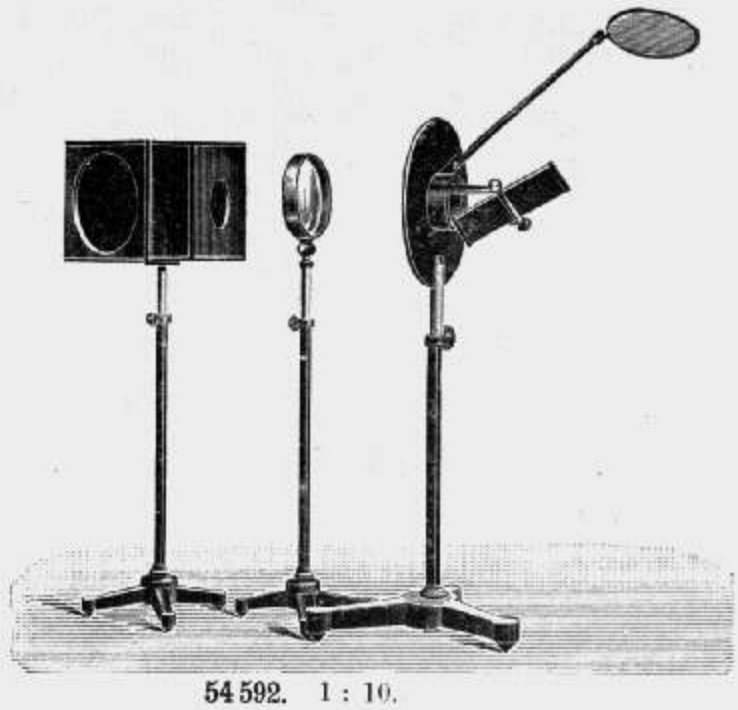
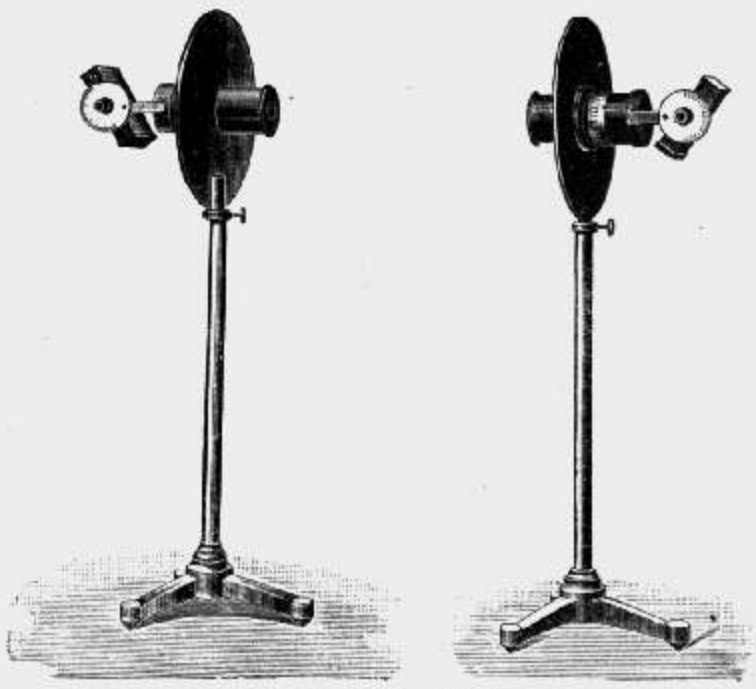


54 590. 1 : 7.



54 592. 1 : 10.



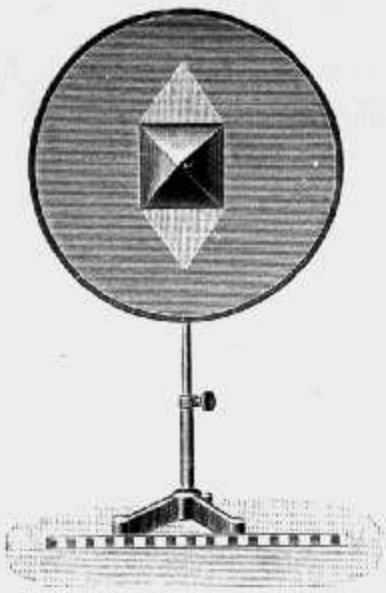
54 593. 1 : 12.



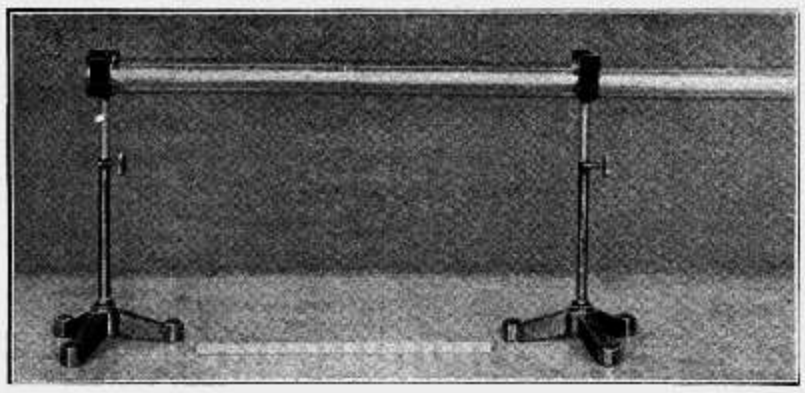
54 594. 1 : 5.

	£ s. d.
Apparatus for Fresnel's Explanation of the Rotation of the Plane of Polarisation; see Nos. 51,817 and 51,818, p. 259.	
54,589. **Model for showing the Rotation of the Plane of Polarisation** in quartz and in a sugar solution, after Grimsehl (Ztschr. f. d. phys. u. chem. U. **20**, 1907, p. 220)	3. 0. 0
* 52,047. **Polarisation Apparatus** for Demonstrating the Properties of Polarised Light, for the Whirling Table (M. P. II, 1, Fig. 693 [671]), see Fig. 52,047, p. 285	1. 10. 0
* 54,590. **Polarisation Apparatus** for the Projection Lantern, F i g u r e (W. D., Fig. 322 [304]) The apparatus consists of a screen with tube, an uncoated mirror as polariser, a black mirror and a set of glass plates each with tube and rotary mount, as analysers.	2. 8. 0
* 54,591. **Further Set of Glass Plates** for No. 54,590, for use as polariser (W. D. p. 451 [414])	0. 18. 0
* 54,592. **Polarisation Apparatus** after Duboscq, F i g u r e, for the Projection Lantern (M. P., 9th Edn., II, 1, Fig. 638), with two mirrors, lens and receiving screen, on stands . .	3. 12. 0
* 54,593. **Polarisation Apparatus,** F i g u r e, for objective demonstration of the phenomena of polarisation by reflection and refraction (M. P. II, 1, Fig. 699 [677]), with 2 glass plate columns, diaphragm and lens, on tall stands; can be used with the heliostat or a projection lantern	4. 15. 0
* 54,594. **Demonstration Polariser** after Grimsehl, F i g u r e (Ztschr. f. d. phys. u. chem. U. **18**, 1905, p. 321), with direct vision for demonstrations . . . . . In this very neatly constructed apparatus a coated mirror and a black mirror are fitted as reflection polariser. The apparatus can be rotated about the axis formed by the incident ray of light. The angle at which the ray of light falls on the polariser is 55°. A convex lens given in is used for experiments with converging polarised light. No. 54,595 is used as analyser.	1. 2. 0

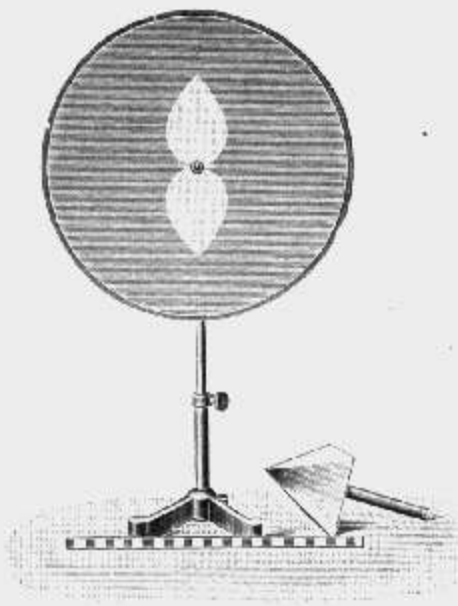
* Can be used with the Projection Apparatus.



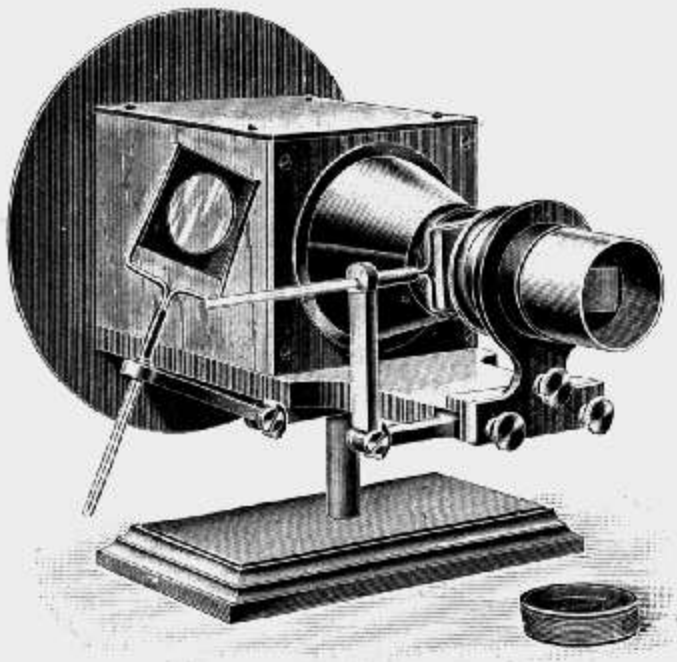
54 595 A. 1 : 10.



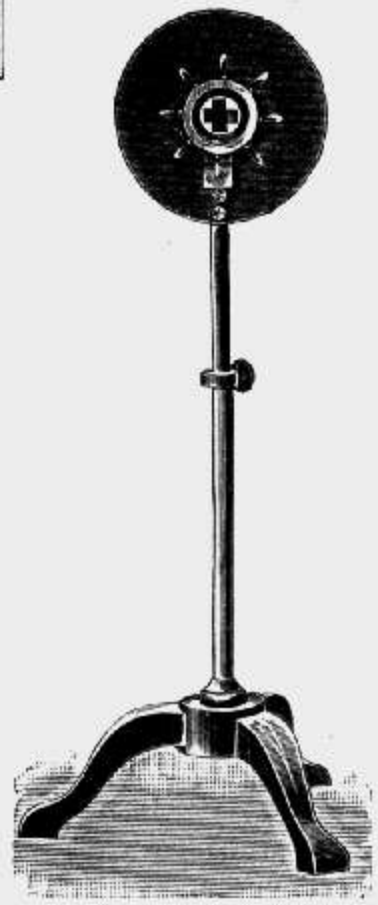
54 597. 1 : 10.



54 595 B. 1 : 10.



51 074. 1 : 4.



54 600. 1 : 6.

	£ s. d.
* 54,595. **Demonstration Analyser** for polarised light, after Grimsehl, Figs. A and B (Ztschr. f. d. phys. u. chem. U. **18**, 1905, p. 322), consisting of a screen on stand with one four-sided pyramid of black glass plate and one black glass sphere on haft	1. 15. 0
Fig. A shows a reflected image of the pyramid produced on the analyser screen by the polariser No. 54,594; Fig. B showing a reflected image of the glass sphere. When the polariser is rotated the images rotate along with it.	
* 54,596. **Plate of Mirror Glass with Haft,** for insertion as an analyser in the screen of No. 54,595 (Ztschr. f. d. phys. u. chem. U. **20**, 1907, p. 219)	0. 6. 0
* 54,597. **Glass Tube for Polarisation Experiments with Liquids,** after Grimsehl, Figure (Ztschr. f. d. phys. u. chem. U. **18**, 1905, p. 324), with two stands, closed on one side by a plane glass disc, with stopper; for use with polariser No. 54,594	1. 8. 0
The liquids to be tested — water or sugar solution — are rendered cloudy by the addition of a considerably diluted alcoholic mastic solution. The illuminated straight zone of the water and the spirally twisted zone of the sugar solution respectively rotate when the polariser is rotated.	
* 54,598. **Auxiliary Apparatus** after Grimsehl, for objectively demonstrating the Calc-spar cross (Ztschr. f. d. phys. u. chem. U. **20**, 1907, p. 219, Fig. 11), with reflex polariser . .	2. 0. 0
* 54,599. **Demonstration Polarisation Apparatus,** direct vision, after Grimsehl, arranged for inserting preparations (Ztschr. f. d. phys. u. chem. U. **18**, 1905, p. 325, 326, Fig. 6)	1. 10. 0
This apparatus consists of two movable polarisers No. 54,594 connected together, one of which acts as an analyser. It is possible to demonstrate objectively with them the ordinary phenomena of polarisation by using a projection lantern and a transparent screen No. 51,003.	

* Can be used with the Projection Apparatus.

Cl. 3807, 3809, 3808, 317. 3:6.

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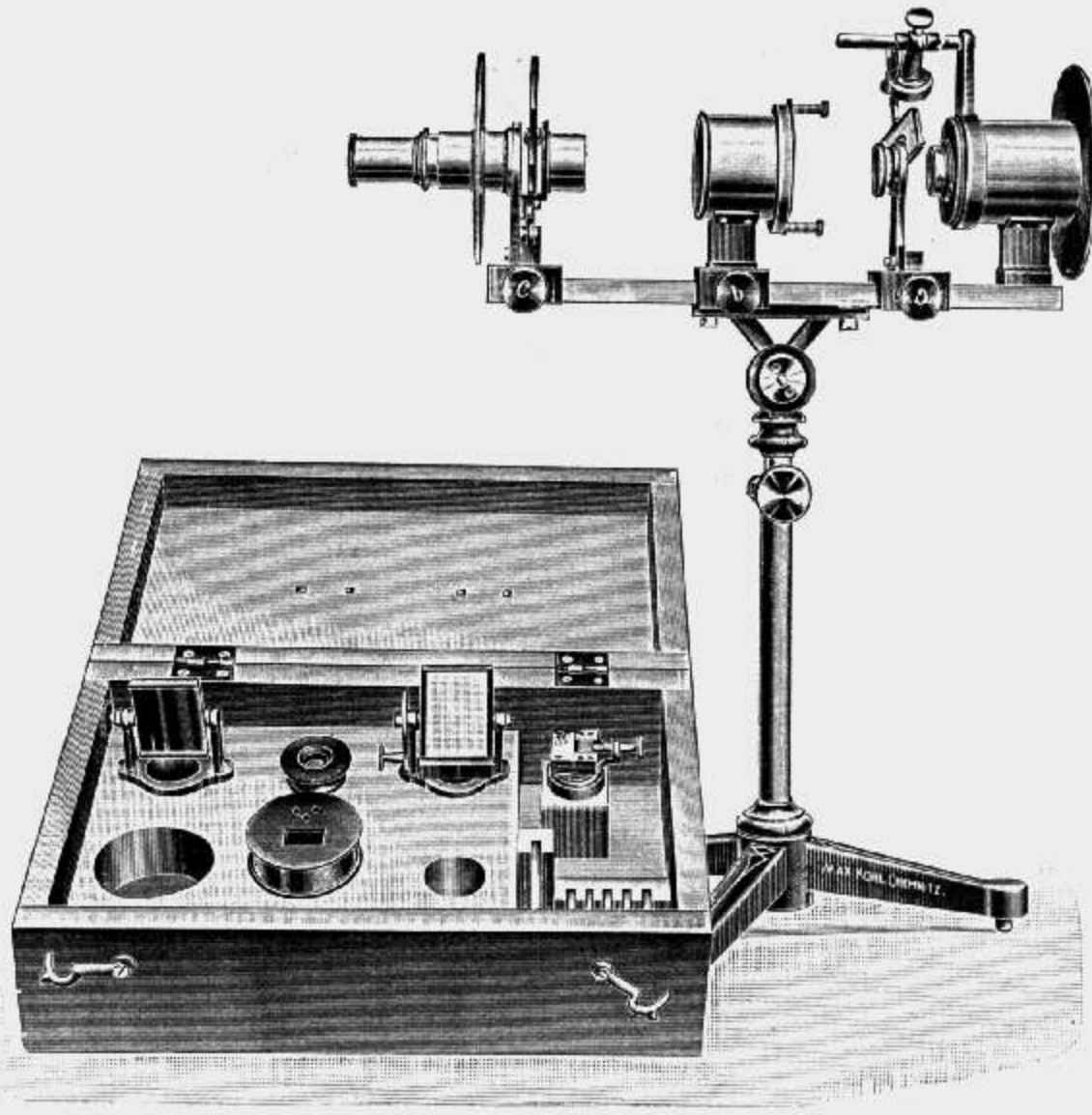
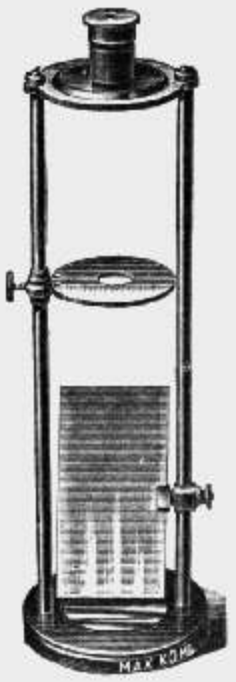


54 602. 1 : 4.



54 604. 1 : 6.

		£	s.	d.
* 54,600.	**Simple Polarisation Apparatus,** Figure (Tyndall, Das Licht [Light], p. 125), with two large tourmaline plates 5 × 15 mm, fastened on the glass, one of which is rotary . .	3.	0.	0
* 51,074.	**Polarisation Apparatus for Objective Demonstration,** Figure (W. D., Fig. 323 [305])	7.	0.	0
* 54,601.	**1 Set of Preparations** for preceding apparatus: 2 gypsum figures, 2 rapidly annealed glasses, 2 gypsum plates, calc-spar, rock crystal, aragonite, potassium-cyanide, strontium copper acetate and tourmaline	3.	5.	0
54,602.	**Large Projection-Polarisation Apparatus** after Duboscq and von Lang, Figure (M. P., 9th Edn., II, 1, Figs. 746 and 747), for use with the heliostat or projection lantern and for demonstrating all phenomena of double refraction and polarisation	34.	0.	0

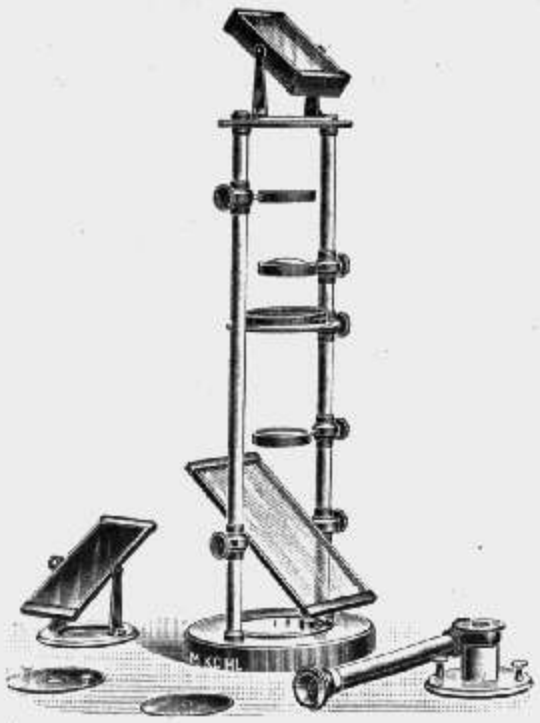
The apparatus consists of a rotary stand adjustable vertically containing one fixed and three sliding attachments; one condenser; 3 lenses; 4 calc-spar prisms as polariser; 1 Nicol as analyser and 1 bi-concave lens on stand for rendering the luminous rays of the projection lantern parallel. To the apparatus appertain: 1 Delezenne polariser; 1 black mirror; 1 gap; 1 set glass plates; 1 quartz plate cut parallel to the axis; 1 ditto cut perpendicular to the axis; 2 quarter-wave mica plates; 1 direct vision prism; 1 wedge compensator with quartz plate after Soleil and 1 double quartz plate; 2 gypsum plates; 1 piece aragonite; 1 piece tourmaline; 1 piece calc-spar; 1 gypsum figure.

54,603.	**Polarisation Apparatus** after Nörrenberg, simple, of brass, with coarsely divided circle, with rotary stage and with black mirror as analyser	2.	0.	0
54,603a.	— idem, **with Glass Plate Column** as analyser	2.	5.	0
54,604.	— idem, Figure, **with Nicol prism** as analyser	2.	10.	0
54,605.	— idem, **with black mirror and glass plate column,** without Nicol	2.	10.	0
54,606.	— idem, **with black mirror, glass plate column and Nicol prism** (Gan.-Atk., Figs. 654, 655; Gan.-Man., Figs. 439, 440)	3.	5.	0

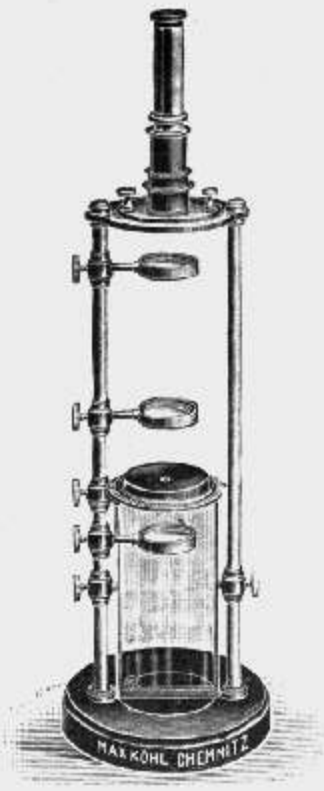
* Can be used with Projection Apparatus.



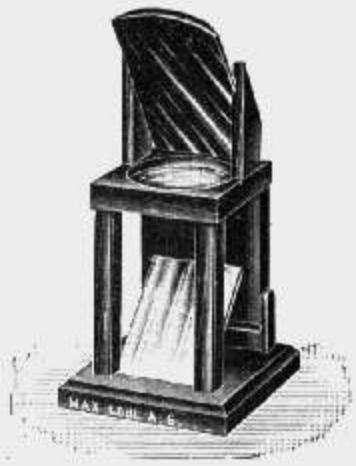
54 607. 1 : 5.



54 609. 1 : 6.



54 610. 1 : 6.



54 612. 1 : 4.

	£ s. d.
54,607. **Polarisation Apparatus** after Nörrenberg, Figure, entirely of brass, with finely divided circles, glass stage rotary and movable about the horizontal axis, with one lens, 1 black mirror, 1 column of glass plates (M. P. II, 1, Fig. 698 [676])	4. 16. 0
For simpler patterns, see preceding page.	
54,608. — idem, with 3 lenses, also with a Nicol prism as analyser	6. 0. 0
54,609. — idem, Figure, with 3 lenses, black mirror, column of glass plates, Nicol prism and tube for circular-polarising liquids	6. 10. 0
54,610. — idem, as No. 54,609, with a **Vogel Pocket Spectroscope,** for use as a **Polarisation Spectroscope,** Figure	9. 0. 0
54,611. **Collection of Polarisation Preparations,** suitable for Apparatus Nos. 54,602/9 and 54,618/20, consisting of 6 crystals and 2 rapidly annealed glasses	1. 16. 0
54,612. **Simple Polarisation Apparatus** after Hartl, Figure, with wood stand, for taking preparations, and in particular the rapidly annealed glasses No. 53,863 (Fr. phys. Techn. II, 2, Fig. 2954)	0. 10. 0
54,613. **Polarisation Apparatus for Students' Use,** after Grimsehl (Grimsehl, Ausgewählte physikalische Schülerübungen, pp. 19—31)	4. 0. 0

(a) Vertical and inclined glass plate with bases and Glow Lamp Holder on base for measuring the angle of polarisation on glass plates (£ **0. 7. 0**); (b) Polarisation Apparatus with 2 inclined black glass plates, with preparation holder, for investigations between parallel polarisers (£ **0. 4. 0**); (c) Polarisation Apparatus with crossed polarisers, with preparation holder (£ **0. 4. 0**); (d) Polarisation Apparatus arranged on Nörrenberg's principle, with rotary set of glass plates (£ **1. 10. 0**); (e) Preparations suitable for above: calc-spar, aragonite, gypsum plate 2 mm thick, gypsum plate 0.5 mm thick, gypsum image, butterfly (£ **1. 15. 0**).

For **lenses,** see No. 53,932 b; for **model** for explaining polarisation in a thin gypsum sheet, see No. 54,686.

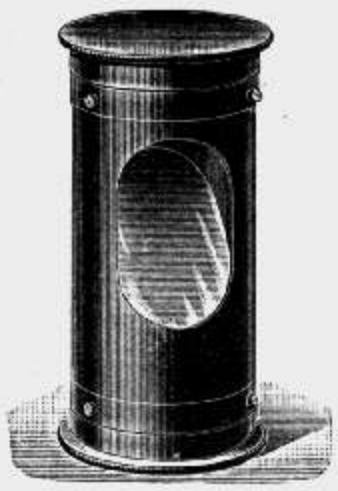
* 54,614. **Column of Glass Plates,** Figure, formed of 15—20 thin plate glass sheets, in round mount with lateral opening so as to be capable of use in transmitted and reflected light, 65 mm diameter, 110 mm long	1. 16. 0

Black Mirrors, in mahogany frame:

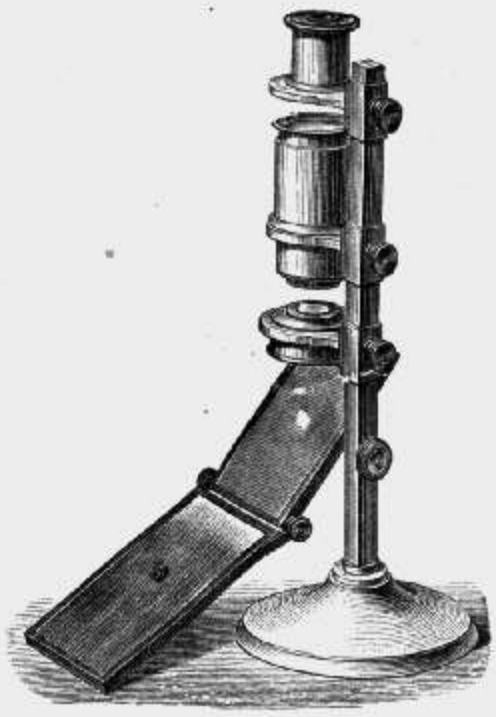
List No.	**54,615**	**54,616**	**54,617**
Size cm	10×20	15×30	20×40
£	**0. 10. 0**	**0. 18. 0**	**1. 10. 0**

* Can be used with the Projection Apparatus.

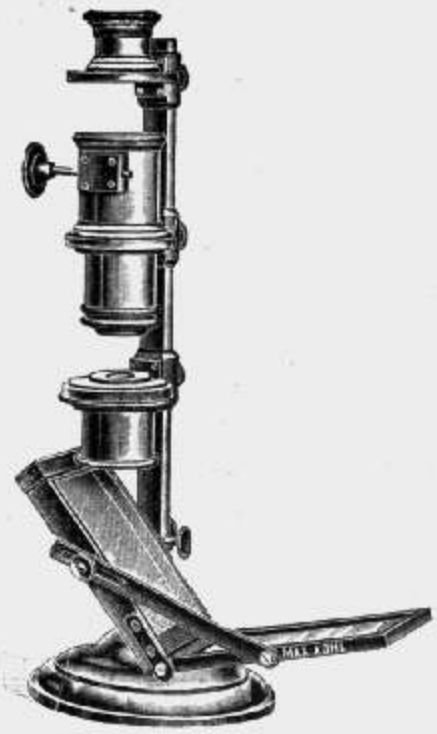
Max Kohl A G. Chemnitz, Germany.



54 614. 1 : 3.



54 618. 1 : 5.



54 619. 1 : 5.



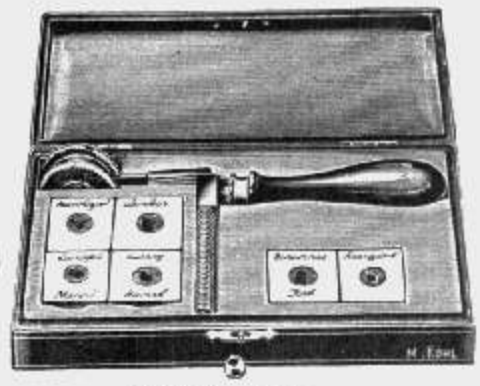
54 623. 1 : 4



54 621. 1 : 6.



54 622. 1 : 2.



54 624. 1 : 5.

54,618. **Microscopic Polarisation Apparatus,** Figure (M. P. II, 2, Fig. 802 [II, 1, 763]), with draw tube and lens system, for magnifying the axial images . . . . . £ s d. 8. 0. 0

The apparatus possesses a very large field of view and permits of viewing simultaneously the poles of the rings in sodium hyposulphite.

54,619. — idem, Figure, with rack on draw tube and **Goniometer** for measuring the axial angles of the crystals 10. 0. 0

54,620. — idem, with polished mahogany storing box 11. 0. 0

With the last three apparatus listed it is possible to observe the axial images and other phenomena on crystal plates, gypsum and mica combinations, etc.

54,621. **Large Polarisation Apparatus,** Figure, with black mirror, Nicol prism, 3 lenses, preparation holder on one axis, with divided drum, provided with vernier and magnifier for reading off the rotation. The preparation holder can be rotated horizontally and vertically thus rendering possible the focussing of the axial images to a nicety. The apparatus has cross wires which can be adjusted symmetrically narrower and wider by a screw. The apparatus gives a very large and beautiful image 15. 0. 0

54,622. **Tourmaline Tongs,** Figure. Price according to beauty and purity of the tourmalines (M. P. II, 1, Fig. 680 [654]) . . . . . £ **0. 15. 0, 1. 0. 0, 1. 5. 0** . . 1. 10. 0

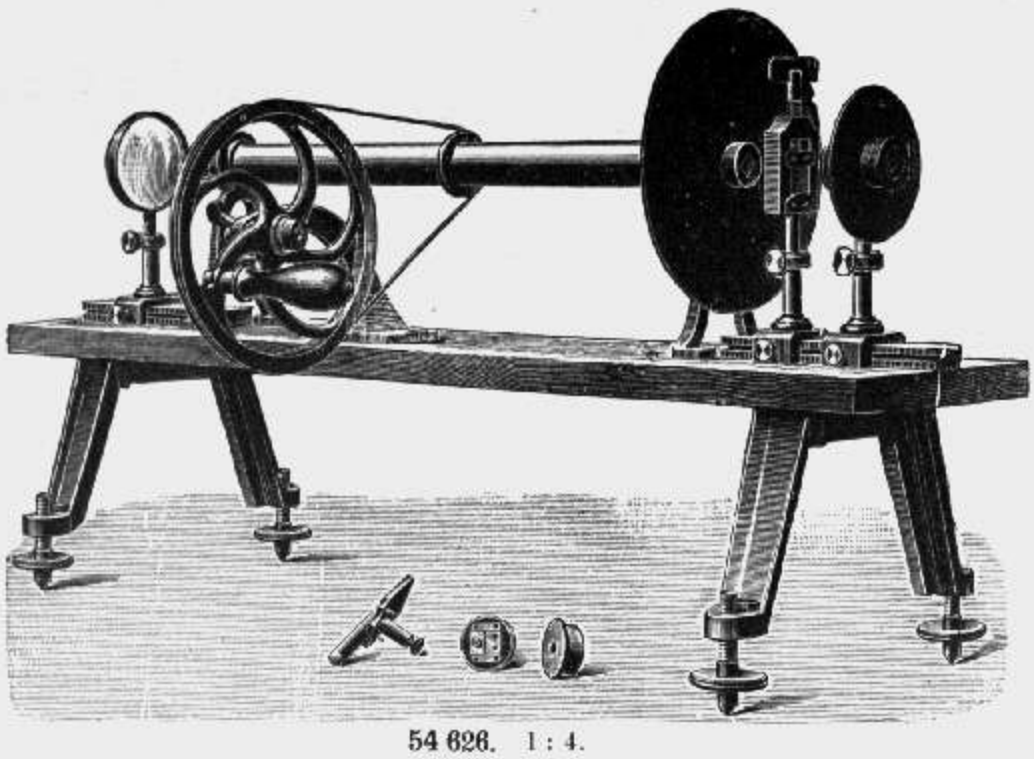
54,623. — idem, Figure, with device for automatically securing the preparations (M. P. II, 2, Fig. 799 [II, 1, 758]) 1. 10. 0

54,624. **Tourmaline Tongs with 6 different preparations,** Figure, with box 2. 12. 0

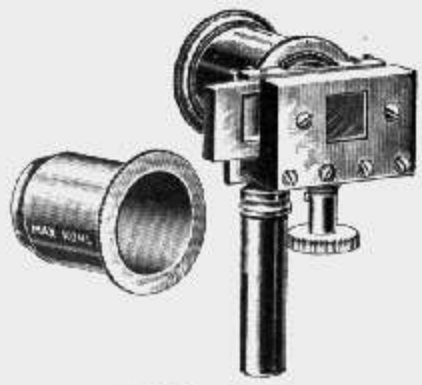
Preparations: sugar, amethyst, calc-spar (Iceland), smoky quartz, potassium-cyanide, aragonite.

54,625. **Tourmaline Plates,** green, singly . . . . . Each £ **0. 6. 0** to 0. 10. 0

Cl. 321, 1617, 1618, 1621, 1619, 1620, 1622.



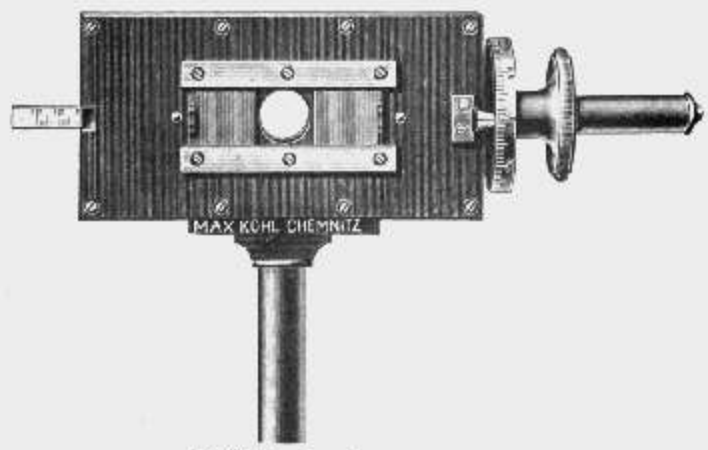
54 626. 1 : 4.



54 628. 1 : 3.



54 633. 2 : 5.



54 627. 1 : 2.

	£ s. d.
* 54,626. **Polarisation Apparatus** after Mach, Figure, with rotary analyser (M. P. II, 2, Fig. 812 [II, 1, 749]), with 2 Nicol prisms, one of which rotates, with gap attachment, diaphragm attachment, glass press, object holder and direct-vision prism	13. 0. 0
* 54,627. **Wedge Compensator** after Babinet, Figur (M. P. II, 2, Figs. 764, 765 [II, 1, Figs. 814, 815]), 2 wedges cut parallel to the axis, in mount	5. 0. 0
* 54,628. **Compensator** after Soleil, 2 wedges and compensating plate, in brass mount, Figure (M. P., 10th Edn., II, 2, Fig. 766)	6. 10. 0
54,629. **Polariscope** after Savart, in brass mount	0. 18. 0
54,630. — after Babinet	1. 4. 0
54,631. — after Sénarmont	1. 10. 0
54,632. — after Bravais	1. 10. 0
54,633. **Fresnel's Parallelepiped,** Figure, in brass mount (M. P. II, 2, Fig. 884 [II, 1, 827])	2. 8. 0

Paalzow Optical Benches.

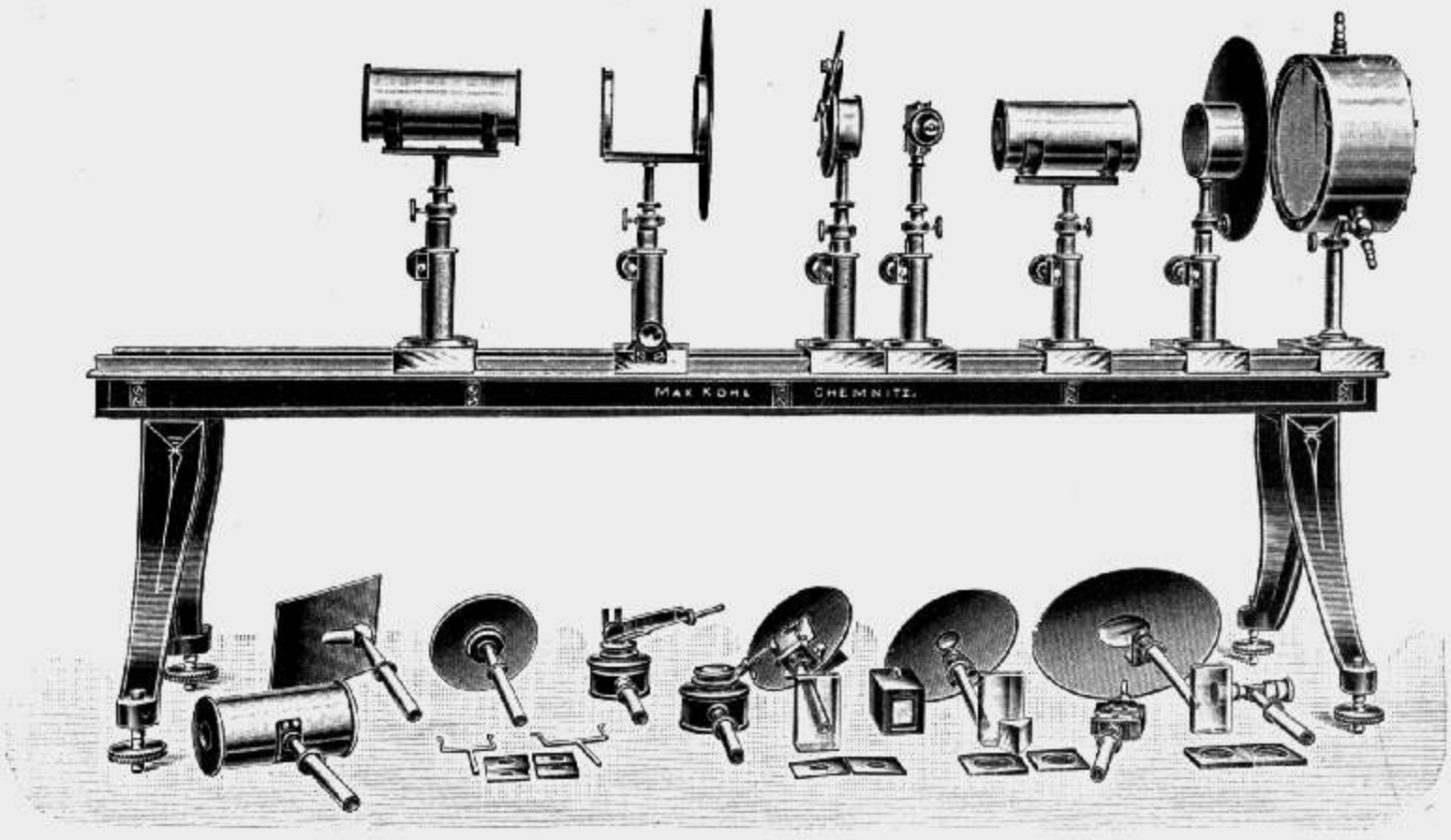
* 54,634. **Large Paalzow Optical Bench,** Figure, for experiments on Double Refraction, on Polarisation in parallel and converging light, on Interference and Diffraction, on Spectrum Phenomena and on Microscopic Phenomena, by means of sunlight, electric light, or limelight; fitting all our projection apparatus	34. 0. 0

The optical bench consists of an iron cheek 1.2 m long, planed and ground, resting on legs having levelling screws. It is provided with a rule accurately divided in millimetres and has 7 brass stands.

* Can be used with the Projection Apparatus.

Cl. 320, 294, 1628, 293.

Max Kohl A. G. Chemnitz, Germany.



54 634. Large Paalzow Optical Bench, 1 : 7.
Fitted with the undermentioned accessories and auxiliary apparatus No. 50,982, 50,986, 54,022, three of No. 54,180, Nos. 54,627, 54,637, 54,641, 54,644, 54,648, 54,650, 54,653, 54,664, 54,665 and 9 additional preparations.

6 of which can be adjusted vertically by rack and pinion; one of these can be adjusted laterally by a micrometer screw for carrying out interference experiments. £ s. d.

The following experiments are possible when an appropriate selection of the accessories Nos. 54,636 to 54,669 is made.

1. Double refraction with one or two double refracting prisms, Fig. 54,635d.
2. Breaking up of the unpolarised light into 2 or 4 polarised rays by double-refracting prism.
3. Polarisation by using a Nicol and a double-refracting prism, Fig. 54,635b.
4. Polarisation by a Nicol prism and a column of glass plates.
5. Polarisation by a Nicol prism and a black mirror.
6. Polarisation by a glass plate column and a black mirror, Fig. 54,635c.
7. Polarisation by 2 Nicol prisms in parallel light.
8. Polarisation by 2 Nicol prisms in strongly converging light, for monaxial and bi-axial crystals, Fig. 54,635a.
9. Explanation of the scientific and technical polarisation apparatuses; Soleil's wedge compensation, colour apparatus and half-shadow apparatus by means of Lippich's polariser.
10. Demonstration of interference and diffraction phenomena.
11. Demonstration of spectrum phenomena by a gap, a collimator lens and a large direct-vision prism, Fig. 54,635e.
12. Demonstration of Microscopic phenomena in polarised light, Fig. 54,635f.
13. Projection of microscopical preparations.

As luminous source use can be made of a heliostat, of one of the projection apparatus listed under Nos. 50,730—50,744, 50,783—50,806, or of the Megadiascopes Nos. 9500—9519. The most advantageous sources to use for these experiments are the apparatus having an electric arc lamp or, perhaps, limelight. The path of rays can be followed freely by the audience and the entire arrangement of lenses, objects, etc. is such that an image is first cast on the projection screen in unpolarised light, the objects then appearing in polarised light when the polarisers are inserted.

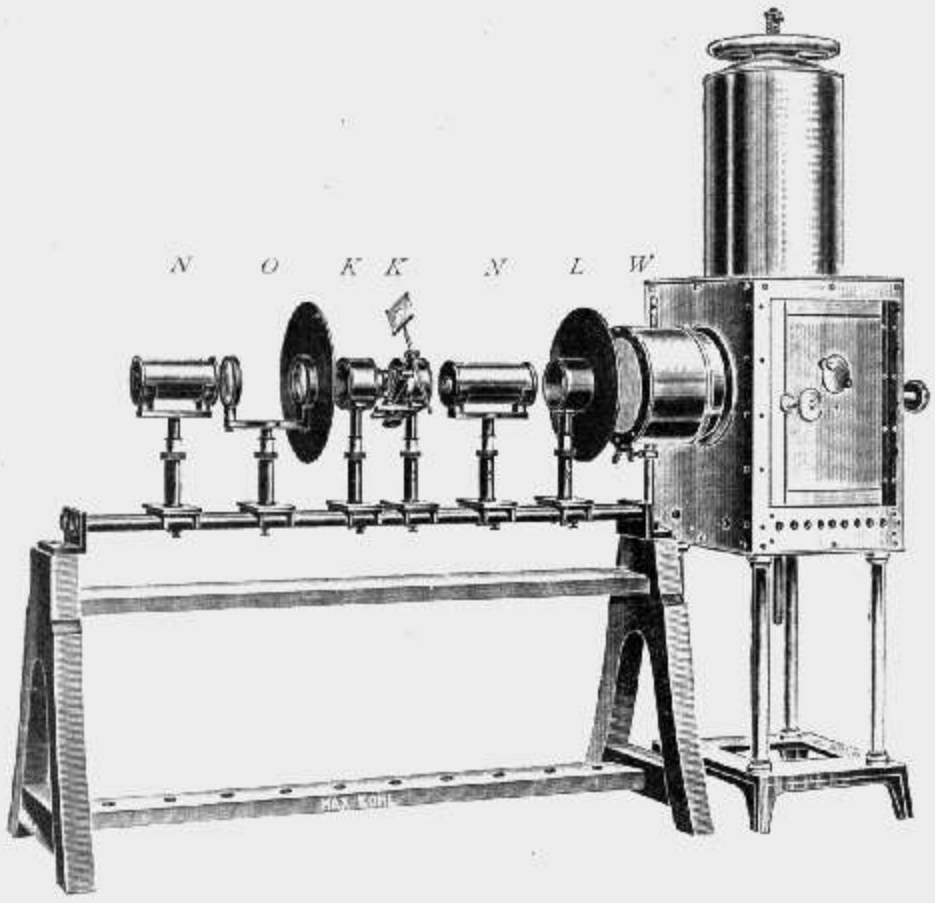
Supplied with the apparatus are:

6 Stands, with up and down adjustment, five of these with rack and pinion.
1 Stand with lateral screw displacement for interference experiments.
1 Water Trough (£ **2. 0. 0**) for continuous cooling, for condensers to 122 mm diameter (when using projection lanterns having larger condenser use should be made of larger troughs at an extra price of £ **0. 10. 0**, see List No. 50,977).
1 Bi-concave Lens in mount (£ **1. 5. 0**) for producing parallel rays (when ordering the size of condenser of the lantern should be given).
1 Rotary Object Holder (£ **1. 5. 0**).
1 Open Objective (£ **1. 10. 0**).
2 Bearings for the Nicol prisms (£ **0. 15. 0**).
2 Condensers (£ **4. 0. 0**) for producing strongly converging rays. One of these condensers is fitted with preparation holder.

If desired, the accessories, together with any auxiliary parts ordered at the same time, are fitted in a durable box, at lowest possible price.

Auxiliary parts for definite optical experiments: see Nos. 54,636—54,669.

Max Kohl A. G. Chemnitz, Germany.

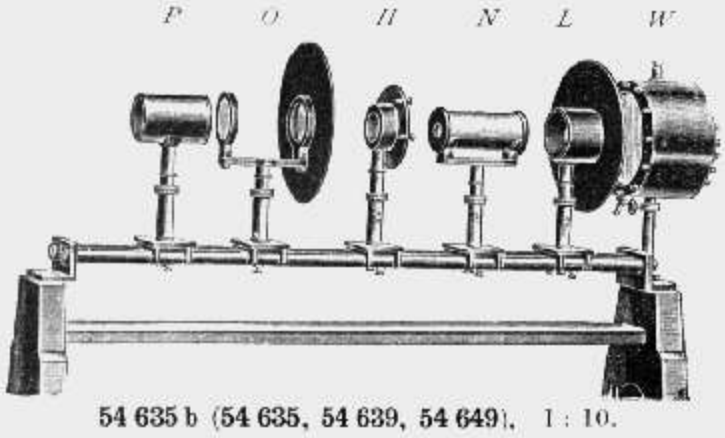


54 635 a (50 789, 54 635, 54 639). 1 : 10.

Polarisation in converging light with 2 Nicol prisms and 2 condensers, for uniaxial and bi-axial crystals.

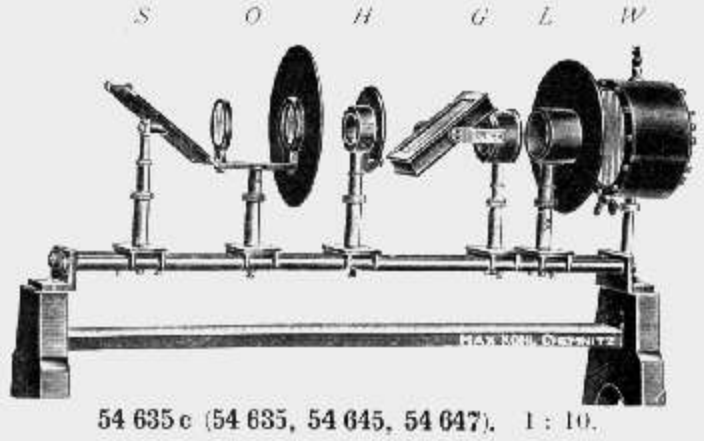


54 641. 1 : 3.



54 635 b (54 635, 54 639, 54 649). 1 : 10.

Polarisation in parallel light with 1 Nicol as polariser and 1 double-refracting prism.



54 635 c (54 635, 54 645, 54 647). 1 : 10.

Polarisation with Column of Glass Plates and Black Mirror.

The collections for different experiments are represented in Figs. 54,635 a—f; the projection apparatus should be imagined as being to the right of the optical bench and the projection screen to the left.

In the illustrations

C = Collimator Lens,
D = Direct-vision Prism,
F = Adjustable Gap,
G = Glass Plate Column,
H = Rotary Object Holder,
K = Condenser with Preparation Holder,
L = Bi-concave Lens,
M = Projection Microscope,
N = Nicol Prism,
O = Open Objective,
P = Double-refracting Prism,
S = Black Mirror,
W = Water Trough.

* 54,635. **Small Paalzow Optical Bench,** Figs. a—f, with tall legs, for experiments on Double Refraction, Polarisation in parallel and converging Light, on Spectrum Phenomena and on Microscopical Phenomena . . . . . £ s. d. 16. 0. 0

This optical bench consists of a polished stand of mahogany with two metal rails.

Given in are the following:

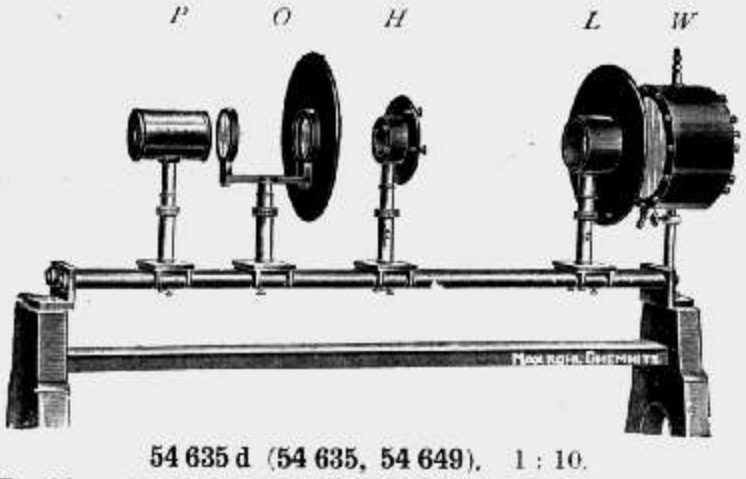
7 simple stands sliding on the rails.

1 Water Trough (£ **2. 0. 0**) for continuous cooling, for condensers to 122 mm diameter (when using projection lantern having larger condensers a larger trough, at an extra price of £ **0. 10. 0,** should be employed, see List No. 50,977).

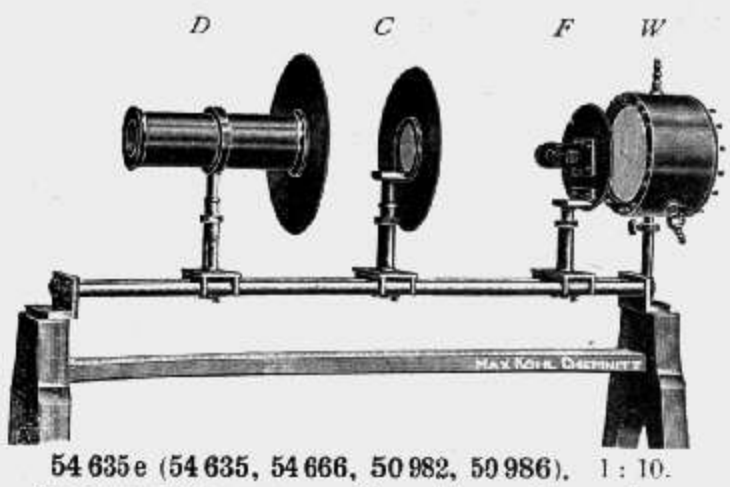
* Can be used with the Projection Apparatus.

Cl. 302, 291, 303, 304.

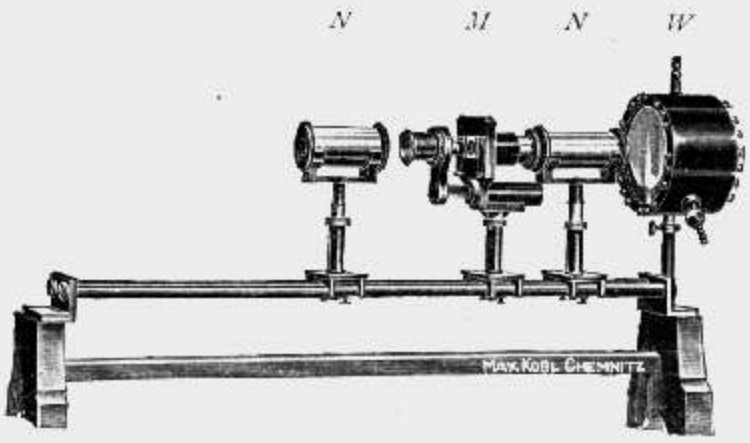
Max Kohl A. G. Chemnitz, Germany.



54 635 d (54 635, 54 649). 1 : 10.
Double refraction with 1 or 2 double-refracting prisms.



54 635 e (54 635, 54 666, 50 982, 50 986). 1 : 10.
Spectrum Phenomena with a direct-vision prism.



54 635 f (54 635, 54 639, 51 048, 54 639). 1 : 10.
Microscopic Polarisation Phenomena in converging light (can also be used as Projection Microscope).



54 643. 1 : 3.

1 **Bi-concave Lens in mount** (£ 0. 18. 0) for producing parallel rays (when ordering size of condenser of lantern should be quoted). £ s. d.

1 **Rotary Object Holder** (£ 1. 5. 0).

1 **Open Objective** (£ 1. 10. 0).

2 **Bearings** for Nicol Prisms (£ 0. 10. 0).

2 **Condensers** (£ 4. 0. 0) for producing converging rays, with preparation holder.

The preceding optical bench is specially adapted for experiments Nos. 1—9 and 11—13 included in the remark to List No. 54,634. If the bench has to be arranged for **interference and diffraction experiments** (see No. 10) also, it must be constructed longer, the extra cost being £ 2. 0. 0.

Auxiliary Apparatus for Experiments on Polarisation and Double Refraction, Figs. 54635a, b, c, d.

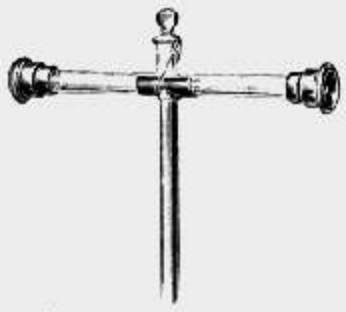
	For large Paalzow Bench No. 54,634 £ s. d.	For small Paalzow Bench No. 54,635 £ s. d.
54,636. **Nicol Prisms in brass mount,** polariser 35 mm, analyser 28 mm	50. 0. 0	Prices vary
† 54,637. — idem, polariser 30 mm, analyser 24 mm	30. 0. 0	
The prices of the Nicol prisms are only approximate and liable to vary.		
54,638. **Divided Circle and Index** on the prism mounts	1. 10. 0	—
† 54,639. **2 Nicol Prisms in brass mount,** polariser 25 mm, analyser 22 mm, Fig. 54,635 b (N) and 54,635 f (N), quality I .	Prices vary 22. 10. 0	
54,640. — idem, polariser 25 mm, analyser 20 mm, quality I .	20. 0. 0	
The prices of Nicol prisms are only approximate and subject to variation.		

	For large Paalzow Bench No. 54,634 £ s. d.	For small Paalzow Bench No. 54,635 £ s. d.
† 54,641. **Glass Press,** Figure, with 2 glasses, for showing that glass becomes double refracting by pressure (M. P. II, 2, Fig. 797 [II, 1, 790])	1. 2. 0	1. 2. 0
† 54,642. **Fresnel's Press,** for showing that pressure makes glass double refracting (M. P. II, 1, 753 [734])	2. 15. 0	2. 15. 0
† 54,643. **Glass Bending Press,** Figure, with 2 glass strips, for producing double refraction (M. P. II, 2, 796 [II, 1, 789])	1. 2. 0	1. 2. 0
† 54,644. **Black Mirror,** with mount and haft	1. 2. 0	—
† 54,645. — idem, smaller, Figure 54,635 c (S)	—	0. 16. 0
† 54,646. **Column of Glass Plate,** with mount and haft	3. 0. 0	—
† 54,647. — idem, smaller, Figure 54,635 c (G)	—	2. 0. 0

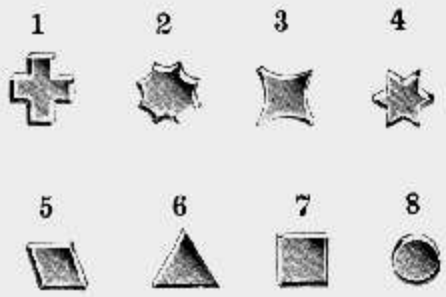
The items marked † are absolutely necessary for carrying out the experiments.

Cl. 305, 306, 307, 292.

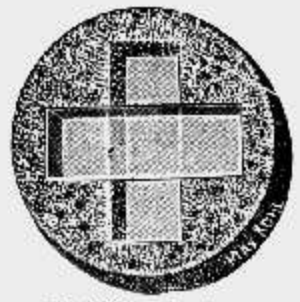
Max Kohl A. G. Chemnitz, Germany.



54 653. 1 : 3.



54 654. 1 : 4



54 655. 1 : 1.

	For large Paalzow Bench No. 54,634 £ s. d.	For small Paalzow Bench No. 54,635 £ s. d.
† 54,648. **2 Double-refracting Prisms** 20 mm diameter, in one mount with haft	3. 10. 0	—
† 54,649. — 13.5 mm diameter, Figure 54.635b (P) and 54,635d (P)	—	2. 5. 0
† 54,628. **Complete Soleil Wedge Compensation**	6. 10. 0	6. 10. 0
† 54,650. **Right- and Left-rotating quartz plate,** mounted in cork	0. 15. 0	0. 15. 0
† 54,651. **Small Window,** half red, half blue glass	0. 7. 0	0. 7. 0
† 54,652. **Nicol with sharp edges** for making the Lippich polariser, with suitable mount for the wedge compensation	1. 5. 0	1. 5. 0
† 54,653. **Observation Tube,** with haft, Figure, for filling with rotating solutions	0. 18. 0	0. 18. 0

Polarisation Apparatus for the Paalzow Optical Bench.

	£ s. d.
* 54,654. **8 Rapidly Annealed Glasses** of different shapes, Figure	2. 10. 0
* 54,655. **2 Crossed, Annealed Glasses** in cork mount, Figure	0. 10. 0
* 54,656. **Rock Crystal**	0. 6. 0
* 54,657. **Aragonite**	0. 8. 0
* 54,658. **Calc-spar**	0. 6. 0
† 54,659. **Gypsum with movable hyperbolae**	0. 7. 0
† 54,660. **2 Gypsum Plates** for complementary colours, mounted in cork. Each £ 0. 3. 6	0. 7. 0
† 54,661. idem, ½ wavelength. Each £ 0. 4. 0	0. 8. 0
† 54,662. **2 Gypsum Figures,** star and butterfly	1. 10. 0

Further preparations listed on pp. 564 to 567.

Auxiliary Apparatus for Experiments on Spectrum Phenomena, Fig. 54 635e.

	£ s. d.
* 50,986. **Adjustable Gap,** with micrometer screw, Fig. 54,635 e (F) and 50,986, p. 176, with round screen and haft	1. 8. 0
50,988a. — idem, with iris diaphragm	2. 16. 0
* 54,663. **Cylinder Lens** with screen and haft	0. 15. 0
* 50,982. **Collimator Lens** with diaphragm and haft, Fig. 54,635 e (C)	0. 18. 0
54,664. **Flint Glass Prism,** 27 mm high	0. 10. 0
* 54,022. **Wernicke's Liquid Prism,** 20 mm aperture	2. 15. 0
54,028. — idem, **built round,** can be taken apart for cleaning, 30 mm	5. 0. 0
54,029. **Direct-vision Prism** after Koenigsberger, 25 mm aperture	1. 10. 0
Liquid Prisms and Direct-vision Prisms (compound): see Nos. 54,022/059, p. 502.	
54,042. **Direct-vision Prisms,** consisting of 2 crown glass and 1 flint glass prism, 20 mm high, without mount	2. 0. 0
54,052. — idem, consisting of 3 crown glass and 2 flint glass prisms, 38 mm side, 180 mm long, without mount, for placing on stage No. 54,665	8. 0. 0
* 54,665. **Stage** for preceding prisms, with rotary plate and haft	0. 10. 0
54,666. **Direct-vision compound Prism** as No. 54,052, quintuple, 38 mm side, in mount with haft, Fig. 54,635e (D)	9.10 0
† 54,180. **Absorption Box,** Fig. 54,180, p. 516, 55 × 35 × 10 mm inside	0. 3. 0

Auxiliary Apparatus for Experiments on Microscopic Phenomena, Fig. 54 635f.

	£ s. d.
† 51,048. **Projection Microscope,** Fig. 54,635f (M) and 51,048, p. 183, with object holder, rack and fine motion and condenser lens, without objective	4. 0. 0

Objectives for above: see Nos. 51,049—51,053.
† **Collection of Microscopical Specimens for School Use:** see Nos. 51,062 and 51,063, p. 184.

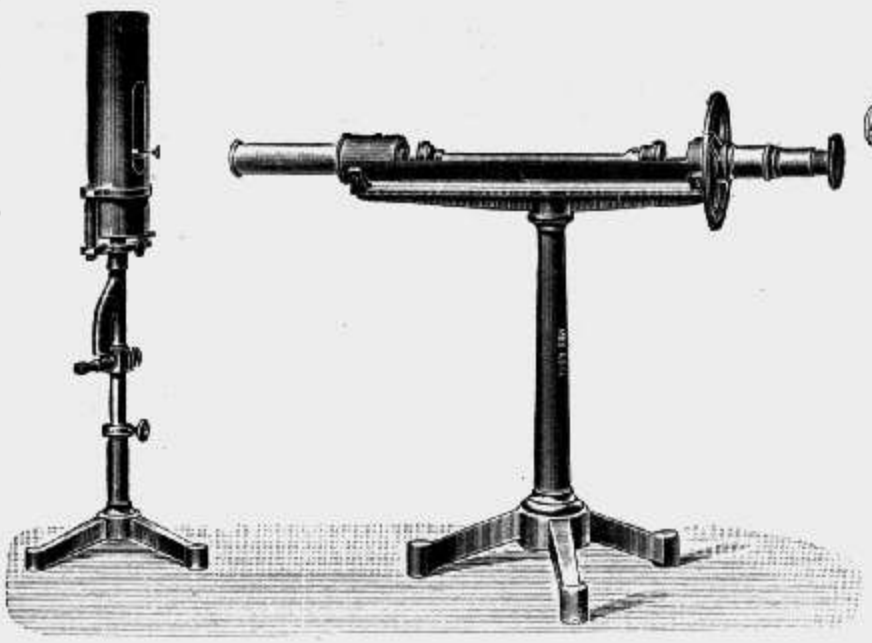
Auxiliary Apparatus for Experiments on Interference and Diffraction
for the large Optical Bench No. 54 634.

	£ s. d.
54,668. **Complete Installation for Interference and Diffraction Experiments,** Fig. 54,540 B, p. 547, comprising: 1 cylinder lens, 1 interference prism, 1 ocular micrometer (Fresnel's), Fig. 54,525, for measuring wave length, with red observation glass, 1 doubly adjustable, rotary micrometer gap, 1 rotary gap with screw adjustment, 1 rotary double grating on glass, 3 screens for taking 12 diaphragms	18. 0. 0

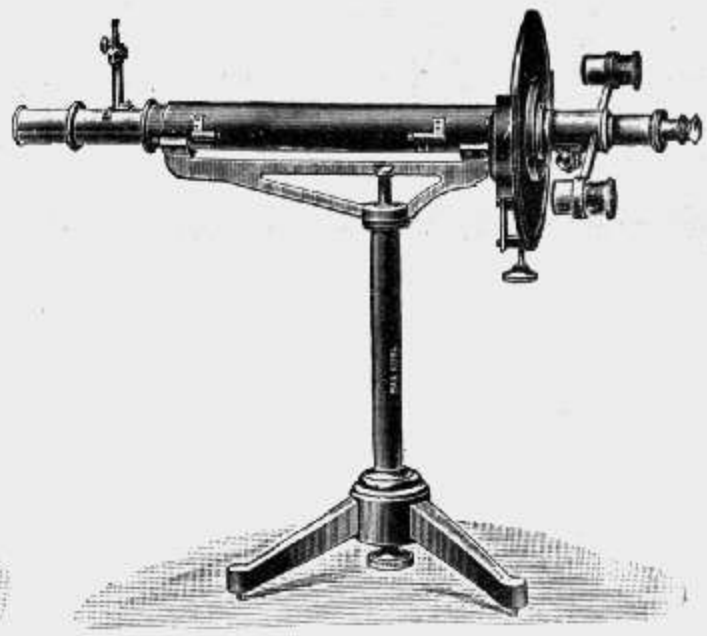
Re the construction of the diaphragms supplied and of the phenomena obtained by the same, further particulars will be found in the optical bench for interference and

The items marked † are absolutely necessary for carrying out the experiments.

Max Kohl A. G. Chemnitz, Germany.



54 670, 54 684. 1 : 6.



54 672. 1 : 6.

Max Kohl A. G. Chemnitz, Germany.

diffraction experiments under No. 54,540; the set there mentioned comprises a complete and independent bench. As to the employment of device No. 54,668 with a small Paalzow Bench, see remark under No. 54,635. £ s. d.

54,523. **Interference Mirror** after Fresnel, Fig. 54,523, p. 545, with parallel micrometer motion, micrometer screw with drum and graduation, on stand, carefully constructed 7. 0. 0

54,524. — idem, without parallel micrometer motion 4. 16. 0

54,669. **Complete Installation for setting up the Diffraction Chromoscope on the Paalzow Optical Bench,** fitting the large Optical Bench No. 54,634 or the small bench No. 54,635 with extension. Given in are 6 image plates with grating images after Wood, size of images about 6.5 cm . . 8. 0. 0

The outfit comprises 1 screening folding box with one simple gap, 1 photo holder with change frame, 1 bi-convex lens, 1 gap adjustable as regards height and width and 1 achromatic objective with up-and-down adjustment.

Further details as to the Diffraction Chromoscope given on p. 185, No. 51,066.

Polarisation Apparatus for Technical Purposes.

(Polariscopes.)

£ s. d.

54,670. **Polarisation Apparatus with Divided Circle,** after Mitscherlich, Figure, **with Laurent Polariser,** for urine analyses, reading accurately to 0.1°, with observing tube 189.4 mm and one tube 94.7 mm long, without sodium lamp 8. 5. 0

By using the 189.4 mm long tube the angle of rotation in degrees gives direct the amount in grammes of dextrose contained in 100 ccm of the urine investigated. With rotations of more than 5° the sodium light must be purified by a light filter filled with potassium bichromate solution (see next item). For gas sodium lamp see No. 54 684.

54,671. **Absorption Vessel for Potassium Bichromate Solution,** for screwing in the end of the apparatus opposite the source of light 0. 10. 0

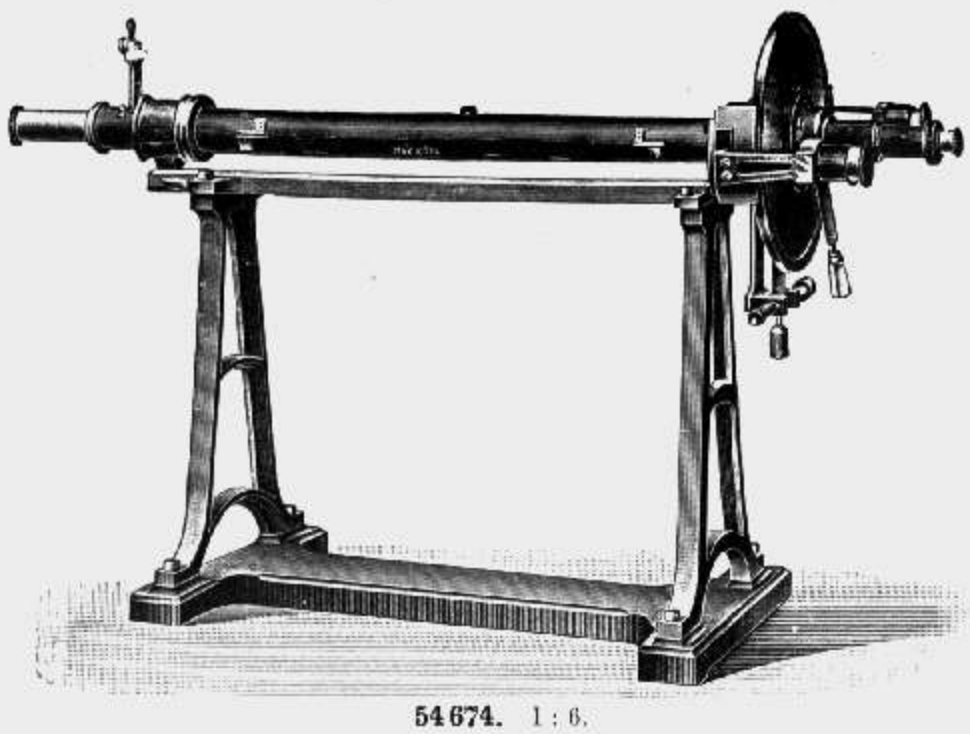
54,672. **Simple Polarisation Apparatus with Divided Circle,** after Lippich, Figure, mounted on pillar with tripod, with two verniers and magnifiers; also with **Lippich Polariser** in two parts and absorption vessel and containing box; for tubes to 220 mm length, without observing tubes (see Nos. 54,677/81) 23. 5. 0

54,673. idem, for tubes to 400 mm length, without observing tubes (see Nos. 54,677/82) 26. 10. 0

If specially desired, apparatus Nos. 54,672 and 54,673 can also be fitted with a second graduation in Ventzke degrees, this graduation rendering it possible to read the percentage dextrose direct. Fitting this second graduation costs 2. 15. 0

If a Lippich Polariser with tripartite field of view is desired in these apparatus, the price of the latter is increased by 5. 10. 0

The half-shadow can be varied within the limits 0°—20° and read off on a small scale.



54 674. 1 : 6.

	£ s. d.
54,674. **Polarisation Apparatus with Divided Circle,** after Lippich, on trestle stand, Figure, with measurable, variable, half-shadow, with **tripartite Lippich Polariser.** The circle can be rotated by hand or micrometrically. Readings to 0.01°. The apparatus is arranged for observing tubes 220 mm long. Price without observing tubes (see Nos. 54,677/81)	33. 0. 0
54,675. — idem, for observing tubes 400 mm long; without observing tubes (see Nos. 54,677/82)	36. 5. 0
54,676. — idem, for observing tubes 600 mm long; without observing tubes (see Nos. 54,677/83)	39. 10. 0

Observing Tubes, Fig. 54,681.

List No.	**54,677**	**54,678**	**54,679**	**54,680**	**54,681**	**54,682**	**54,683**
Length mm	94.7	100	189.4	200	220	400	600
£	**0. 10. 0**	**0. 10. 0**	**0. 10. 0**	**0. 10. 0**	**0. 10. 0**	**0. 11. 0**	**0. 13. 0**

54,684. **Gas Sodium Lamp,** latest pattern, Fig. 54,670, p. 561; Bunsen burner with platinum ring for taking sodium-chloride	1. 13. 0
54,685. **Spirit Sodium Lamp,** similar pattern to above	1. 15. 0

Double Refraction.

54,686. **Model of a Gypsum Membrane,** after Grimsehl, for explaining the formation of colour by polarisation in double-refracting substances (Ztschr. f. d. phys. u. chem. U. **18**, 1905, p. 326, 327, Fig. 7) 1. 10. 0

Between two glass discs representing the bounding surfaces of the Gypsum Membrane, the wave lines of the ordinary (red) ray having $2^1/_2$ vibrations and of the extraordinary (blue) ray having 3 vibrations are fitted in the form of sine-shaped pieces of wire. The phase displacement inside the membrane is thus known. The wire waves represented on the outside are arranged to rotate. The manner in which the luminous ray is split up is indicated on cardboard discs.

54,687. **Model shewing the passage of converging polarised Light through a Calc-spar Plate cut perpendicular to the optical axis,** after Grimsehl (Ztschr. f. d. phys. u. chem. U. **18**, 1905, p. 328, Fig. 8), for explaining **colour formation** and the **Calc-spar Cross** . . . 3. 0. 0

It is possible to show that a calc-spar plate, cut perpendicular to the optical axis, and inserted in a polarised pencil of light has no influence whatever on the nature of the polarised light in a vertical and horizontal plane, while with an incident angle of 45° those portions of the light are extinguished (in the case of parallel polarisers) in which the phase displacement amounts to $^1/_2$ wave length; on the other hand, however, those luminous rays in which the phase displacement amounts to one-quarter or a whole wave length pass through without interference.

54,688. **Model showing Polarisation in double-refracting Substances,** after Grimsehl, with indication of the three main directions which are important for the formation of the **Calc-spar Cross** (Ztschr. f. d. phys. u. chem. U., **18**, 1905, p. 330, Fig. 9) 2. 2. 0

In this model the three principal rays are simultaneously available so that no alteration needs to be made to the apparatus during the explanation.

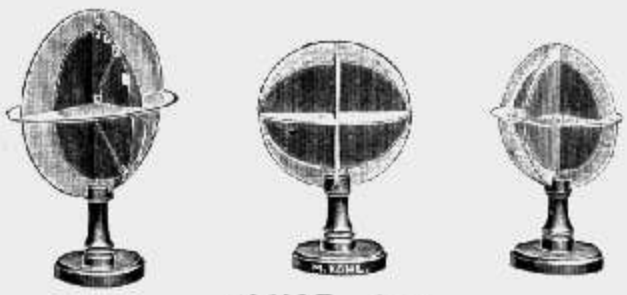
Max Kohl A. G. Chemnitz, Germany.



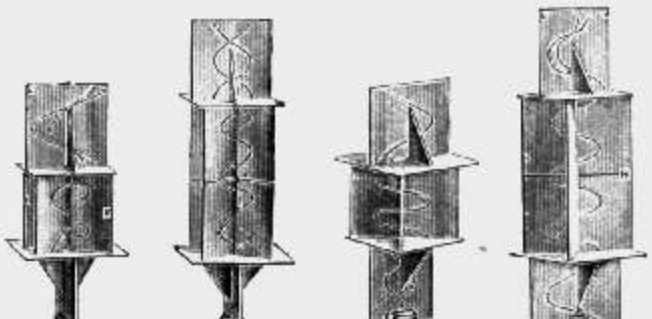
54 681. 1 : 3.



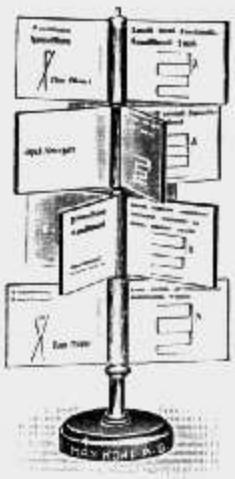
54 689 A. 1 : 5.



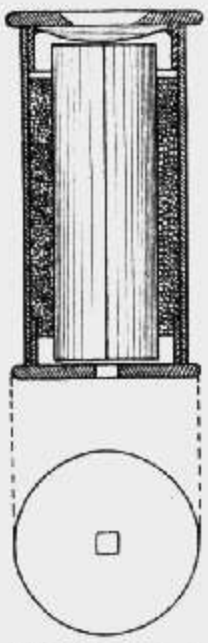
54 689 B. 1 : 5.



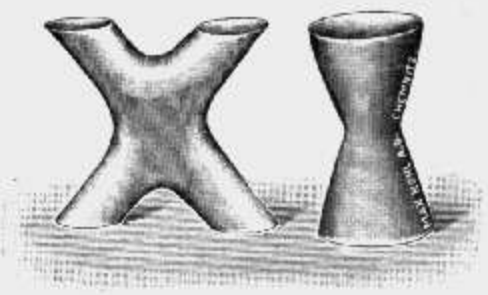
54 689 C. 1 : 5.



54 692. 1 : 8.



54 700 B. 1 : 1.



54 690. 1 : 7.



54 693. 1 : 2.



54 700 A. 1 : 1.



54 701. 1 : 5.

54,689. **10 Pasteboard Models,** after J. Müller, Figs. A, B and C, for explaining the **Ring Systems** in uniaxial and biaxial Crystals, after Fresnel (M. P. II, 1, Fig. 724, 725, 736—740 [658, 702, 703, 717, 718, 719, 720, 729]), with two stands in boxes . . . . . £ 1.16.0

54,690. **2 Plaster Models** for the isochromatic wave-surfaces, Figure, after Bertin . . . £ 0.12.0

54,691. **2 Wood Prisms** (can be taken to pieces) with Drawings on cardboard and Ellipsoids after Pfaundler, for deriving the phenomena in uniaxial, negative crystals from the wave-area by means of the **Huyghenian construction** (M. P. II, 1, Figs. 726—734 [704—707, 709, 711—713, 715]) . . . . . £ 1.10.0

54,692. **Model of the Vibration Planes of the Light** in the Polarisation Apparatus, Figure, after Prof. Triepel, Breslau, with description . . . . . £ 1. 4.0

54,693. **Glass Plate with Letters and Calc-spar Plate,** Figure, for showing double refraction (Gan.-Man., Fig. 420) . . . . . £ 0.16.0

Double Refracting Prisms, of Calc-spar, achromatised by a glass prism (M. P. II, 1, Fig. 696 [674]).

List No.	54,694	54,695	54,696	54,697	54,698
Aperture mm	10	15	20	25	30
£	**0. 10. 0**	**0. 16. 0**	**1. 2. 0**	**1. 15. 0**	**2. 5. 0**

Triple achromatised prisms are double the price of above.

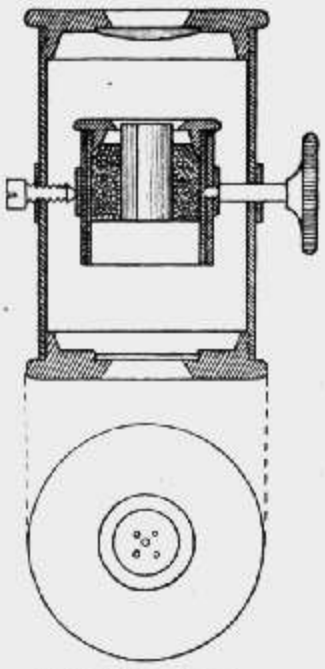
54,699. **Fresnel's Prism,** consisting of three quartz prisms of reverse rotation, for showing circular double refraction (M. P., 9th Edn., II, 1, Fig. 835) . . . . . £ 3. 0.0

54,700. **Dichroscopic Magnifier** after Haidinger, Figs. A and B . . . . . £ 0.16.0

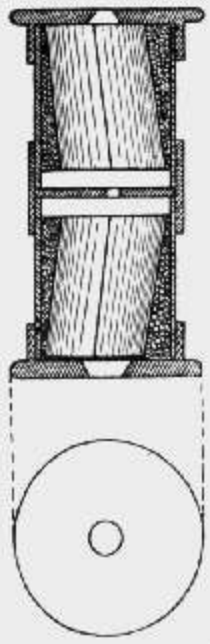
54,701. **Polarisation Polyoscope** after Dove, Figure . . . . . £ 1.16.0



54 702 A. 4 : 5.



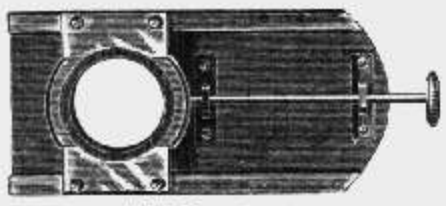
54 702 B. 4 : 5.



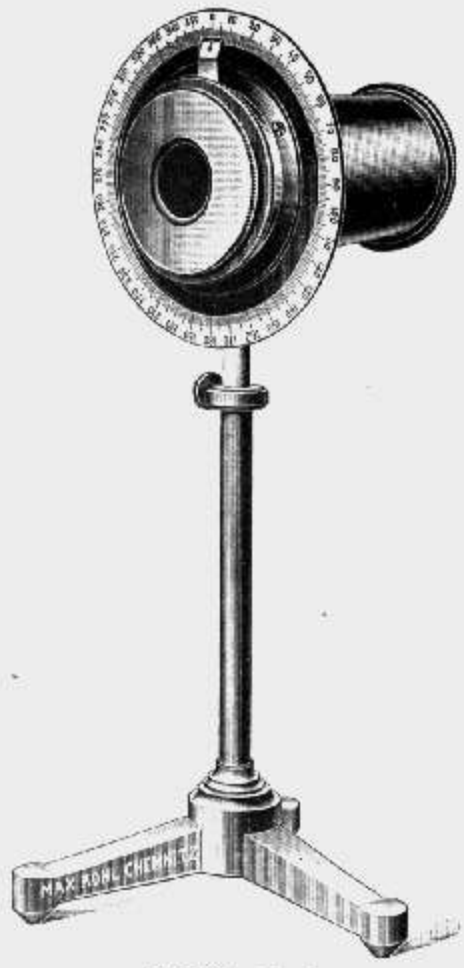
54 703 B. 2 : 3.



54 703 A. 2 : 3.



54 703. 1 : 4.



54 754. 1 : 5.

Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
54,539. **Analyser** after Delezenne, with two small parallel mirrors, in brass mount, Fig. 54,539, p. 546	1. 8. 0
53,747. **Kaleidoscope** for polarised light, Fig. 53,747, p. 476, with black mirror, Nicol prism and gypsum objects	3. 0. 0
54,702. **Hamilton's (or Lloyd's) Apparatus,** Figs. A and B, for subjective observation of conic refraction	1.10. 0
54,703. **Apparatus** after Beer, Figs. A and B, for demonstrating double refraction, with two rotary rhombohedra and diaphragms	2. 0. 0
* 54,641. **Glass Press,** with two glasses, for showing that glass becomes double refracting by the application of **pressure** (M. P. II, 2, Fig. 797 [II, 1, 790]), see Fig. 54,641, p. 558	1. 2. 0
* 54,642. **Fresnel's Press** for showing that pressure renders glass double refracting (M. P. II, 1, Fig. 753 [734])	2.15. 0
* 54,643. **Press for bending Glass,** with two glass strips (M. P. II, 2, Fig. 796 [II, 1, 789]) .	1. 2. 0
* 54,654. **8 rapidly annealed Glasses** of different shapes, see Fig. 54,654, p. 560 . . . . . Nos. 1, 2, 3 and 4 cost singly £ **0. 5. 0** each; No. 5, £ **0. 8. 0**; and Nos. 6, 7 and 8, £ **0. 12. 0** each.	2.10. 0
* 54,655. **2 crossed annealed Glasses,** consisting of 2 single glasses mounted in cork, see Fig. 54,655, p. 560 . . . . . These glasses show hyperbolæ.	0.10. 0
54,704. **4 Coloured Plates,** after Brezina, on interference phenomena in crystal plates, with text . . . . . together Plate 1 shows a uniaxial crystal, ruby; plate 2 circular-polarising quartz; plates 3 and 4 a biaxial prismatic crystal ground perpendicular to optical centre line, in cross and hyperbola position (Cerussite).	0.16. 0

Gypsum and Mica Preparations.

54,705. **Gypsum Wedge,** 45 mm long, 1st to 2nd order	0.15. 0
54,706. — 1st to 3nd order	0.12. 0
54,707. — 1st to 5th order	0.10. 0
54.708. **Convex and Concave Gypsum Plates,** Figure, in mount; can be rotated over each by means of rack and pinion for varying the colour ring	2. 0. 0

* Can be used with the Projection Apparatus.

54,709. **Gypsum Plates** of $^1/_4$, $^3/_4$, $^9/_4$ wave length; thirteen different wave retardations can be produced with the same by alternating them; in round pasteboard mounts . . . . . £ s. d. 0. 15. 0

Gypsum Figures, appearing in the different colours in polarised light.

List No.	54,710	54,711	54,712	54,713	54,714
	4 different-coloured Lamellæ	Cube	Octahedron	Star	Butterfly
£	**0. 5. 0**	**0. 6. 0**	**0. 7. 0**	**0. 10. 0**	**0. 18. 0**

List No.	54,715	54,716
	Flower	Bouquet
£	**1. 0. 0**	**1. 16. 0**

54,717. **Double Plate** after Bravais 0. 10. 0

54,718. **Small Gypsum Plate** between two $^1/_4$ mica plates, aperture 40 mm 0. 8. 0

54,719. — idem, after von Mohl, collection of 8, comprising 4 gypsum plates, read first to fourth order, and 4 small mica plates of $^1/_8$—$^1/_2$ wave-length 30 mm diameter . . 0. 12. 0

54,720. **Single Gypsum Plate,** in 1st order colours 0. 3. 0

54,721. — in colours of higher order 0. 3. 0

54,722. **Quarter-wave Mica Plate,** for investigating the character of double refraction in uniaxial crystals, large and rectangular 0. 4. 0

54,723. **Gypsum and Mica Combination,** after Wright, giving the most beautiful phenomena, collection of 6 . . . . . 1. 4. 0
These preparations are only suitable for Polarisation Apparatus No. 54,618.

54,724. **Mica Combinations** after Nörrenberg, for shewing how uniaxial mica is formed out of biaxial, collection of 6 pieces 1. 4. 0

54,725. — in a preparation with mica segments crossed at right angles 1. 6. 0

54,726. **Uniaxial circular-polarising Mica Combinations** after Reusch, left and right rotating, crossed at an angle of 60° . . . . . Per pair 1. 4. 0

Max Kohl A. G. Chemnitz, Germany.

Calc-spar Preparations.

54,693. **Calc-spar Plate and Glass Plate with lettering,** see Fig. 54,693, p. 563 . . . . . 0. 16. 0

54,728. **Calc-spar Prism** for demonstrating decomposition and simultaneous double-refraction, showing two spectra (W. D. p. 452) 1. 0. 0

Nicol Prisms, with oblique end surfaces:

List No.	54,729	54,730	54,731	54,732	54,733	54,734	54,735	54,736
Side mm	4	5	6	7	8	9	10	11
£	**0. 4. 0**	**0. 5. 0**	**0. 6. 0**	**0. 7. 0**	**0. 8. 0**	**0. 9. 0**	**0. 10. 0**	**0. 12. 0**

List No.	54,737	54,738	54,739	54,740	54,741	54,742	54,743
Side mm	12	13	14	15	16	18	20
£	**0. 14. 0**	**0. 16. 0**	**1. 0. 0**	**1. 4. 0**	**1. 10. 0**	**2—2. 10. 0**	**3—3. 10. 0**

The length of the prisms is about $2^1/_2$ times the length of side. Prices for larger Nicols quoted on application.

Glan-Thompson Prisms, with perpendicular end surfaces:

List No.	54,744	54,745	54,746	54,747	54,748	54,749	54,750	54,751	54,752	54,753
Length mm	15	18	20	22	24	26	28	30	35	40
£	**0. 10. 0**	**0. 14. 0**	**0. 18. 0**	**1. 4. 0**	**1. 12. 0**	**2. 0. 0**	**2. 10. 0**	**3. 5. 0**	**5. 10. 0**	**8. 0. 0**

The width is approximately **half the length** of the prism. The prices for prisms above 24 mm length fluctuate.

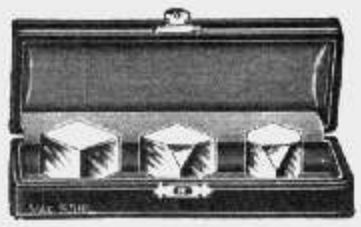
Mounts for Nicol Prisms with divided circle on stand, Figure.

List No.	54,754	54,755
For Nicols to	20	35 mm
£	**2. 0. 0**	**2. 10. 0**

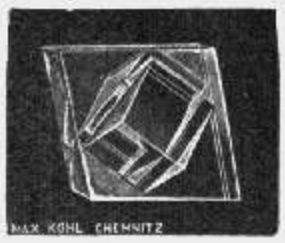
54,756. **Sénarmont's Prism,** made up of two calc-spar prisms (M. P. II, 1, Fig. 711 [689]). Prices according to size . . . . . £ **1. 4. 0** to 2. 0. 0

Foucault Prisms (M. P. II, 1, Fig. 717 [695]), without cement, with air stratum:

List No.	54,757	54,758	54,759
Side mm	20	25	30
£	**1. 10. 0**	**2. 10. 0**	**3. 15. 0**



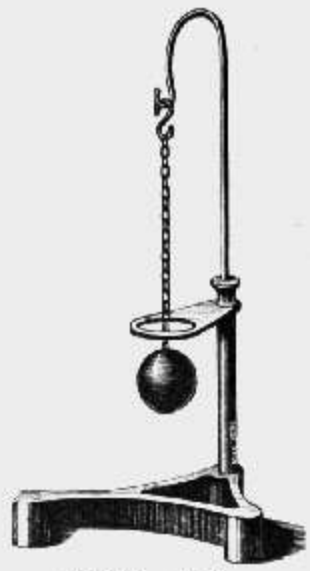
54765. 1 : 4.



54776. 1 : 2.



54777. 1 : 3.



54785. 1 : 5.

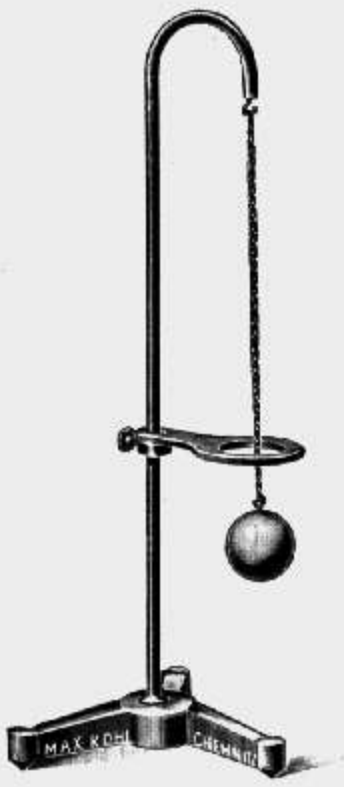
	£ s. d.
Glan's Prisms (M. P. II, 1, Fig. 854 [1018]), with air stratum, without cement, optical axis parallel to refracting edge, end surfaces perpendicular to direction of rays:	
List No. **54,760** **54,761** **54,762**	
Free Aperture 12 16 20 mm	
£ **1. 4. 0** **1. 16. 0** **3. 6. 0**	
54,763. **Wild's Double Plate**	0. 15. 0
54,764. **Calderon's Double Plate**	0. 12. 0
54,765. **Three Different Calc-spar Rhombohedra,** Figure, with 6, 8 and 10 polished surfaces, 20 mm side, in case	3. 0. 0
Rhombohedra with the 6 natural cleavage surfaces, all 6 surfaces polished:	
List No. **54,766** **54,767** **54,768**	
Side mm 20 25 27	
£ **0. 16. 0** **1. 6. 0** **1. 15. 0**	
— idem, also having two surfaces (ground and polished) perpendicular to the axis (**8 polished surfaces**). List No. **54,769** **54,770** **54,771**	
Side mm 20 25 27	
£ **1. 0. 0** **1. 12. 0** **2. 5. 0**	
— idem, each having in addition two ground and polished surfaces perpendicular and parallel to the axis (**10 polished surfaces**).	
List No. **54,772** **54,773** **54,774**	
Side mm 20 25 27	
£ **1. 4. 0** **1. 16. 0** **2. 10. 0**	
54,775. **Calc-spar Cube,** ground perpendicular and parallel to the axis	0. 15. 0
54,776. **Calc-spar Plate between two Glass Prisms,** Figure, shewing from one side the ring system and from the other double-refraction	0. 15. 0
52,224. **Press** for producing the sliding surfaces in calc-spar and rock salt, after Reusch, with preparations	1. 5. 0
52,225. **Pressed and unpressed Preparations,** singly . . . . . £ **0. 2. 6** to	0. 4. 0
52,226. **Press** after Baumhauer, for producing calc-spar doublets	1. 4. 0
54,777. **2 Large Calc-spar Rhombohedra** on stands, Figure, in mount, rotary, approx. 25 mm side, for demonstrating all phenomena of double-refraction and polarisation peculiar to calc-spar	6. 0. 0

Quartz Preparations.

Quartz and Rock Crystal Prisms: see Nos. 53,975—53,986.	
Quartz Lenses, bi-convex, perpendicular to axis, in two different radii of curvature, 300 or 150 mm, first quality:	
List No. **54,778** **54,779** **54,780** **54,781** **54,782**	
Diameter mm 40 45 50 60 70	
£ **0. 15. 0** **1. 0. 0** **1. 5. 0** **1. 10. 0** **2. 0. 0**	
54,783. **Double Plate,** of right and left rotating quartz	0. 12. 0
54,784. **Bertrand's quadruple Quartz Plate**	1. 4. 0

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



54 786. 1 : 10



54 788. 1 : 3.



54 789. 1 : 3.



54 787. 1 : 6.



54 791. 1 : 10.

Heat.

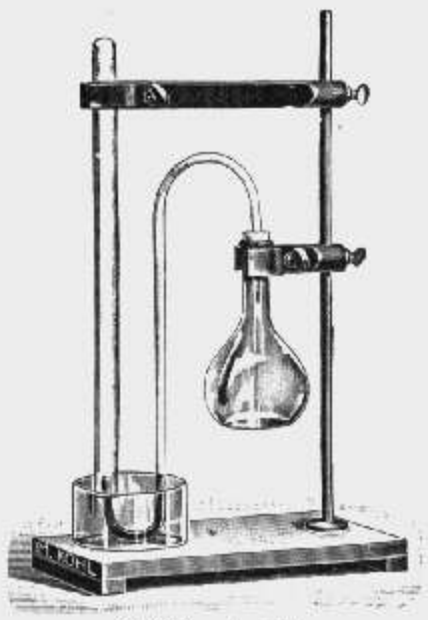
General. Thermal Expansion.

	£ s. d.
52,146. **Molecule Model** after Körner Fig. 54 216, p. 301, for explaining heat and its generation by impact or friction (Fr. Phys. Techn. 1, 2, Fig. 3899)	1. 10. 0
54,785. **Brass Sphere with Ring,** after S'Gravesande, Figure, for showing the **expansion of solids** by heat and **contraction** by cooling (W. D. Fig. 324 [306]), diameter of sphere **24 mm**	0. 5. 0
54,786. — idem, **larger,** Figure, with sphere **75 mm** diameter	1. 8. 0
54,787. **Brass Sphere on stem,** Figure, with small tripod having a circular opening, for the same experiment	0. 8. 0
* 54,788. **Glass Sphere with tube closed at top, for showing the expansion of liquids,** Figure, filled with coloured petroleum (W. D. Fig. 326 [308])	0. 1. 8
* 54,789. **Glass Sphere with Capillary Tube open at top,** Figure (Gan.-Man. Fig. 462; Gan.-Rein. Fig. 300)	0. 1. 8
* 54,790. — idem, **without filling,** for use for demonstrating expansion of air when a mercury thread is introduced (Gan.-Man. Fig. 463; Gan.-Rein. Fig. 301)	0. 1. 8
54,791. **Square formed of Tubes,** with two open limbs, Figure, for the expansion of liquids	0. 3. 0
If the square of tubes is nearly filled with coloured water and one limb heated by a spirit lamp the water rises in this limb.	
54,792. **Air Thermoscope** after Galilei (M. P., 10th Edn., III, p. 6; Meyer, Naturlehre, Fig. 11)	0. 2. 8

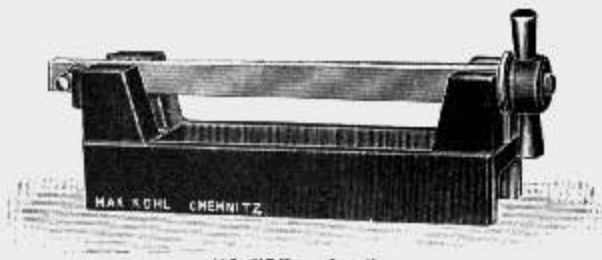
* Can be used with the Projection Apparatus.



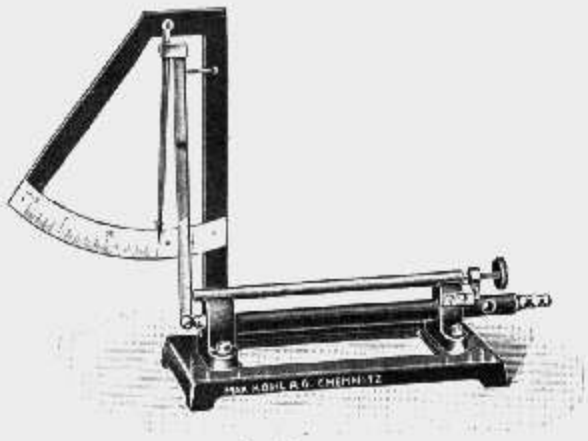
54 793. 1 : 10.



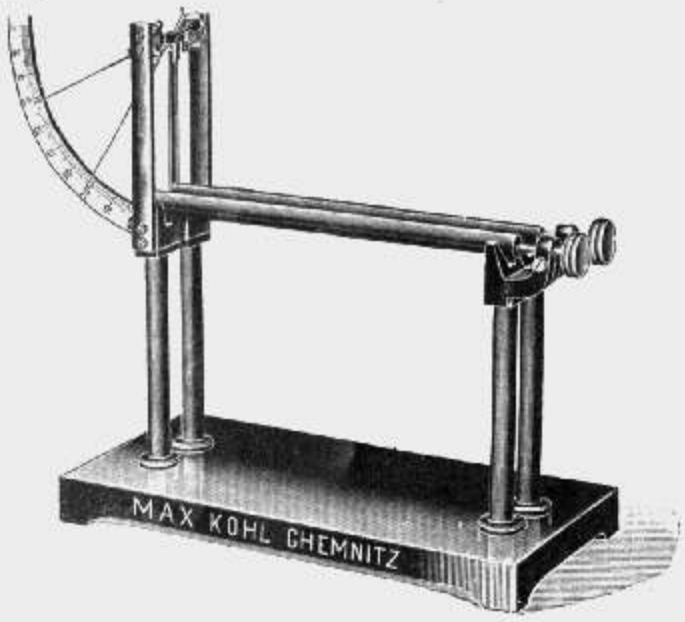
54 794. 1 : 10.



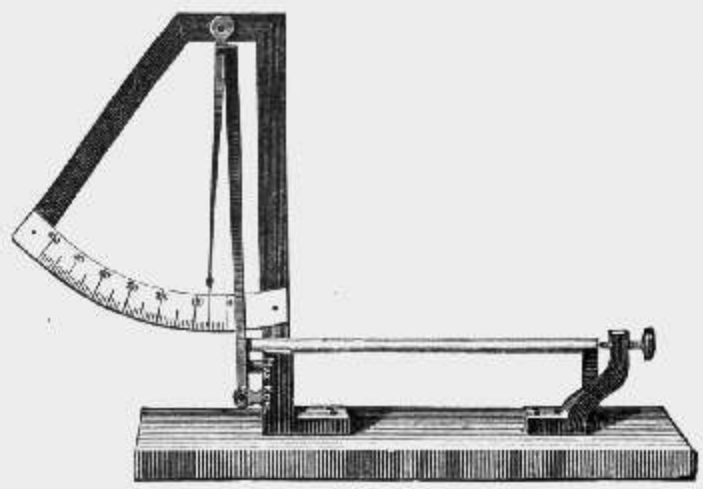
54 795. 1 : 8.



54 799. 1 : 8.



54 802. 1 : 5.



54 800. 1 : 8.

54,793. **Thermoscope** after Drebbel, **for showing the expansion of gases,** Figure, consisting of a bulb, with tube attached, the former half-filled with a liquid, length of tube 75 cm, with graduation (Fr. Phys. Techn. I, 2, Fig. 2848) . . . . . £ 0. 10. 0

54,794. **Tyndall's Apparatus for showing the Expansion of Gases,** Figure (Tyndall, Die Wärme. Fig. 43, 1894) 1. 0. 0

From the boiling flask, filled with air, a small tube leads into a wider, shortened barometer tube (to be filled with coloured water) clamped on the same stand. If the air in the flask is heated it expands and rises in bubbles into the barometer tube.

54,795. **Contraction Apparatus** after Tyndall, Figure, for demonstrating expansion by heating and elementary force on contraction by cooling (M. P. II, Figs. 34 and 35 [II, 2, Figs. 32 and 33]), **with 12 cast-iron rods** 0. 14. 0

A 9 mm thick cast-iron rod is fractured by the contraction of a thick square-section rod after heating. For Bunsen Burners and Heating Stand, see following items.

54,796. **4 Bunsen Burners,** arranged in a row, for heating the iron bar 0. 14. 0

54,796 a. **Simple Stand** on which to set the iron bar while heating, together with wire stirrup for supporting the bar 0. 4. 0

54,797. **Contraction Apparatus** with Fletcher Burner, for use without heating stand . . . 1. 0. 0

54,798. **Contraction Apparatus** after Tyndall, as No. 54,795, but **double the size** 1. 16. 0

54,799. **Pyrometer.** Figure (Fr. phys. Techn. I, 2, Fig. 2990 [I, Fig. 337]), for demonstrating **linear expansion,** with three bars of brass, iron and zinc; with gas burner, graduation in $^1/_{100}$ mm (Gan.-Man. Fig. 460; Gan.-Rein. Fig. 298) 1. 8. 0

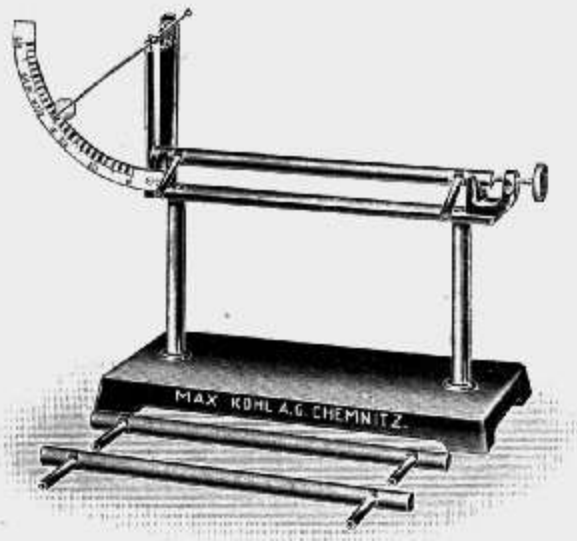
54,800. — idem, Figure, **with Spirit Burner** 1. 8. 0

54,801. **3 Bars** for Nos. 54,799 and 54,800, of **Copper, German Silver,** and **Aluminium** . . 0. 3. 0

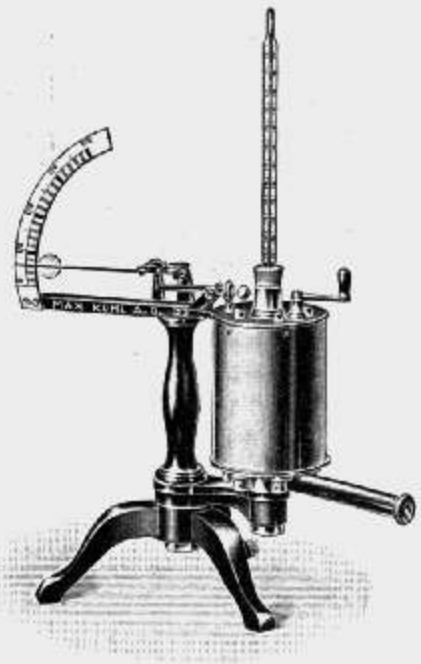
Cl. 5124, 5772, 1664, 5413, 1667[1], 1667.

Compensating Pendulums: see Nos. 51,695/7 and 51,703.

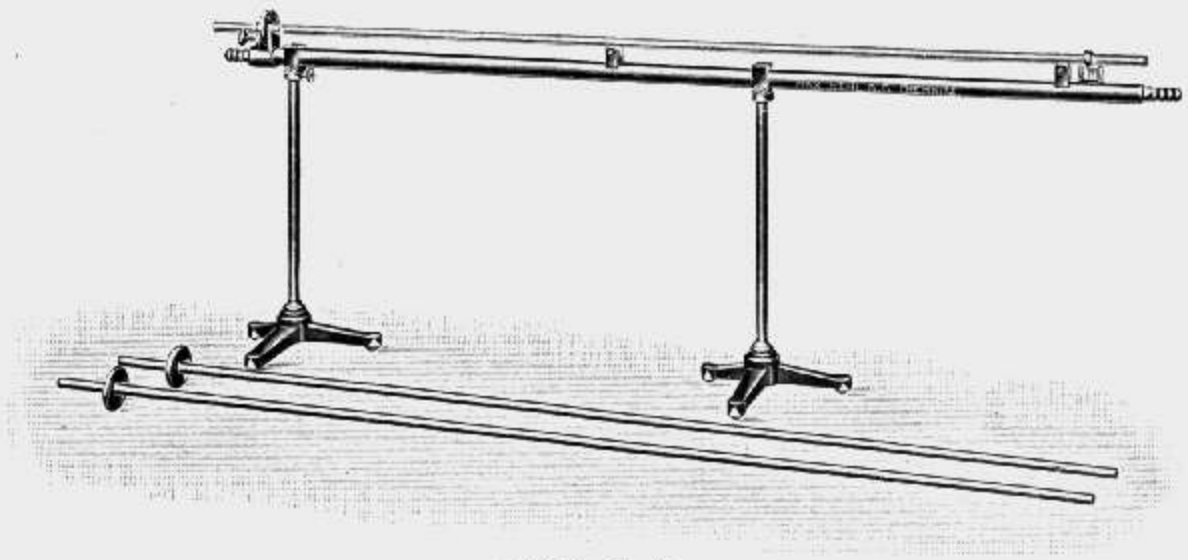
Max Kohl A. G. Chemnitz, Germany.



54 803. 1 : 6.



54 805. 1 : 6.



54 806. 1 : 11.

54,802. **Pyrometer with 2 Pointers,** Figure, for comparing the expansion of two bars of iron and zinc . . . . . £ 2. 10. 0

54,803. **Pyrometer,** steam heated, Figure, with tubes of brass, copper and iron . . . £ 1. 16. 0

51,285. **Small Weinhold Steam Boiler,** Fig. 51,285, p. 213 (W. D. Fig. 49 [45]), for producing steam at boiling temperature and higher, of sheet brass . . . . . £ 0. 16. 0

54,804. — idem, with tripod . . . . . £ 1. 3. 0

54,805. **Drum Pyrometer,** Figure, with thermometer and spirit lamp (Fr. phys. Techn. I, 2, Fig. 2994) . . . . . £ 5. 10. 0

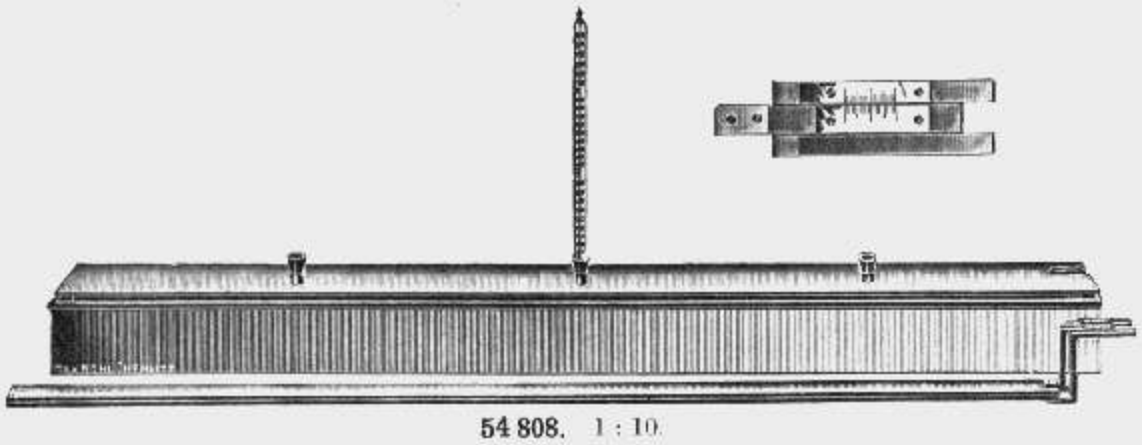
The six bars of copper, brass, iron, zinc, aluminium and German silver respectively, contained in a water bath, can be successively rotated under a "feeler lever". The bars are adjustable by micrometer screws. The indicating mechanism is very sensitive, the scale permitting of reading direct to $^1/_{100}$ mm. The box has a lateral copper tube for heating and a stirring device.

* 54,806. **Apparatus for measuring the linear Expansion of Rigid Bodies,** after Weinhold, Figure (W. D. Fig. 334 [315]), for objective demonstration, with three tubes of brass, iron, and glass respectively, the tubes heated by steam direct reading on glass scale . . . . . £ 2. 10. 0

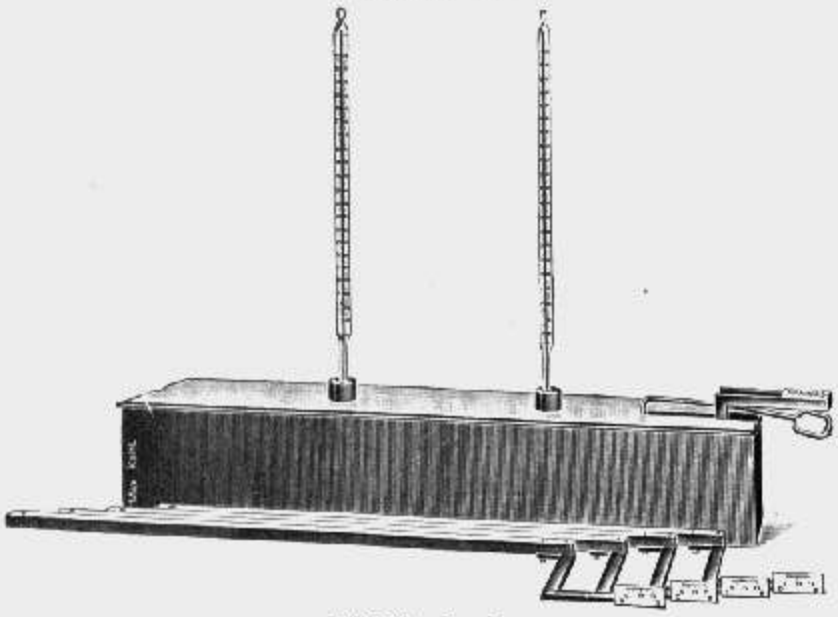
53,195. **Drawn Brass Tube,** after Rebenstorff, for **thermal expansion** in large dimensions (Ztschr. f. d. phys. u. chem. U. **20**, 1907, p. 248), also for conserving the acoustic intensity without lateral expansion (Ztschr. f. d. phys. u. chem. U. **19**, 1906, p. 279); total length 4 m, 20 mm wide, in two parts, for steam-heating in the heat experiment . . . . . £ 0. 10. 0

* Can be used with the Projection Apparatus.

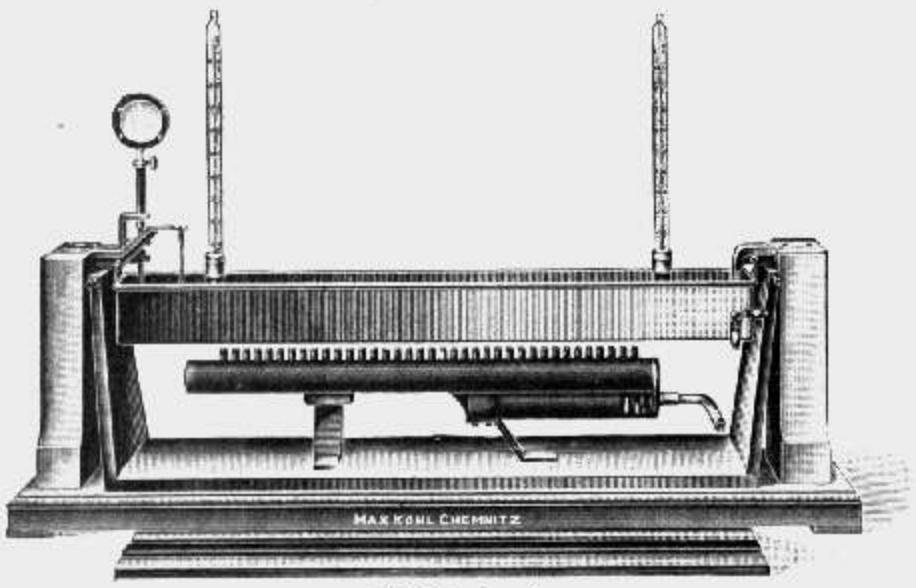
Cl. 6143, 6141, 6178.



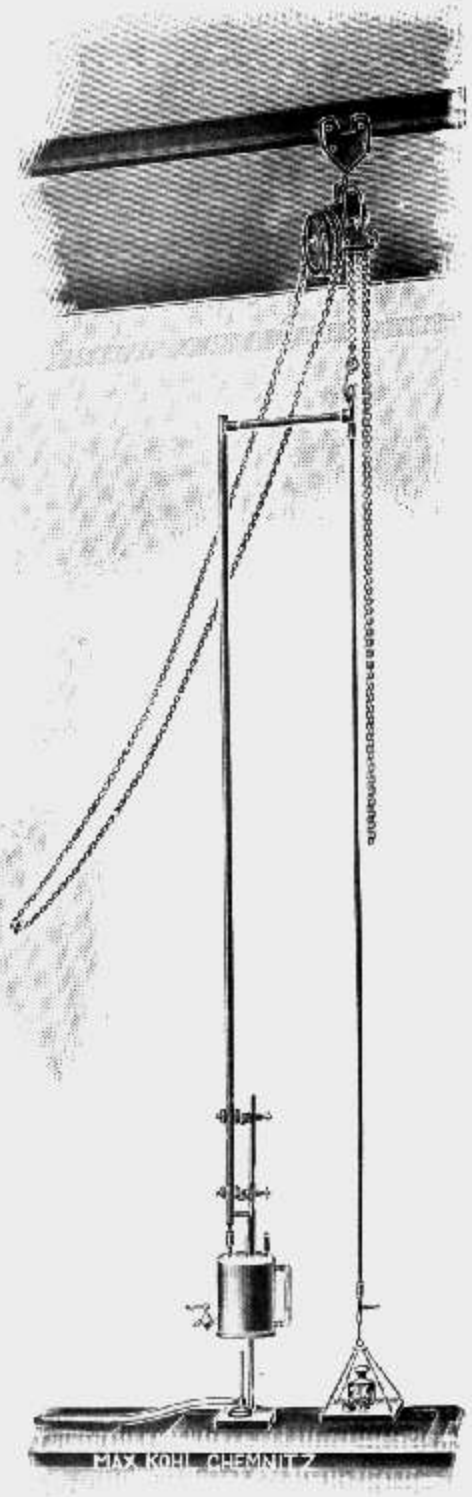
54 808. 1 : 10.



54 809. 1 : 8.



54 810. 1 : 6.



54 812. 1 : 20.

54,807. **Tube Expansion Apparatus** after Friedr. C. G. Müller (M. T. Figs. 101 and 102), suitable for observations at great distances . . . . . £ 3. 12. 0

54,808. **Apparatus for the Linear Expansion of Steel and Zinc** after Borda (Dulong and Petit), by the differential method, Figure, with two bars 120 cm long, 25 mm wide, and 4 mm thick (M. P. III, Fig. 32 [II, 2, Fig. 30]) 3. 12. 0

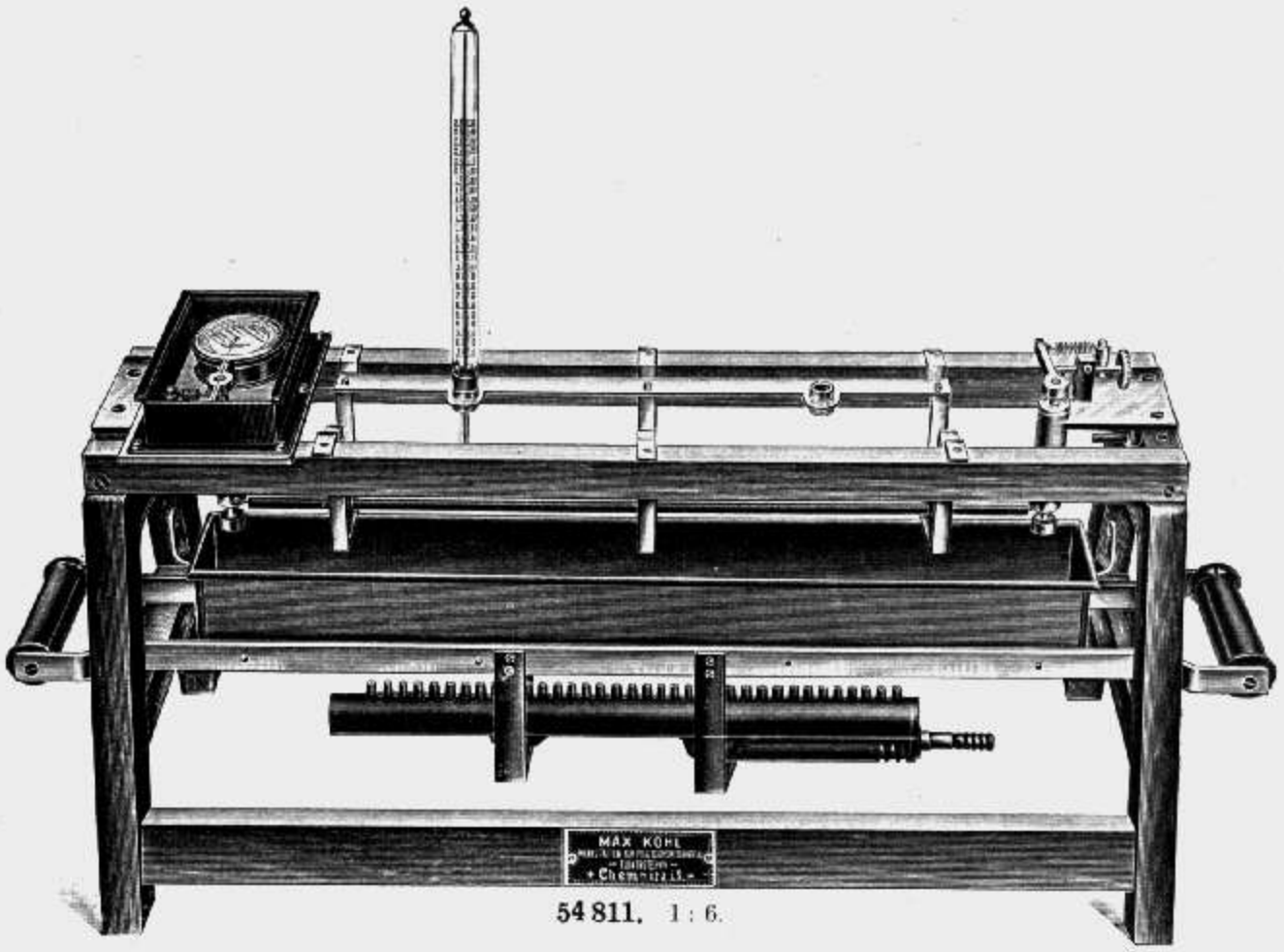
54,809. — idem, **smaller,** with 6 bars of iron, brass, copper, zinc, aluminium, and German Silver, Figure, with **two thermometers** to + 240° C. and **Stirrer** 6. 0. 0

The apparatus consists of a copper box in which the bars to be compared rest on fillets. These bars are pierced at one end so as to enable them to be firmly connected by a bolt; at their free ends they carry rectangular attachments allowing them to project out of the bath as shown in the Figure. On the upper sides of these angle pieces are placed graduations. Accurate reading with a vernier can be made since the comparison bar (of iron) has a millimetre graduation 20 mm long and the bars to be compared are scaled 19 m long with 20 divisions.

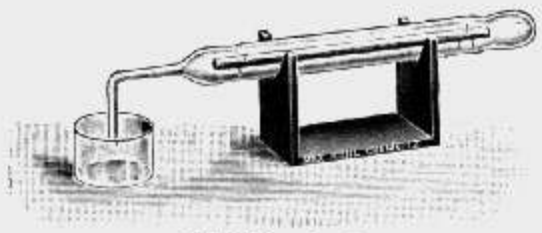
Cl. 1673, 1674, 3411, 1677.

Max Kohl A. G. Chemnitz, Germany.

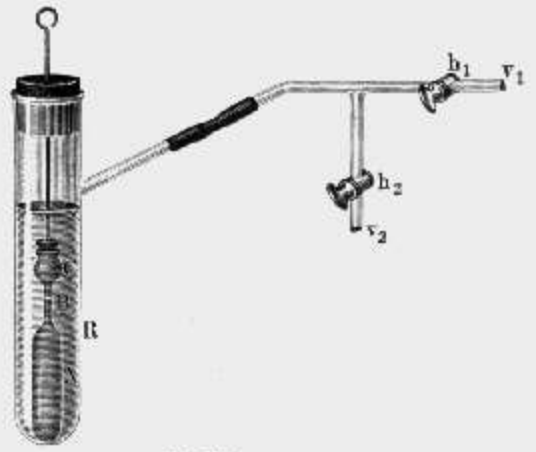
Max Kohl A. G. Chemnitz, Germany.



54 811. 1 : 6.



54 813. 1 : 6.



54 814. 1 : 6.

54,810. **Apparatus for determining the Linear Expansion Coefficient of Bars,** after Lavoisier and Laplace, for mirror reading. Figure. with heating apparatus and water jacket, with inlet and outlet for cooling the frame (W. u. E. phys. Prakt., Fig. 91; M. P., 9th Edn., II, 2, Figs. 28 and 29) . . . . . £ s. d. 7. 10. 0

Given in as test pieces are bars, 0.5 m long, of copper, iron, glass, and ebonite (the latter resting on a somewhat shorter glass rod).

54,811. — idem, **with Micrometer Reading,** Figure, with heating apparatus, copper bath and one thermometer to 250° C. 12. 0. 0

The apparatus is easy to manipulate. The alterations in length are read off on the micrometer direct to 0.01 mm. We supply as test pieces rods, 0.5 m long, of iron, copper, zinc, brass, glass, and aluminium.

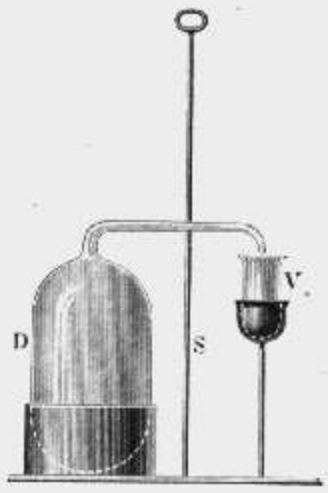
54,812. **Apparatus for shewing the Contraction of an expanded Rubber Tube by Heat,** Figure (W. D., Figs. 335, 336 B [316, 317 B]), comprising rubber tubing with hooks at the ends, balance pan, and steam conduit pipe 1. 6. 0

The accessories illustrated, i. e., steam boiler with stand, tackle, and weights, are not included in the price. Price of **Boiler** and **Stand £ 1. 13. 6; Balance Pan** No. 52,216, **£ 0. 6. 0.**

54,813. **Dilatometer,** Figure (Chwolson, Lehrb. d. Phys., Vol. III, Fig. 39), for determining the cubical expansion coefficient of solids, with iron bar 100 g weight . . . 0. [illegible]. 0

54,814. **Weight Dilatometer,** Figure, for determining the cubical expansion coefficient of liquids and glass (W. u. E. phys. Prakt., Fig. 92) . . . . . 4. [illegible].0

Cl. 1676 [illegible]
3963, 4647 [illegible]18, 1724.



54 815. 1 : 2.



54 816. 1 : 5.



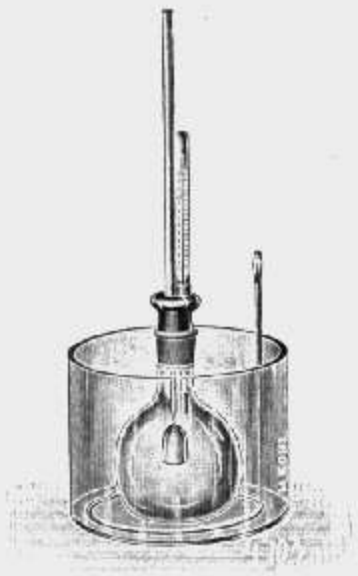
54 817. 1 : 3.



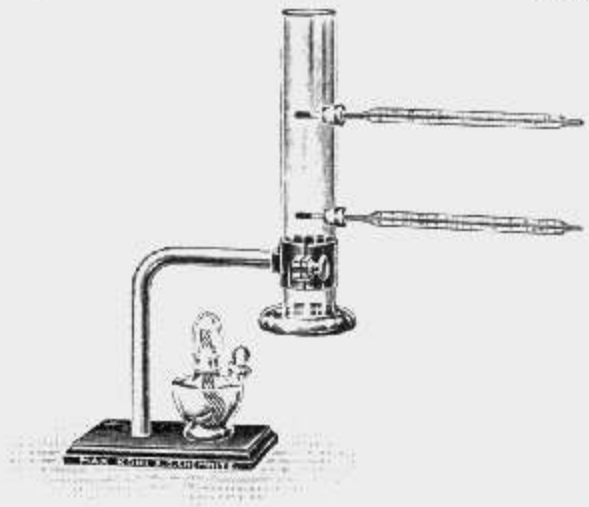
54 819. 1 : 3.



54 821. 1 : 7.



54 822. 1 : 5.



54 823. 1 : 7.

54,815. **Weight Dilatometer** (Weight Thermometer), Figure, for the same purpose, with stand and receiving vessel (W. u. E. phys. Prakt., Fig. 93; cf. Chwolson, Physik, pp. 58 and 95) . . . . . £ 0.16.0

The vessel D is filled with mercury by the aid of the air pump by plunging it completely in a second vessel containing mercury. When heated in an air bath the mercury passes into the vessel V.

54,816. — idem, without stand or catching vessel, Figure (M. P. III, Fig. 50 [II, 2, Fig. 48]), without mercury 0. 3.0

54,817. — idem, with straight outflow tube and ground-on cap, Figure (M. P. III, Fig. 51 [II, 2, Fig. 49]), without mercury 0. 5.0

54,818. **3 Expansion Flasks** with very plain graduation on neck, 100 ccm (M. T., Fig. 103) 0. 4.0

* 54,819. **Projection Water Dilatometer,** Figure, simply and conveniently arranged (Fr. phys. Techn. I, 2, Fig. 3041) 0. 7.0

54,820. **Compensated Water Dilatometer** after Noack (M. T., p. 145; Ztschr. f. d. phys. u. chem. U. 2, 1889, p. 159); the expansion of the vessel is compensated by **mercury;** with stirring device acting by blowing air in 2. 0.0

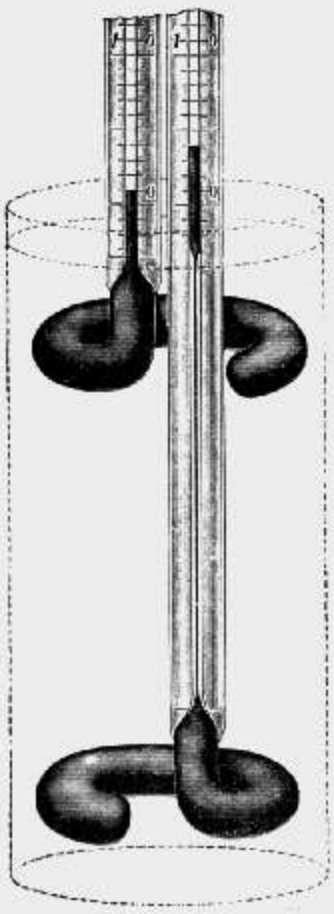
54,821. — idem, after Poske, Figure (Höfler-Poske, Oberstufe, Fig. 283 and p. 893; Ztschr. f. d. phys. u. chem. U. 2. 1888, p. 12) 1. 5.0

54,822. — idem, after Grimsehl-Rebenstorff, Figure (Ztschr. f. d. phys. u. chem. U. 8, 1905, p. 92), with stirrer. The expansion of the glass vessel is compensated by a corresponding quantity of air 0.18.0

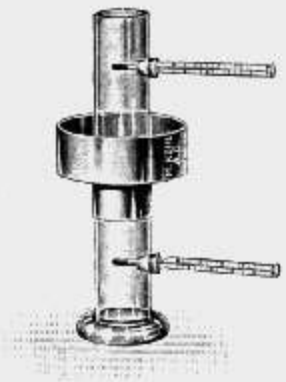
be used with the Projection Apparatus.

Cl. 6110, 1680, 6111, 6193, 5715, 4703, 6142.

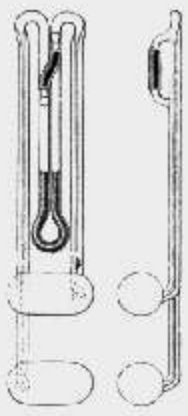
Max Kohl A. G. Chemnitz, Germany.



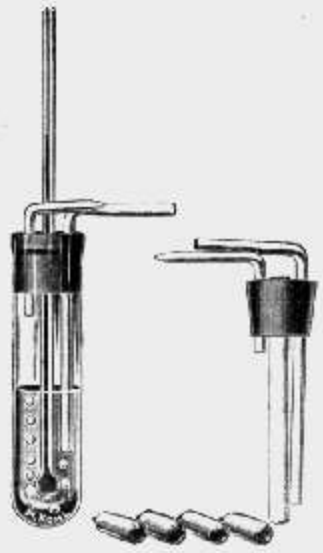
54 825. 1 : 3.



54 824. 1 : 7.



54 826. 1 : 8.



54 827. 1 : 5.



52 549. 1 : 5.

Max Kohl A. G. Chemnitz, Germany.

54,823. **Glass Cylinder with Heating Device,** Figure. (1) for investigating the stratification of liquid masses in accordance with their specific gravity; (2) the circulation of water, in which the thermometer shows a lower temperature in spite of its proximity to the thermal source; (3) convection of water. With two thermometers . . . . . £ s. d. 1. 4. 0

54,824. **Glass Cylinder with Cooling Ring,** after Hope, Figure, for investigating the **stratification of aqueous masses** according to their specific gravity and for determining **maximum density** (Gan.-Man., Fig. 478; Gan.-Rein., Fig. 323), for cooling by ice . . 0. 16. 0

54,825. **2 Thermometers with annular, horizontally arranged Vessels,** after Weinhold, Figure, for measuring the temperature-differences in different layers of water, particularly also for measuring the temperature in the lower aqueous layers of a vessel on reaching maximum density (W. D., 4th Edn., Fig. 339) 1. 5. 0

The attainment of maximum density is determined by the Looser or Kolbe Thermoscope (or in another manner, e. g. with Weinhold's Apparatus No. 54,826) and the temperature measured in the undermost and uppermost aqueous layers.

The thermometer intended for the lower aqueous layer has a capillary tube 20 cm long beetween vessel and scale in order that the readings of the instrument may not be appreciably influenced by the temperature of the upper aqueous layers. The thermometers are alcohol-filled, 1° = 5 mm length.

54,826. **Thermoscope** after Weinhold, Figure, for measuring the **maximum Density of Water** (W. D., 2nd Edn., p. 304) 0. 6. 0

* 54,827. **Apparatus** after Wais, Figure, for shewing the **Expansion Anomaly of Water** by cooling by means of ether evaporation; wide test tube with water thermoscope, inlet and outlet tube for gas or air blowing, and piece inserted having narrow test tube. Can be used with the Projection Apparatus (Ztschr. f. d. phys. u. chem. U. **13**, 1900, p. 219) 0. 8. 0

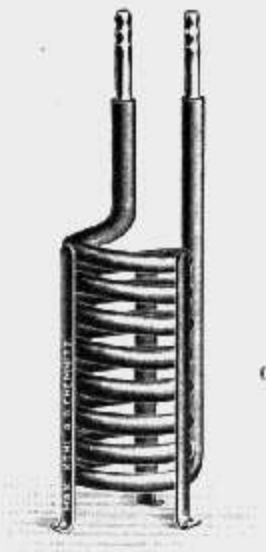
52,549. **Hydrometer, very sensitive,** Figure, for measuring the **Density of Water** at temperatures between 0° and 25° C. and for proving **Maximum Density;** large pattern . 0. 15. 0

Cold-water Floats: see Nos. 52,526 and 52,528, p. 345. . 0

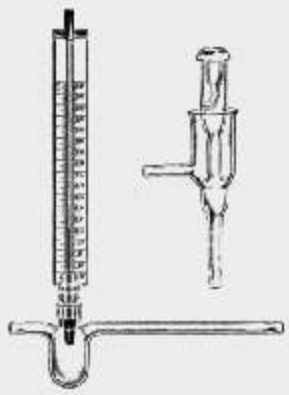
54,829. **Lantern Slide** of the curve of maximum density of water in relation to that of glass (W. D., Fig. 340 [320]) 4. 0

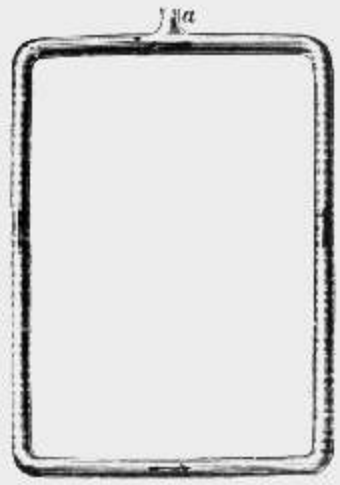
* Can be used with the Projection Apparatus.

Cl. 614, 3753, 1647, 45, 18, 1724.

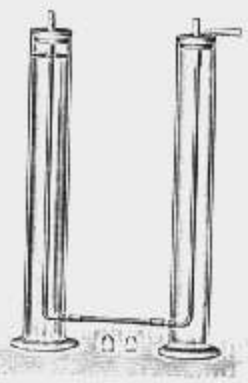


54 830. 1 : 4.

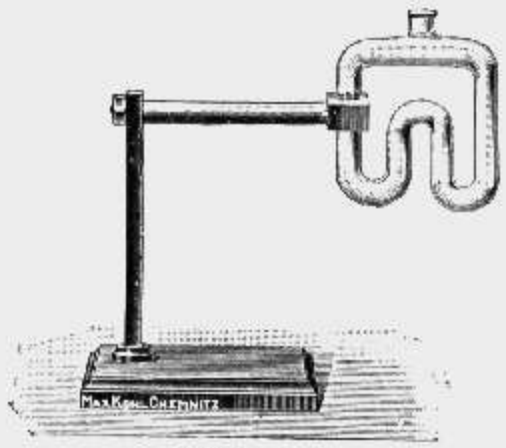




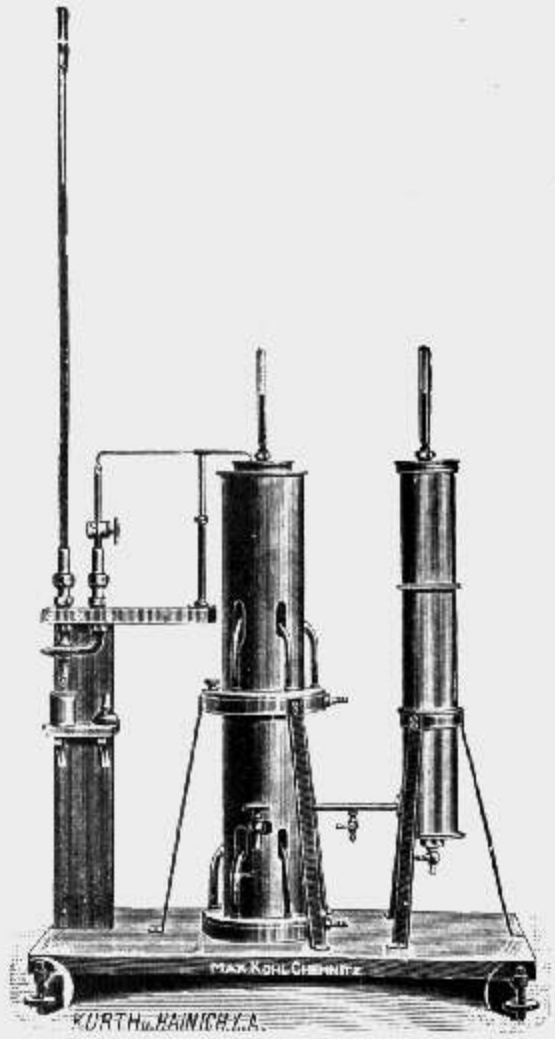
54 831. 1 : 8.



54 835. 1 : 12.



54 832. 1 : 5.



54 836. 1 : 15.

		£ s. d.
54,830.	**Apparatus** after Weinhold. Figure, for projecting the **phenomena of the freezing of water and melting of ice, also the behaviour of water on boiling** (W. D. Figs. 331—333 [312—314]), consisting of two glass apparatus, one lead pipe cooling coil and one projection thermometer	0. 14. 0
54,831.	**Glass Tube for showing the Circulation of Water,** Figure (W. D., Fig. 341 [321])	0. 4. 0
* 54,832.	— idem, small, for use with the Projection Lantern, on heating stand, Figure	0. 8. 0
54,833.	**Overflow Apparatus** after Schäffer, for showing the motion of unequally heated water, of glass, with stand (Bohn, Physikal. App. u. Versuche, No. 254; M. T. p. 145) . .	0. 18. 0
54,834.	**Hot Water Heating,** model of glass, on stand, after Schäffer (Bohn, Physikal. App. u. Versuche, No. 255; M. T. p. 145)	1. 10. 0
54,835.	**Apparatus for showing the Expansion of Mercury** by means of the Alteration in Level in communicating Tubes, Figure (W. D. Fig. 337 [318]), water-cooled; suitable for explaining the measurement of expansion coefficient after Dulong-Petit-Régnault . .	0. 18. 0
54,836.	— idem, after Dulong and Petit, Figure (M. P. III, Fig. 46 [II, 2, Fig. 44]; Gan.-Man., Fig. 477; Gan.-Rein., Fig. 328), with cathetometer . . . . . The determination of the expansion of mercury is made by showing the change in height in communicating tubes when one tube is cooled and the other heated. The mercury levels are read on the cathetometer; the temperature is determined in the heating vessel by means of an air thermometer having a long air vessel. Freezing temperature is maintained in the cooling vessel by melting ice. The communicating tubes are constructed of steel tubing, the ends being formed of glass tubes inserted in stuffing boxes. The heating vessel is of copper, being provided with a heating jacket. 12 Bunsen burners projecting into this jacket heat the oil bath very uniformly to 280° C. in 8—10 minutes. The cooling vessel is in three portions which can easily be screwed apart for cleaning. With the aid of a gas regulator it is possible to maintain the temperature uniform for a long time. The overall height of the apparatus is 1.6 m and breadth 1 m.	15. 0. 0
* 54,837.	**Apparatus** after Rühlmann, Figure, for showing the **Expansion of Gases at constant pressure,** for the Projection Lantern (W. D., Fig. 342 [322])	0. 12. 0
54,838.	**Apparatus for determining the Expansion Coefficient of Gases at constant pressure** (Gay-Lussac's Law), after Weinhold, Figure (W. D., 4.. Edn., Fig. 343) . . . . With this apparatus the value of the coefficient of expansion is obtained accurately to the 2nd nificant figure (4th decimal).	1. 16. 0

n be used with the Projection Apparatus.

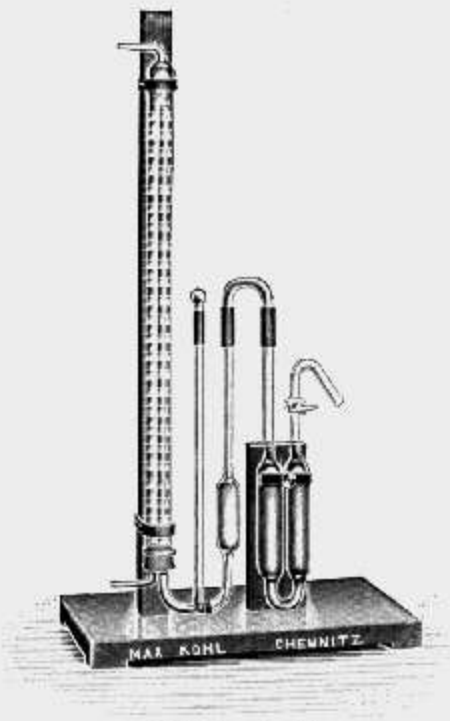
Cl. 6192, 1689, 5888, 360, 1692.

Max Kohl A. G. Chemnitz, Germany.

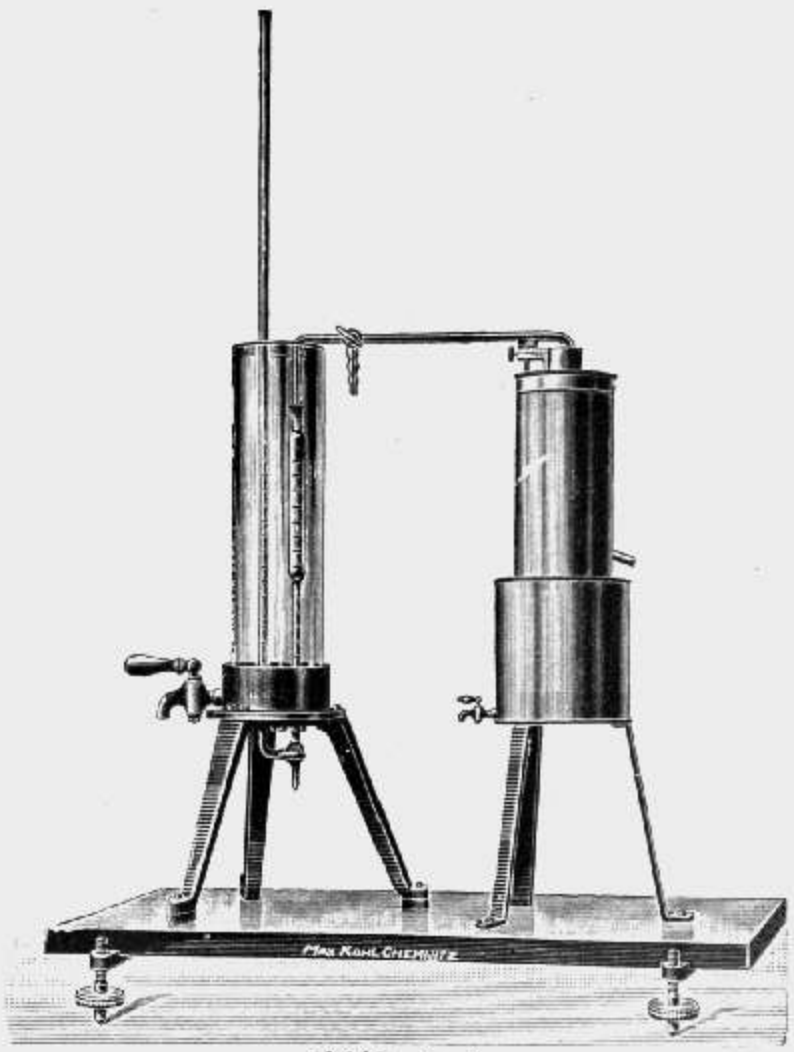
Max Kohl A. G. Chemnitz, Germany.



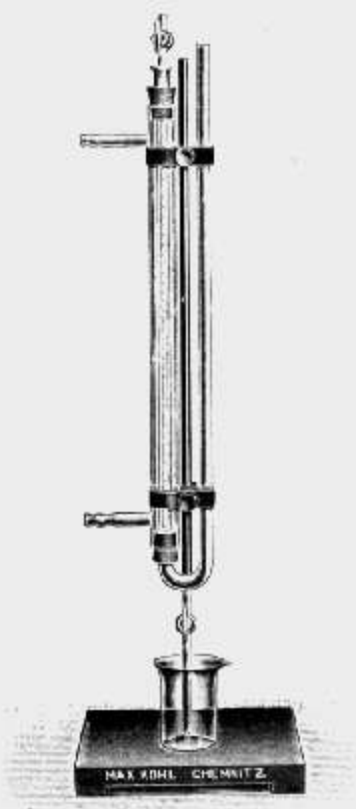
54 837. 1 : 9.



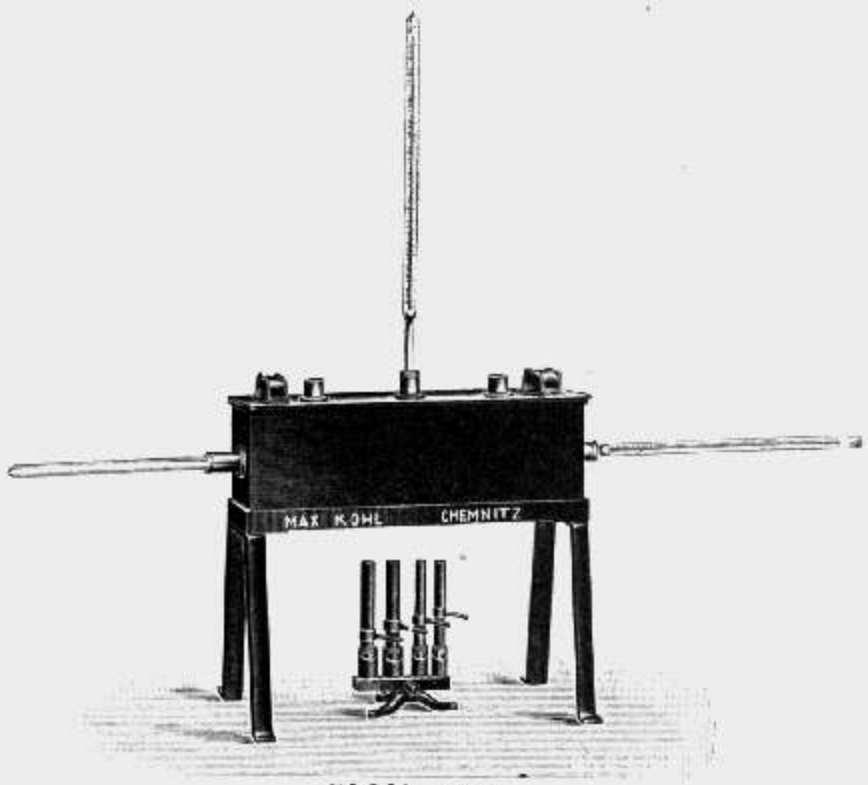
54 838. 1 : 9.



54 840. 1 : 8.



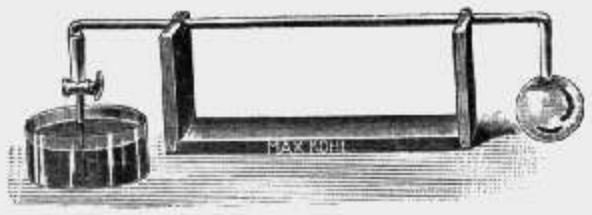
54 839. 1 : 9.



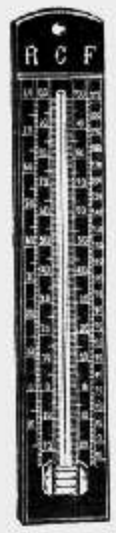
54 841. 1 : 8.

	£ s. d.
54,839. — i d e m, F i g u r e, the gases heated by water vapour and by alcohol vapour, with cock for regulating the pressure (Fr. phys. Techn. I, 2, Fig. 2840)	1. 7. 0
Further Apparatus for determining the Expansion Coefficient of Gases: see Nos. 52,706, 52,707, 52,812 and following items.	
54,840. **Apparatus for the Expansion of Gases at constant pressure,** after Régnault, F i g u r e, for accurate measurements (M. P. III, Fig. 61 [II, 2, Fig. 59])	8. 0. 0
54,841. **Gas Dilatometer,** after Gay-Lussac, F i g u r e, **for determining the Expansion of Gases at constant pressure** (M. P. III, Fig. 58 [II, 2, Fig. 56]; Gan.-Rein., Fig. 324)	4. 0. 0

Cl. 6530, 4708, 3851, 4547 [illegible] 18, 1724.



54842. 1 : 7.



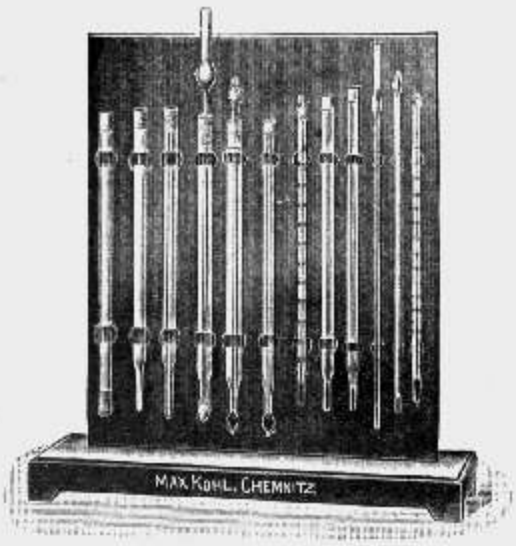
54848. 1 : 6.



54845. 1 : 7.



54846. 1 : 4.



54847. 1 : 10.



54849. 1 : 8.



54850. 1 : 8.

Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
54,842. **Apparatus for determining the Coefficient of Expansion (pressure-increase Coefficient) of Gases at constant volume.** Figure (W. D., Fig. 344 [324]) . . . . . The vessel can also be used for Apparatus No. 52,811 in order to admit of the latter being used as an air thermometer: see Fig. 52,811, p. 377.	0. 10. 0
54,843. **Large Glass Flask for determining the Coefficient of Expansion of Air, also the Specific Gravity,** with glass stopcock (4 litres capacity) . . . . . Cf. Fig. 53,034, p. 402.	1. 0. 0
53,033. **Glass Sphere with two Stopcocks,** for the same purpose (Fr. phys. Techn. I, 2, Fig. 2837)	0. 10. 0
54,844. **Gas Dilatometer,** after Friedr. C. G. Müller (M. T. Fig. 104), consisting of boiling flask (1 litre), large beaker, glass cylinder, calibrated bell, 2 indiarubber stoppers, 3 glass tubes with stopcocks and rubber tubing	0. 15. 0
53,121. **Windmill** for showing the Motion of Heated Air (M. T. Fig. 105)	0. 3. 0

Thermometers, Pyrometers, and Thermoscopes.

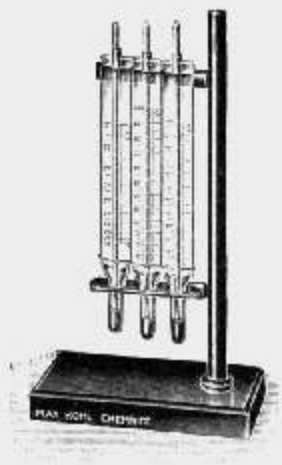
54,845. **Thermometer Tube,** with bulb blown on, Figure, so as to fill and make a thermometer oneself for 0—100° C. A diagram of the scale is appended to the tube (Gan.-Man., Fig. 480; Gan.-Rein., Fig. 302)	0. 0. 6
54,846. **Thermometer with ground milk-glass plate,** Figure . . . . . The thermometer is mercury filled and has a ground milk-glass plate the rough side being in front. The apparatus is intended for demonstration experiments, being ungraduated; the graduation can be attached by the lecturer as occasion demands and removed again. The thermometer is dimensioned for 0—100° C.	0. 2. 0
54,847. **The Thermometer in 7 Stages of Construction,** Figure; 2 half-finished **Maximum Thermometers** and a **high-range Thermometer** in three stages of construction	1. 10. 0
54,848. **Thermometer with 3 Scales** on wood, Figure, 350 × 50 mm, graduations in Réaumur, Centigrade and Fahrenheit degrees, from — 20° to + 100° Centigrade	0. 2. 0

Cl. 886, 6156, 1697, 1698, 4195, 3412, 6120.

Max Kohl A. G. Chemnitz, Germany.


54852. 2:7.


54853. 1:5.


54 854. 1:4.


54856. 1:9.


54858. 1:9.


54859. 1:9.


54860. 1:9.


54861. 1:9.


54862. 1:9.

54,849. **Demonstration Thermometer,** Figure, filled with sulphurie acid, with plain black and white scale, in $^1/_1{}^0$, milk glass scale, visible at a distance, range — 15° to + 100° C., 1 m long . . . . . £ s. d. 0. 12. 0

54,850. **Demonstration Thermometer** after Friedr. C. G. Müller, with paper scale and coloured graduation, Figure, divided every 5°, filled with sulphurie acid, range — 20° to + 150° C., 0.5 m long 0. 6. 0

These thermometers are of oval section, whereby the reflex action prevalent in a tube of circular section is avoided.

54,851. — idem, 1.00 m long, graduated from — 20° to + 150° C. 0. 12. 0

54,852. **Water Thermometer,** without mount, Figure, open scale (M. P., p. 145) . . . 0. 4. 6

54,853. **Water Thermometer and Mercury Thermometer** on one board, Figure, for showing the unequal expansion of water 0. 6. 0

* 54,854. **3 small Thermometers,** Figure, for objectively demonstrating the variation in expansion of different liquids, filled with mercury, sulphuric acid and alcohol respectively, on stand 0. 16. 0

The thermometers have vessels of the same size and capillaries of the same width; the scales vary in size corresponding to the different expansions.

* 54,855. **Projection Thermometer,** divided from — 40° to + 50° C. in whole degrees, with transparent glass scale and reversed figures 0. 6. 0

* 54,856. **Projection Thermometer,** graduated from — 10° to + 160° C. in whole degrees, cf. Figure, with transparent glass scale and reversed figures, without stand 0. 6. 0

* 54,857. **Projection Thermometer** with long stem, for calorimetric and similar experiments, divided from 0° to + 30° C. in $^1/_{10}{}^0$, with reversed figures 0. 12. 0

54,858. **Simple cylindrical Thermometer,** Figure, for 0° to 100° C., with paper scale . 0. 1. 0

54,859. **Cylindrical Thermometer** with milk glass scale from — 20° to + 360° C., Figure 0. 3. 0

54,860. — idem, with scale etched on tube, — 20° to + 360° C., 450 mm long, 6—7 mm diameter, Figure 0. 4. 0

54,861. **Cylindrical Thermometer,** 0.5 m long, range from — 10° to + 100° C., in 0.1°, divided on milk glass, Figure 0. 10. 0

54 862. **Cylindrical Thermometer for calorimetric Work,** Figure, from — 10° to — 40° C., divided in 0.1° 0. 5. 0

54,863. — idem, for very accurate work between 15° and 26° C., divided in 0.02°, with the value for water given 1. 10. 0

The thermometer has a quite cylindrical lumen, so that the readings do not vary among each other by more than a thousandth of their value.

* Can be used with the Projection Apparatus.



54867. 1:6.



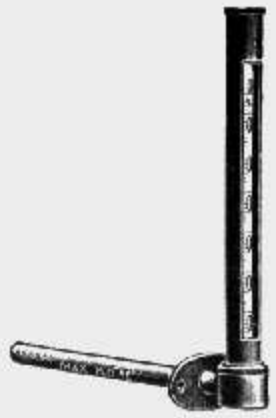
54871. 1:5.



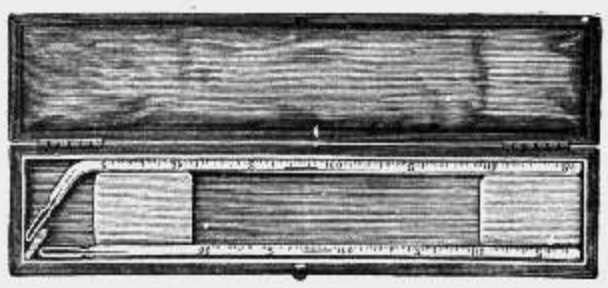
54872. 1:6.



54875. 1:10.



54876. 1:6.



54877. 1:3.

54,864. **Cylindrical Thermometer for temperatures of 0° to + 550° C.**, filled with carbonic acid gas over the mercury at 20 atmospheres . . . . . £ s. d. 1. 10. 0

54,865. **Cylindrical Thermometer for temperatures of — 100° to + 50° C.**, for cold mixtures, divided in whole degrees 1. 5. 0

54,866. **Cylindrical Thermometer for temperatures of — 200° to 0° C.**, for cold mixtures . 1. 8. 0

54,867. **Standard Thermometer,** Figure, from — 5° to + 50° C., divided in $^1/_{10}$°, with calibrated tube, with glass lug at top, in wood box 0. 15. 0

54,868. — idem, tested every 10°, with Test Certificate of the Physikalisch-Technische Reichsanstalt, Charlottenburg 1. 0. 0

54,869. **Standard Thermometer** from — 5° to + 100° C., constructed as No. 54,867 . . . 1. 0. 0

54,870. — idem, tested every 10°, with Test Certificate of the Reichsanstalt, Charlottenburg 1. 10. 0

54,871. **Thermometer** on Wood Board, **for schools,** Figure, from — 40° to + 50° C., 30 cm long . . . . . Each 0. 1. 0
Per dozen 0. 10. 0

54,872. **Thermometer for screwing to the window,** Figure, round, 25 cm long, with Centigrade graduation from — 40° to + 50° C., with porcelain scale enclosed in glass tube, with brass fittings 0. 4. 0

54,873. **Clinical Thermometer** (M. T., p. 138) 0. 3. 0

54,874. **Metastatic Thermometer** of Walferdin (Beckmann's Thermometer), for accurately measuring small temperature differences, for comparison with a standard thermometer (M. P. III, Fig. 16) 1. 10. 0

54,874 a. **Hypsometric Thermometer** (for altitude measurements), 22 cm long, from 87°—102° C. graduated in $^1/_{20}$° 1. 15. 0

54 874 b. — idem, 50 cm long, from 92° to 102° C., divided in $^1/_{50}$° 2. 5. 0

54,875. **Long Stem Thermometer with metal mount,** Figure, range 0° to 200° C., length of immersion tube 60 cm 1. 0. 0

54,876. **Angle Thermometer in Metal Mount,** Figure, range 0° to 200° C., with side tube 24 cm long 1. 0. 0

Thermometers Nos. 54,875 and 54,876 are arranged in such manner that the mercury bulb rests in the inside of a boiler, box, etc., while the scale (surrounded by a metal mount to protect it from knocks) is placed outside the vessel in question.

Cl. 1711, 1702, 6155, 6157, 1710, 1703.

Max Kohl A. G. Chemnitz, Germany.

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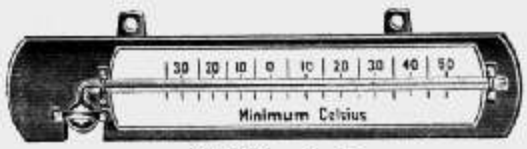
54 878.
1 : 5.



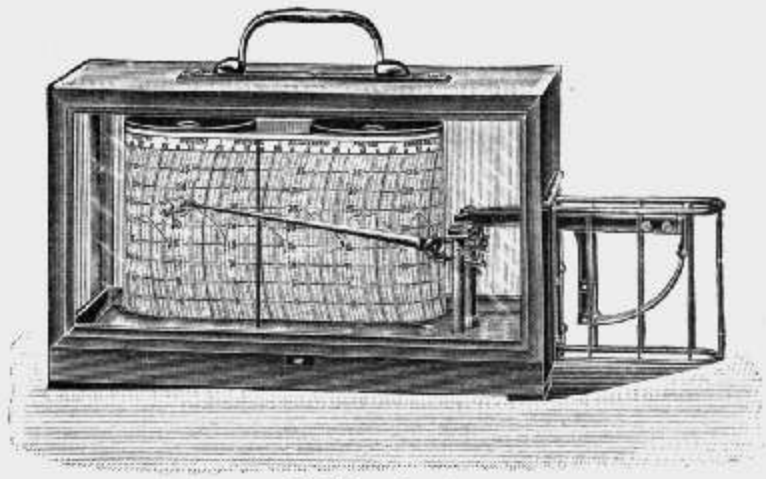
54 879. 1 : 5.



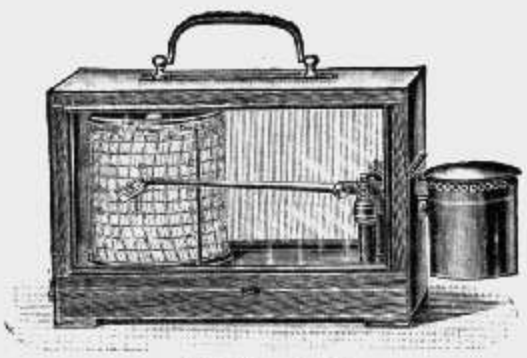
54 880. 1 : 5.



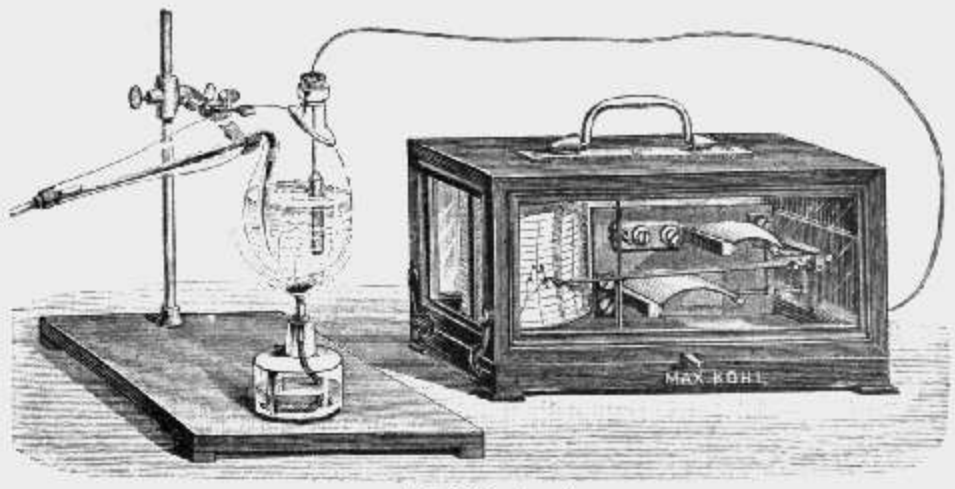
54 881. 1 : 5.



54 882. 1 : 5.



54 884. 1 : 5.



54 885. 1 : 6.

54,877. **1 Maximum and 1 Minimum Thermometer,** Figure, divided in $^1/_5{}^0$, with graduation etched on glass. Both in one case . . . . . £ s. d. 0.18.0

54,878. **Thermometrograph** after Six, Figure, on wood board, 320×65 mm, with Centigrade graduation from — 35° to + 50° C. 0. 6.0

54,879. — idem, after Six, with milk glass scale, in copper chamber, Figure, 320 ×60 mm, with Centigrade graduation from — 35° to + 50° C. 0.12.0

54 880. **Minimum Thermometer,** Figure, with porcelain scale in mahogany frame . . . 0.15.0

54 881. **Maximum Thermometer,** Figure, same pattern as above 0.15.0

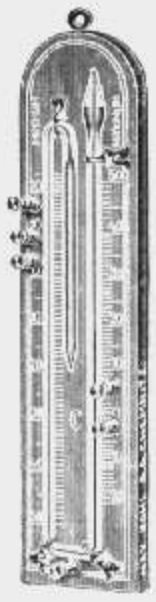
54,882. **Thermograph,** Figure, with 14-day movement and 2 drums so that a whole week's diagram can be seen, with walnut case 8.15.0

54,883. — idem, **with electric contacts** for maximum and minimum reports 9.10.0

54,884. **Small Thermograph,** Figure, with scale from — 10° to + 40° C., in mahogany case 5. 0.0

54,885. **Thermograph,** Figure, with flexible connecting tube 2 m long, for determining temperatures of liquids and for observing the temperature in rooms and in the open 10. 0.0

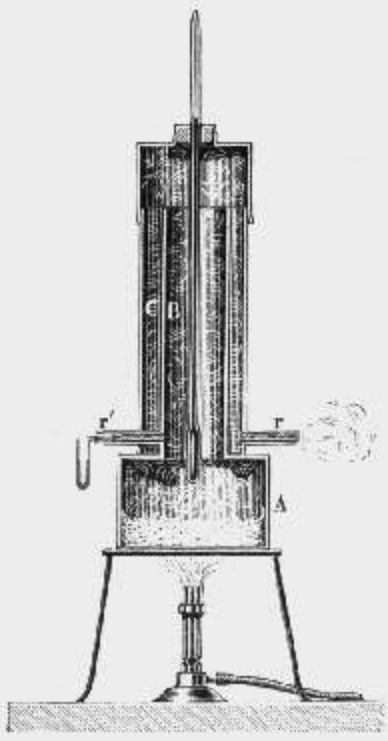
Cl. 6153, 6154, 6151, 6152, 6533, 6534, 1732 ff. 18, 1724.



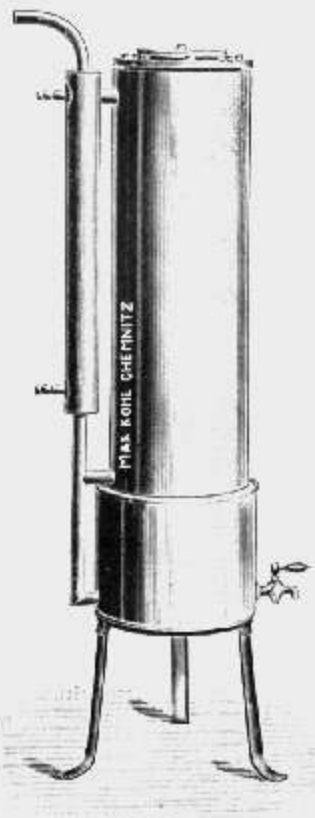
54 886. 1 : 4.



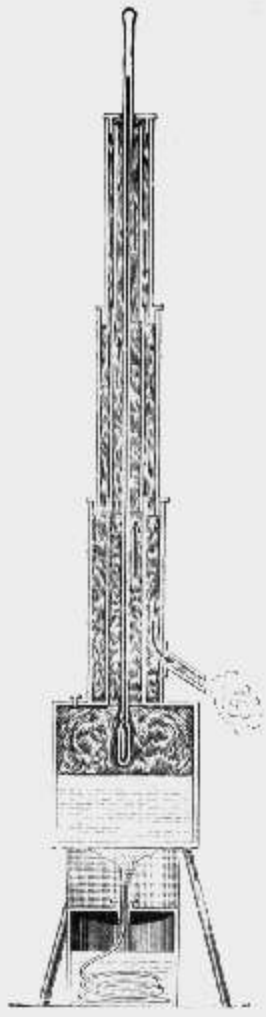
54 887 A. 1 : 6.



54 887 B. 1 : 7.



54 890. 1 : 8.



54 888. 1 : 5.



54 889. 1 : 10.



54 893. 1 : 6.

54,886. **Electric contact Thermometer** from — 30° to + 80° C., cf. Figure, with double tube with platinum wires and six terminals, making contact every 20°, commencing at — 20° C., for **maximum and minimum registrations** . . . . . £ s. d. 1. 4. 0

54,887. **Boiling point Determination Apparatus** for Thermometers, Figs. A and B (M. P. II, 2, Fig. 4; W. E. phys. Prakt., Fig. 95; Gan.-Man. Fig. 468), with simple thermometer 0. 12. 0
Fig. A is a view and Fig. B a section of the apparatus.

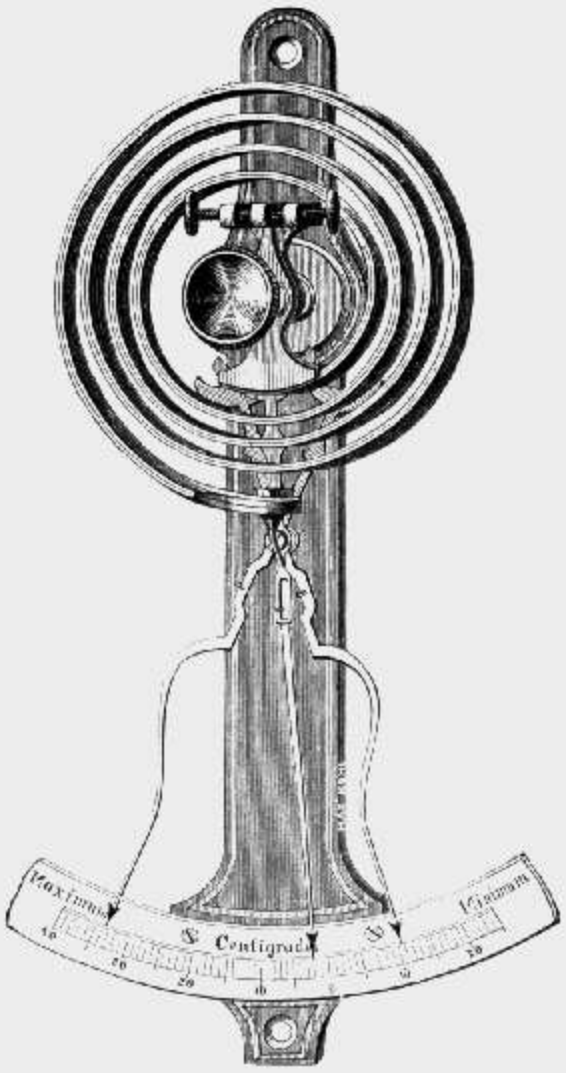
54,888. — idem, Figure, for travelling purposes, collapsible, can be used as a **Hypsometer,** without thermometer, with spirit lamp for attaching 2. 8. 0

54,889. **Freezing Point Determination Apparatus,** Figure, with waste for the water (Gan.-Man. Fig. 466), without thermometer or catching vessel 0. 10. 0

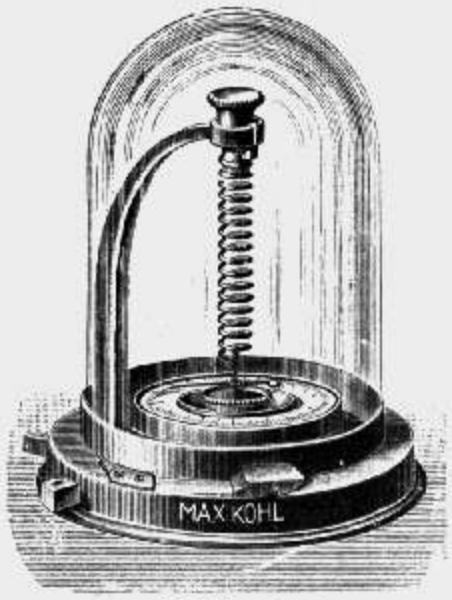
alibration Apparatus for Thermometers (Comparators) see p. 225; **Dividing Engines,** p. 228.

Cl. 6209, 1712, 1713, 1714, 1715, 3938, 1720.

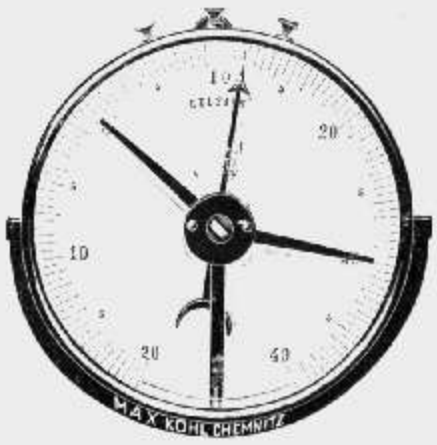
Max Kohl A. G. Chemnitz, Germany.



54 894. 1 : 2.



54 896. 1 : 3.



54 897. 1 : 3.

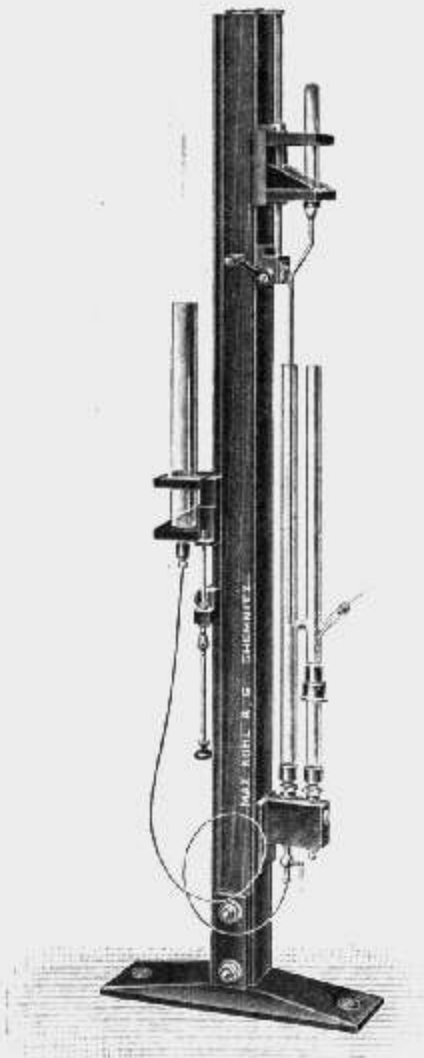


54 898. 1 : 5.

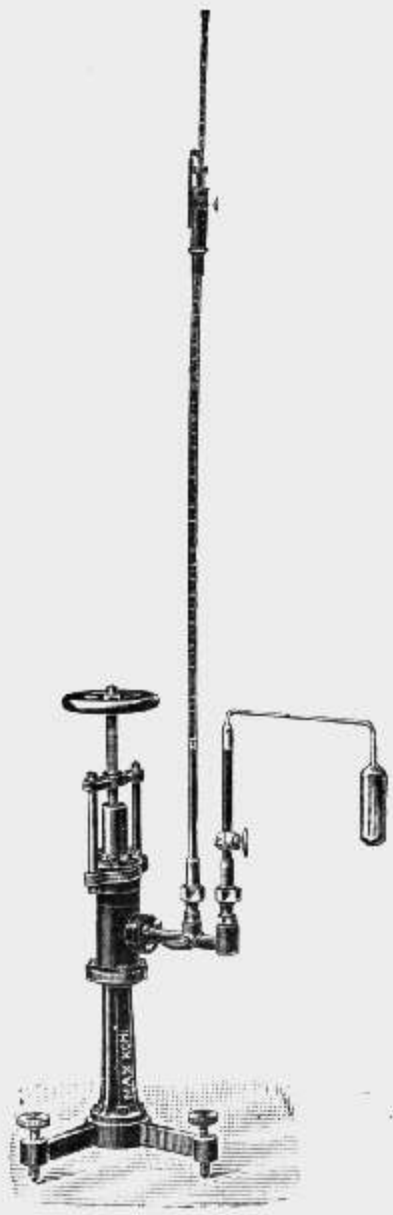
54 900. 1 : 15.

	£ s. d.
54,890. **Thermometer Testing Apparatus,** Figure, Rudberg's boiling tube with return flow cooling (Ztschr. f. Instrkde. **11**, 1891, p. 1), without air chamber	4. 10. 0
Thermometer Testing Apparatus, electrically heated, quoted for on application.	
Reading Microscopes for Thermometers, see p. 226.	
Thermo-Regulators, see p. 208.	
54,891. **Strips** of Steel and Zinc, curling when heated	0. 2. 0
54,892. — idem, of Steel and Ebonite	0. 3. 0
54,893. **Strips of Steel and Zinc,** with pointer and scale, Figure	0. 16. 0
54,894. **Metallic Thermometer,** Figure, Swiss pattern (M. P. III., Fig. 39 [II, 2, Fig. 38]), with maximum and minimum pointers, very reliable	1. 16. 0
54,895. — idem, **with electric contact,** without maximum and minimum pointers . . .	2. 5. 0
54,896. **Metallic Thermometer** after Bréguet, Figure (M. P. III, Fig. 41 [II, 2, Fig. 39]), with platinum silver spiral, with connecting terminals for measuring weak galvanic currents	2. 6. 0
54,897. **Metallic contact Thermometer,** Figure, round pattern, 130 mm diameter, very sensitively constructed, with contacts for maximum and minimum registration, from -20^0 to $+40^0$ C.	1. 10. 0
54,898. — idem, Figure, range 0^0 to 100^0 C.	1. 16. 0
54,792. **Air Thermometer** after Galilei (M. P., 10th Edn. III, p. 6; Meyer, Naturl., Fig. 11) .	0. 2. 8
54,900. **Air Thermometer** after Régnault, Figure (M. P. III, Figs. 71 and 72 [II, 2, Fig. 70]), with unscrewable air chamber, fittings well constructed of steel, wood frame	4. 10. 0

Cl. 1722, 1721, 4008, 5418, 1724.



54 901. 1 : 16.



54 902. 1 : 12.

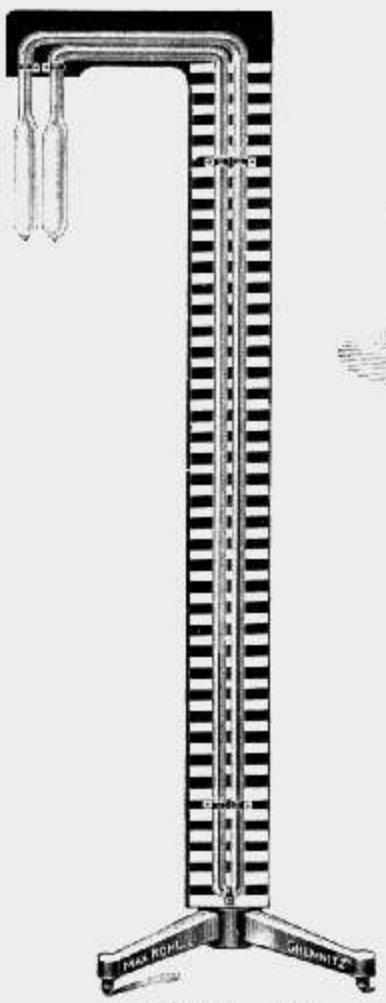


54 903. 1 : 12.

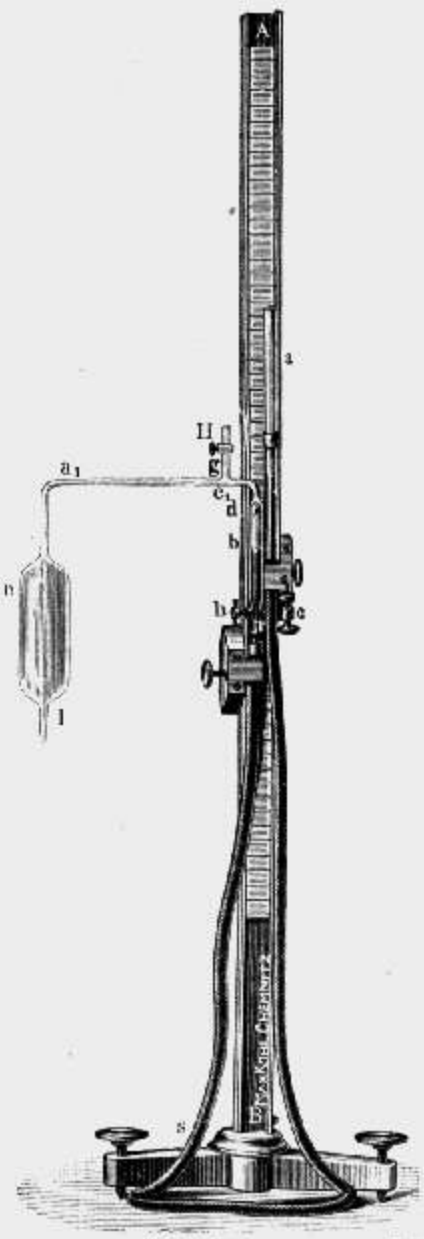
	£ s. d.
54,901. **Gas Thermometer** after Chappuis, Figure (M. P. III, Fig. 79; Chwolson, Physik, Vol. III, Figs. 6 and 7), model of the Bureau International des poids et mesures, Paris, with platinum capillary	18. 0. 0
This apparatus is especially adapted for very accurate measurements; only two readings are necessary for the single temperature measurements so that the sources of error are not so great as in instruments which necessitate four readings. The tubes are wide enough to exclude any error of capillarity. The readings are made by means of a cathetometer and with the aid of an accurate rule.	
54,902. **Air Thermometer** after Jolly, Figure (M. P. III, Fig. 73 [II, 2, Fig. 72]), constructed entirely of iron, steel stopcocks. The apparatus has a height of 1.6 m when the rule is not extended. All bare parts are heavily nickelled. The thermometer chamber is filled with dried air	12. 0. 0
For filling, 5 kg mercury (£ 2. 0. 0) is necessary.	
54,903. **Air Thermometer** after Jolly, Figure (M. P. III, Figs. 74 and 75 [II, 2, Fig. 73]), with plate glass scale	5. 0. 0
54,904. **Air Thermometer** after Jolly, Figure (W. u. E., phys. Prakt., Fig. 52), with plate glass scale and micrometer adjustment for one limb	6. 10. 0
54,906. **Air Thermometer** after Berthelot-Alvergniat, Figure, on wood stand with fixed scale	2. 5. 0
54,907. **Double-chamber Air Thermometer (Differential Air Thermometer)**, after Pfaundler (M. P. III, Fig. 81 [II, 2, Fig. 80]), without stand	0. 14. 0
The two vessels contain air at different pressure, being exposed to the same temperatures.	
54,908. — idem, on stand, with scale, Figure	1. 4. 0

As **air thermometers** use may be made of the apparatus for Boyle's (Marriotte's) Law after Feilitzsch, Friedr. C. G. Müller, Pfaundler, and Huber, Nos. 52,812 et seq., also the apparatus after Lermantoff and Schneider, Nos. 52,706—52,708.

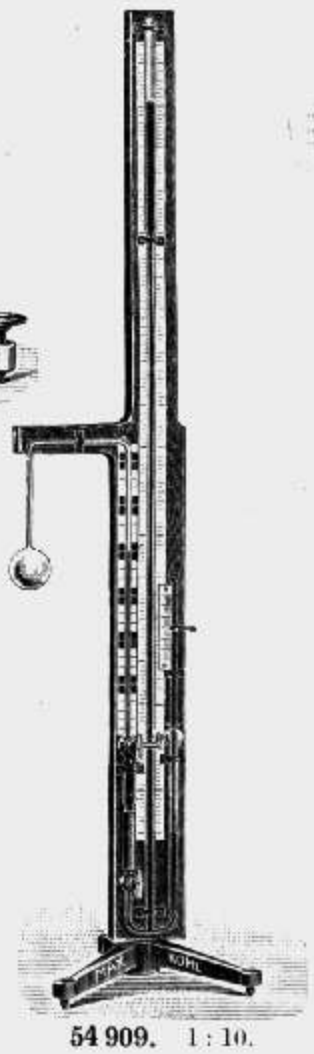
Cl. 5376, 1725, 1726.



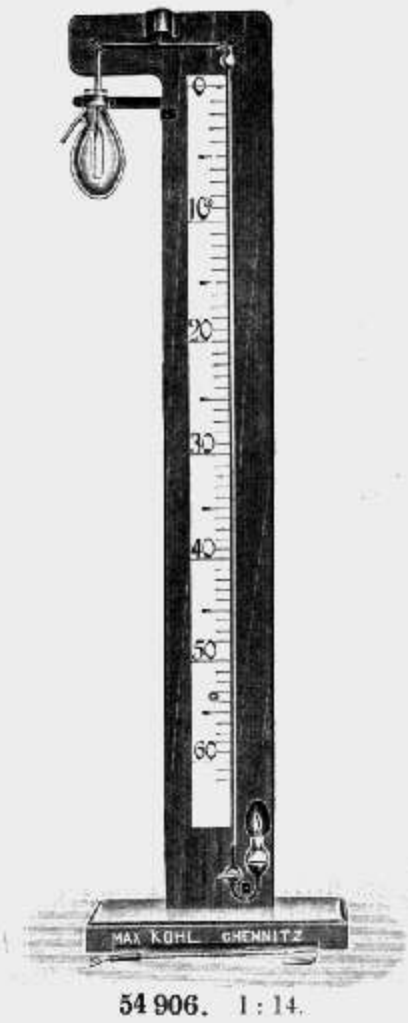
54 908. 1 : 8.



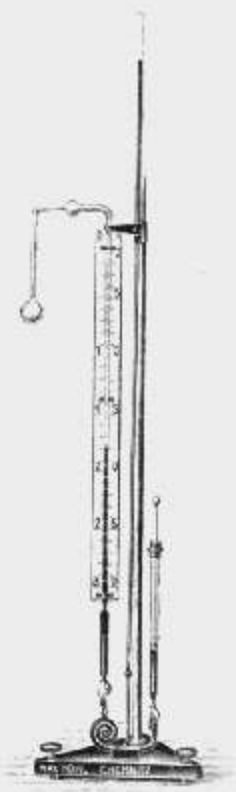
54 904. 1 : 9.



54 909. 1 : 10.



54 906. 1 : 14.



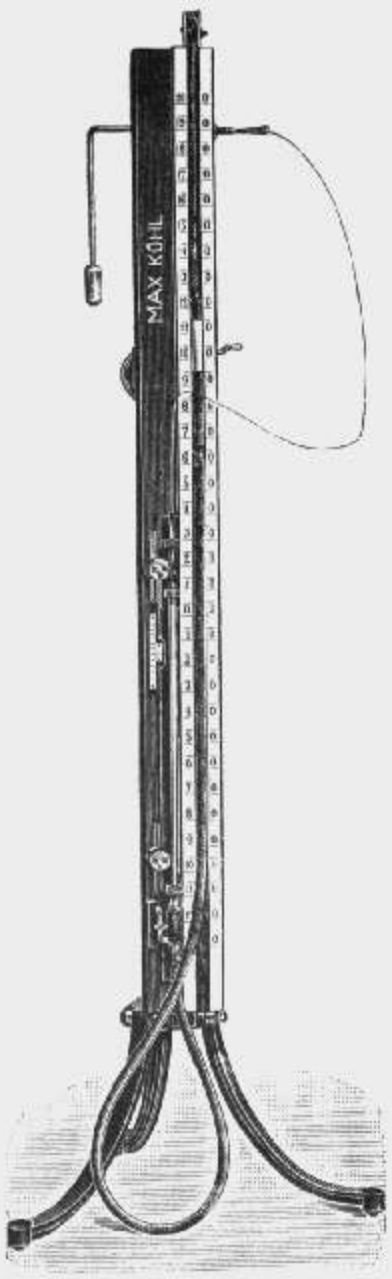
54 910. 1 : 11.

54,909. **Self-correcting Air Thermometer** after Prof. Friedr. C. G. Müller, Figure (Ztschr. f. d. phys. u. chem. U. **8**, p. 308; M. T., p. 139), on metal stand, wood parts of polished mahogany, rules of boxwood and celluloid, all parts most thoroughly constructed . . | £ 5. 10. 0

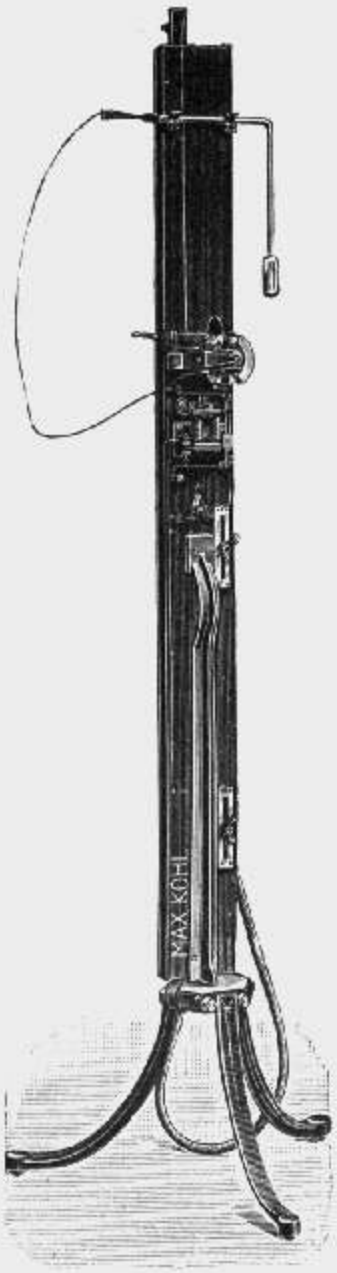
The air thermometer is independent of the momentary air pressure and the temperature reading can be read at a distance up to $^1/_{10}°$, as the degree intervals are 11 mm. The scale ranges over — 1° to + 28° C. The air thermometer can in addition serve as an accurate syphon barometer. It can be transported in the filled condition.

54,910. — idem, **simplified pattern**, Figure, with scale visible at a distance, 1° about 12 mm long (M. T., Fig. 97) . . . . . | 2. 2. 0

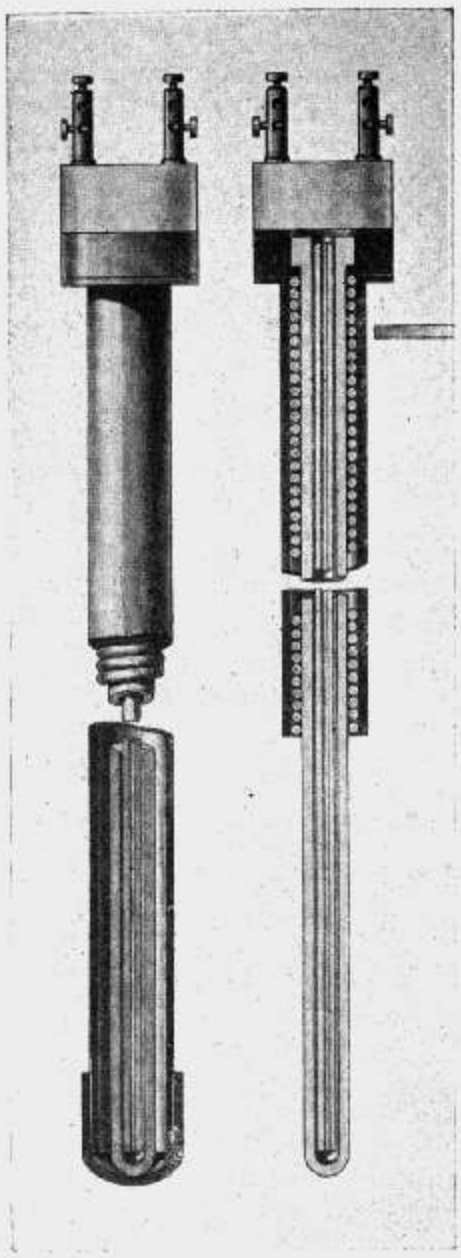
Cl. 1727, 5297, 1729, 1730, 5286.



54 911 A. 1 : 14.



54 911 B. 1 : 14.



54 912. 1 : 3. 54 913. 1 : 3.

54,911. **Demonstration Air Thermometer** after Weinhold, Fig. A (looked at from the front) and B (looked at from back (W. D., Figs. 345/7 [325/7]) . . . . . £ 22. s. 0. d. 0

The temperature is adjusted automatically by a small electric motor which carries the manometer tube up and down. The thermometer chamber is connected to the manometer by a long flexible silver tube, the silver tube being protected from external damage by a rubber coating. The apparatus gives very reliable results.

54,912. **Thermocouple (Electric Pyrometer)**, after Le Chatelier, F i g u r e, in conjunction with one of the Galvanometers Nos. 54,917/9, for use for temperatures to **900° C.**, with platinum and platinum-rhodium couple of 0.6 mm wires, with shielding and insulating tube of Marquardt porcelain and with steel sheath 130 cm long, for continuous measurements, provided with Test Certificate of the Physikalisch-Technische Reichsanstalt; without galvanometer 15. 10. 0

54,913. — i d e m, for temperatures to **1500° C.** (in conjunction with one of the galvanometers Nos. 54 920/2), with porcelain tube mounting, F i g u r e, with Marquardt porcelain tube 130 cm long projecting freely out of the iron tube; for continuous measurements, with Test Certificate of the Reichsanstalt; without galvanometer 15. 10. 0

All abrupt temperature variations or mechanical strains should be avoided.

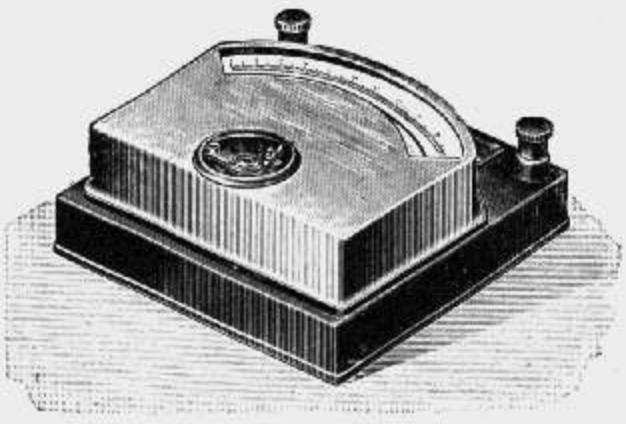
54,914. — i d e m, **for temporary measurements** of temperatures to **1400° C.** (to be used in conjunction with one of the galvanometers Nos. 54 920/2), with silica mounting which can be subjected to the most abrupt temperature changes, 130 cm long; with Test Certificate of the Reichsanstalt; without galvanometer 15. 10. 0

Cl. 173[1], 173.[2], 6542.

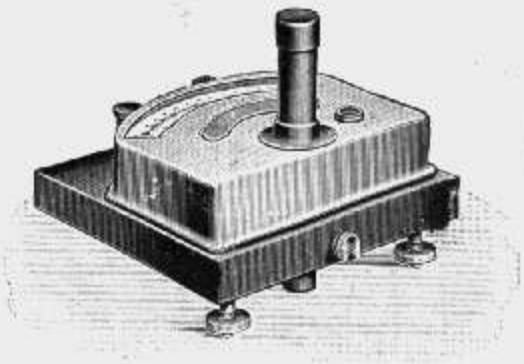
Max Kohl A. G. Chemnitz, Germany.



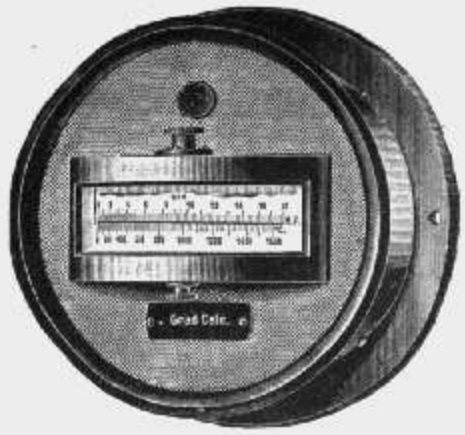
54 916. 1 : 3.



54 917. 1 : 4.



54 918. 1 : 5.



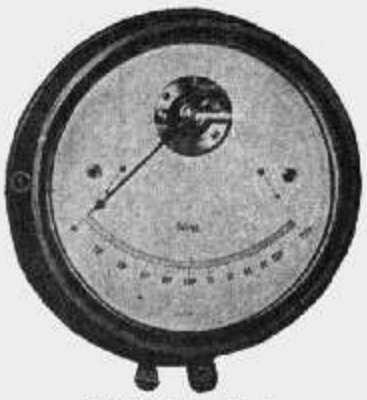
54 919. 1 : 4.

	£ s. d.
54,915. — i d e m, 150 cm long, for temperatures to **1100° C.**, in refractory fireclay tubes (to be used in conjunction with one of the galvanometers Nos. 54,917/9); with Test Certificate of the Physikalisch-Technische Reichsanstalt; without galvanometer	16. 10. 0
54,916. — i d e m, F i g u r e, with small platinum tube of about 55 grammes weight in the lower part, for temperatures to **1600° C.** (for use in conjunction with one of the galvanometers Nos. 54,920/2). Extra price according to the prevalent price of platinum (without Galvanometer) . . . . . £ **17. 10. 0** to	22. 10. 0
54,917. **Galvanometer** for Thermocouples Nos. 54,912 and 54,915, with temperature scale from **0° to 1100° C.**, F i g u r e, with pivot bearing, portable in case	11. 5. 0
54,918. — i d e m, with fibre suspension, F i g u r e	10. 10. 0
54,919. — i d e m, with perpendicular scale, F i g u r e, wall pattern instrument	11. 5. 0
54,920. **Galvanometer** for Thermocouples Nos. 54,913, 54,914 and 54,916, with temperature scale from 0° **to 1600° C.**, with pivot bearings, portable, in case	11. 5. 0
54,921. — i d e m, with fibre suspension	10. 10. 0
54,922. — i d e m, with vertical scale, wall pattern instrument	11. 5. 0
54,923. **Electric Resistance Thermometer,** F i g u r e, for temperatures between — **200°** and + **900° C.**, within the ranges named under No. 54,928, 20 cm long, can be used for distance reading, distance registration and registration in conjunction with one of the indicating apparatus mentioned further on	2. 10. 0

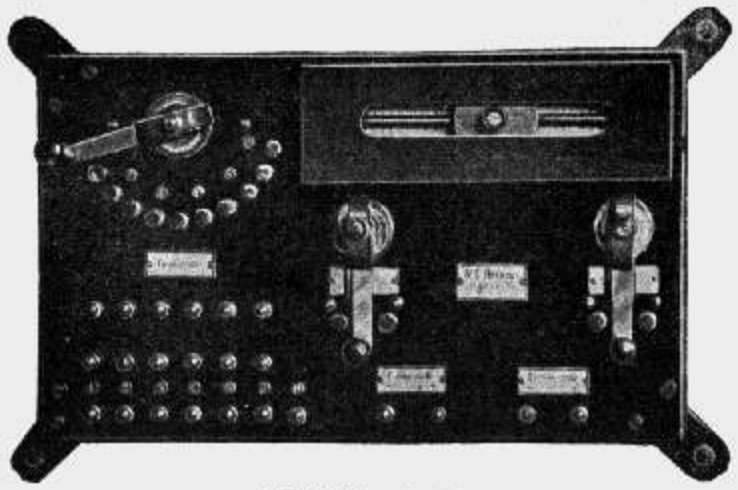
The resistance consists of a fine platinum wire fused into quartz glass in such manner as to protect it entirely from external influences. The resistance wire takes up the external temperature very rapidly (more quickly, for instance, than a mercury thermometer); the thermometer is insensitive to abrupt temperature change owing to the excellent properties of the quartz glass.

A complete installation consists of: (1) one of the thermometers Nos. 54,923/6; (2) an Indicator for stationary use No. 54,928 or 54,929, fitted perhaps with signalling device No. 54,930; or a portable Indicator No. 54,931 or 54,932; and (3) one or two Accumulators Nos. 54,936/7, according to the sensitivity desired; or a Compensator No. 54,938. If recording is desired, use should be made of (4) a Recording Galvanometer No. 54,933. If a number of thermometers are to be connected to the measuring arrangement, (5) a Plug Commutator No. 54,934 or 54,935 should be added.

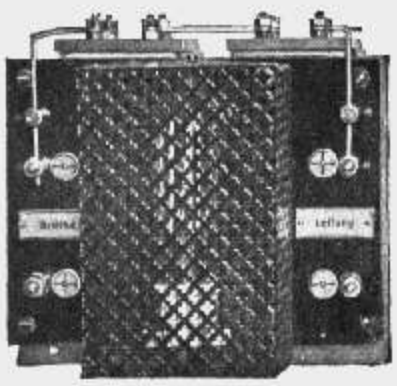
54,924. **Extending** the Thermometer every **10 cm** costs in addition	0. 8. 0
54,925. The same **Thermometer** with iron sheet, 50 cm long, with terminals on the porcelain head	3. 0. 0
54,926. **Extending** this Pattern every **50 cm**	0. 6. 0
54,927. **Test Certificate** of the Physikalisch-Technische Reichsanstalt for one Thermometer .	0. 18. 0



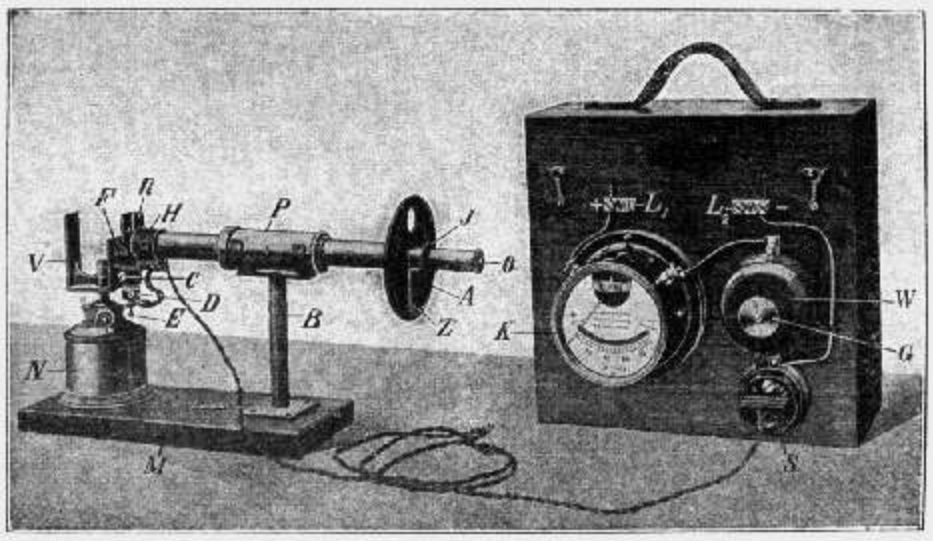
54 929 A. 1 : 5



54 929 B. 1 : 5.



54 938. 1 : 5.

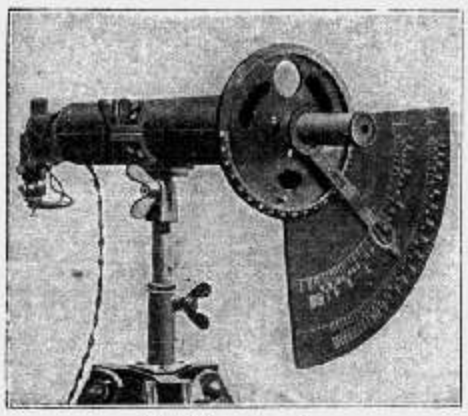


54 941. 1 : 7.

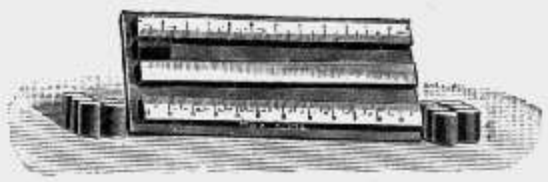
	£ s. d.
54,928. **Indicator for stationary use,** cf. Fig. 54,929 A and B, for Resistance Thermometers Nos. 54,923/6, consisting of a pointer galvanometer and a slate slab with switching and regulating devices **for one range** from 300° to 700° C., with one lead, without lead mountings	9. 0. 0
The minimum range can be selected for — 200° to + 100° or for — 100° to 0°, or for 0° to + 150°, for + 100° to + 300°, for + 200° to + 500°, or + 300° to + 700°. If specially desired the indicating apparatus is supplied for still smaller ranges (say, 30 to 40°) at an extra price. The range desired should be quoted when ordering. It is advisable to order at the same time the connecting leads (double stranded copper) between the thermometers and the indicating apparatus, in order that their resistance can be taken into account in calibrating. See No. 54,940.	
54,929. — i d e m, Figs. A and B, for 6 connections with the same range	10. 10. 0
For a larger number of connections and for connections having a different range, prices are quoted on application.	
54,930. **Signalling Device** for maximum and minimum distance recording; leads unmounted	Price on application
54,931. **Portable Indicator with one range,** not smaller than in the case of No. 54,928 . .	11. 0. 0
54,932. — i d e m, **with two ranges,** not smaller than in No. 54,928	12. 0. 0
54,933. **Recording Galvanometer**	Price on application
54,934. **Adaptor** for connecting a number of thermometers with the measuring arrangement, up to 6 connections	1. 2. 0
54,935. — i d e m, with compensating resistances for the Thermometer leads	1. 16. 0
54,936. **Accumulator,** 13 ampere-hour capacity; can be used for about five days with one charge when worked continuously	0. 8. 0
54,937. **2 Accumulators** in transport case	1. 1. 0

Cl. 6541, 6543, 6545, 6549.

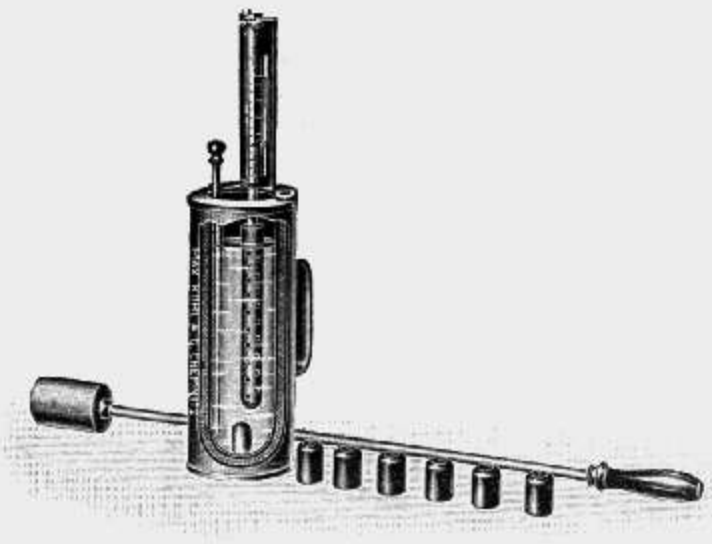
Max Kohl A. G. Chemnitz, Germany.



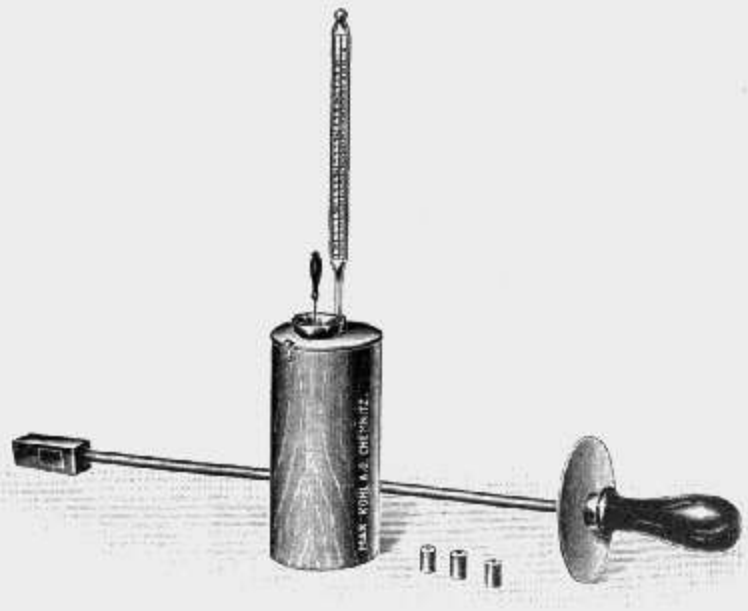
54 943. 1 : 4.



54 945. 1 : 5.



54 948. 1 : 8.



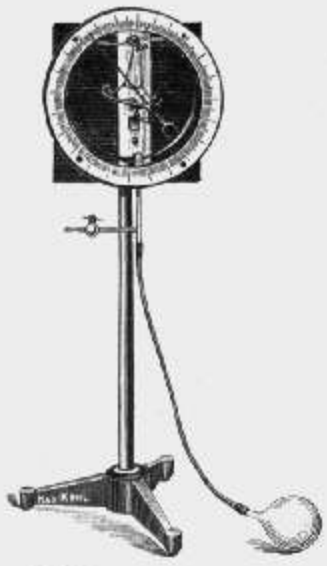
54 949. 1 : 8.

Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
54,938. **Compensator** for connecting the Measuring Arrangement to a 110 volt D. C. Power Supply, Figure	1. 16. 0
54,939. — idem, for 220 volts D. C.	2. 2. 0
54,940. **Double Strand,** the resistance of which is taken into account during the adjustment. In lengths to 30 m . . . . . £ **0. 1. 6** to	1. 2. 0
54,941. **Optical Pyrometer** after Wanner (Photometer), Figure, for measuring temperatures from **840° to 2000° C.**, with regulating resistance, adjusting device and battery of accumulators	25. 0. 0
54,942. — idem, with direct reading for temperature	27. 0. 0
54,943. **Optical Pyrometer** after Wanner (Photometer), for temperatures from **900° C. to 4000° C.**	31. 10. 0
54,944. — idem, with direct temperature reading, Figure	34. 5. 0
54,945. **Pyrometer** after Wedgwood, Figure, for Determining high Temperatures in accordance with the concretion of clay cylinders exposed to the heat, with 12 plate cylinders (Fr. phys. Techn. I., 2, Fig. 3054)	1. 5. 0
54,946. **Clay Cylinders for above** . . . . . Per dozen	0. 3. 0
54,947. **Seger Cones,** one set (20) 590°—1850° C.	0. 4. 0
54,948. **Water Pyrometer** after Siemens, Figure, for temperatures to 1,000° C. with thermometer and six copper cylinders each of 137 grammes weight One of the copper cylinders is inserted into the furnace space, the temperature of which it is desired to measure, until such time as it has taken up the temperature of the same. It is then placed in the water of the calorimeter after the pointer of the sliding scale has been set to the temperature of the water, and during heating the maximum position of the mercury on the thermometer and on the sliding scale is read off. The sum of these two readings is the temperature which the iron body has attained in the furnace.	5. 0. 0
54,949. **Water Pyrometer** after Fischer, Figure, copper vessel with wood jacket, iron case, protecting screen, stirrer, with three similar cylinders of pure nickel, without thermometers (Fr. phys. Techn., 7th Edn., I, 2, Fig. 3081)	2. 0. 0



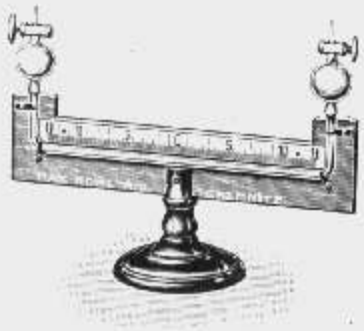
54 950.
1 : 6.



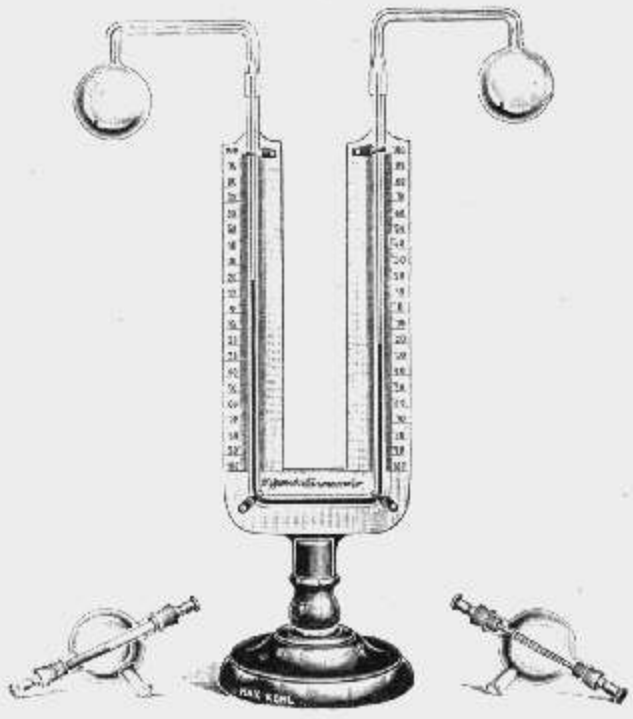
54 951. 1 : 9.



54 952. 1 : 7.



54 953. 1 : 8.



54 954. 1 : 6.

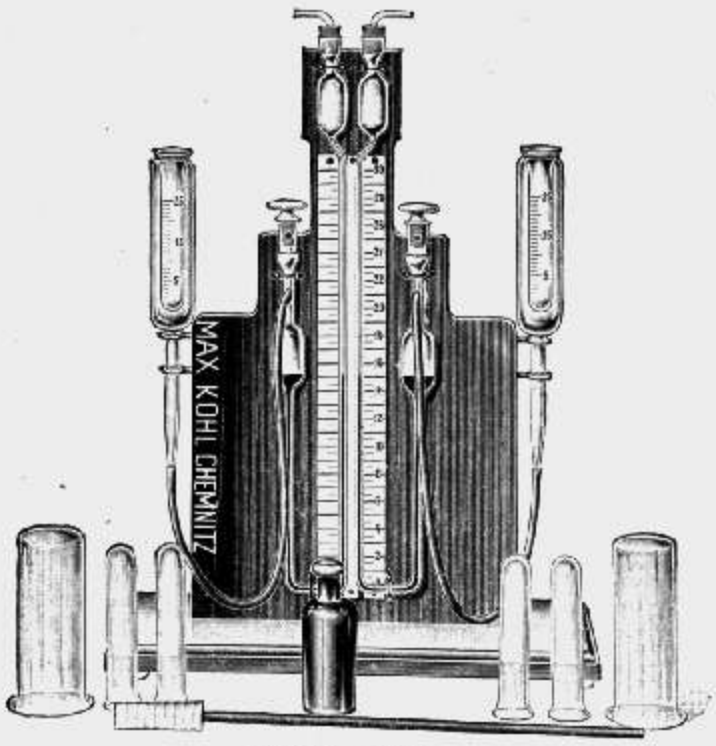
Thermoscopes after Galilei and Drebbel: see Nos. 54,792 and 54,793.

	£ s. d.
54,950. **Thermoscope** after Weinhold, Figure (W. D. Fig. 368 [348]), very sensitive instrument for radiation experiments	0. 3. 0
54,951. **Aneroid Thermoscope,** Figure (Ztschr. f. d. phys. u. chem. U. **3**, p. 141), very sensitive apparatus	2. 10. 0
54,952. **Leslie's Differential Thermometer,** Figure, with detachable ground-on bulbs for automatic filling (M. T., p. 142), with a blackened bulb; also for use for measuring the intensity of radiant heat (M. P. III, Fig. 82 [II, 2, Fig. 81])	0. 10. 0
54,953. **Dilatation Thermometer** after Rumford, Figure (M. P. III, Fig. 83 [II, 2, Fig. 82]), with short liquid threads, with detachable bulbs and glass stopcocks	0. 10. 0
54,953 a. — idem, after Friedr. C. G. Müller, with connecting tube and cock for equalising pressure (M. T., Fig. 100)	0. 16. 0
54,954. **Differential Thermoscope,** Figure, with detachable ground-on glass bulbs, a glass bulb with wire spiral and terminals, Figure, for experiments on the **thermal effects of the electric current;** and two glass bulbs, each with one bismuth-antimony rod and terminals, Figure, for **proving the Peltier effect**	1. 15. 0

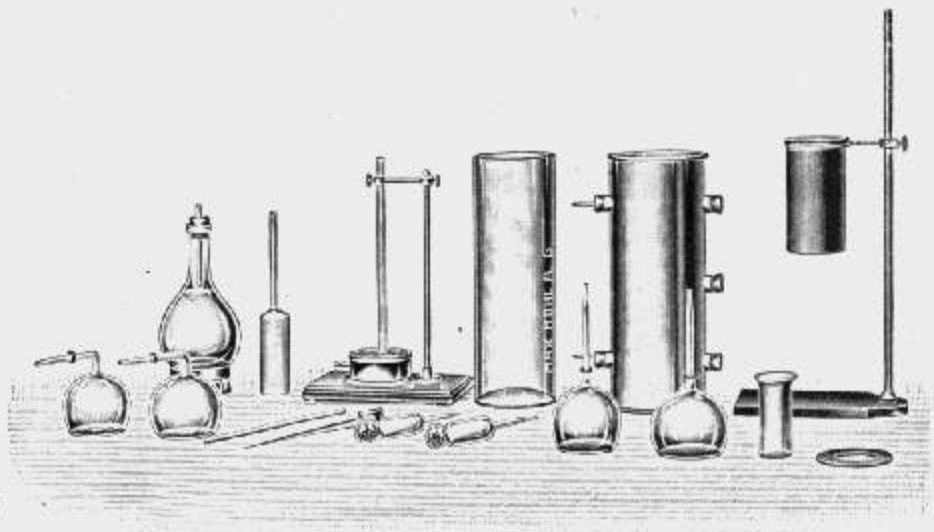
For shewing the thermal effect the bulb with wire spiral is placed on one end of the thermoscope, the other being left open, and a supply of 2—4 volts together with a regulating resistance is connected to the terminals. For showing the Peltier effect the two bulbs with the bismuth-antimony rod are placed on the thermoscope, the poles of the same name, e. g., the nickelled terminals of the bismuth, which are connected up by a lead and two accumulators in series, together with a regulating resistance and a pole commutator, being connected up to the free end. In one glass bulb heating takes place when the current direction is from bismuth to antimony, a cooling effect taking place in the other. By reversing the current the opposite effect ensues. The current density should be about 5 amps. Too high a current generates too much heat in the rod and should be avoided.

Cl. 1748, 6123, 6239, 6121, 1653.

Max Kohl A. G. Chemnitz, Germany.



54 955. 1 : 6.



54 957. 1 : 14.

Max Kohl A. G. Chemnitz, Germany.

54,955. **Double Thermoscope** after Looser, Figure, for a large number of experiments on heat, electricity, etc. (W. D. Fig. 327 [309]; Ztschr. f. d. phys. u. chem. U. **8**, p. 291; **9**, p. 265; **11**, p. 105; **15**, p. 257; **19**, p. 333; Looser, Versuche aus der Wärmelehre und verwandten Gebieten) . . . . . £ s. d. 2. 10. 0

The apparatus consists of two manometers filled with coloured liquid, the long limbs of which are carried upwards quite parallely. A scale graduated in half centimeters admits of easy reading for the students; the lecturer himself can observe the height of the liquid on a second scale at the back. The shorter limbs of the manometer are cut off by wider vessels each having a cock and an attachment for rubber tubing. By means of the rubber tubing the sensitive air capsules (receivers) are connected with the manometers. The air capsules are constructed in suitable forms for the various experiments (see below).

The following experiments can be carried out with the apparatus when use is made of the accessories pertaining thereto which should be selected from Nos. 54,956–54,972:

A. **Expansion of Bodies,**
B. **Specific Heat and Atomic Heat,**
C. **Thermal Conduction in Solids, Liquids and Gases,**
D. **Radiant Heat,**
E. **Heat and Work,**
F. **Heat on change of state,**
G. **Heat by Compression of Gases and Vapours,**
H. **Heat during Chemical Reactions.**
I. **Thermal Effects of the Electric Current.**

In addition the apparatus can be used as a Manometer.

We supply with the apparatus two capsules with cem graduation for liquids, two wide and four narrow glass beakers, one scourer, one bottle of filling liquid, two pieces rubber tubing.

The accessories are set forth in accordance with definite series of experiments in such manner that under a List No. always all the objects necessary for the series of experiments are listed irrespective of whether they are mentioned again previously or subsequently.

In subsequent orders it should be stated — paying due attention to what has been said above — whether such accessory parts are already available, in case it is not desired to duplicate them in the collection. The items marked † are also contained in the "Small Collections of Accessories" mentioned for the second time.

The Figure Numbers in brackets appended to the accessories refer to the "Introduction" No. 54,956.

54,956. **Introduction to above** (Looser, Versuche aus der Wärmelehre und verwandten Gebieten, mit Benutzung des Doppel-Thermoskops), 3th Edn., 148 pages 0. 4. 6

54,957. **Accessories for Experiments on Thermal Expansion,** Figure (Experiments Nos. 1—9) 3. 4. 0

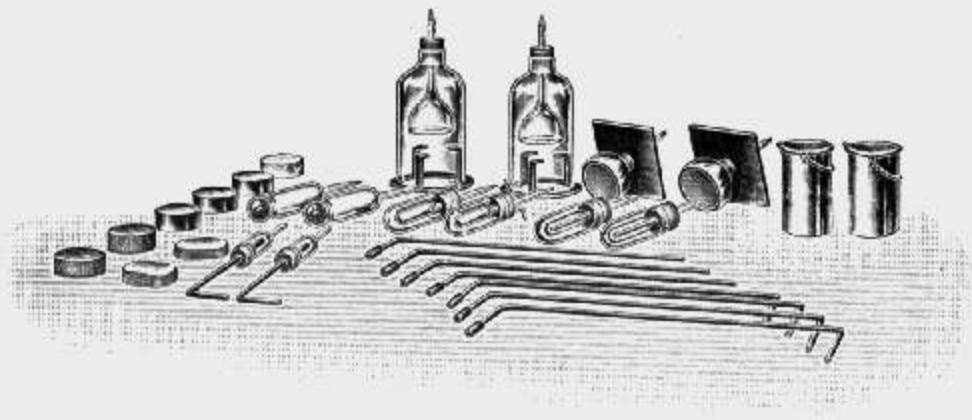
For experiments on the dilatation of vessels and rods, the floating of heated liquids on colder ones, the irregular dilatation of water, change of volume and convection.

† 1 Boiling Flask, 1 litre, with tripod, cork, and connecting tube (Fig. 2).
† 1 porous Pot with tube connection (Fig. 46).
1 Sheet Iron Box with corrugated lid, with stand, test bars of brass and glass (Fig. 3).
1 indicating Device.
† 1 Gauge Glass.
† 2 Capsules weighted with shot (Figs. 4 and 31).
1 Standing Vessel of Zinc with 5 openings and 2 spherical air capsules (Fig. 5 and p. 14).
2 large Hemispheres of glass with bent tube (Fig. 6).
2 Pasteboard Cylinders with stand and beaker (Fig. 7).
2 large Hemispheres (glass) with straight tube (Fig. 7).
1 Rod with ring (p. 16).

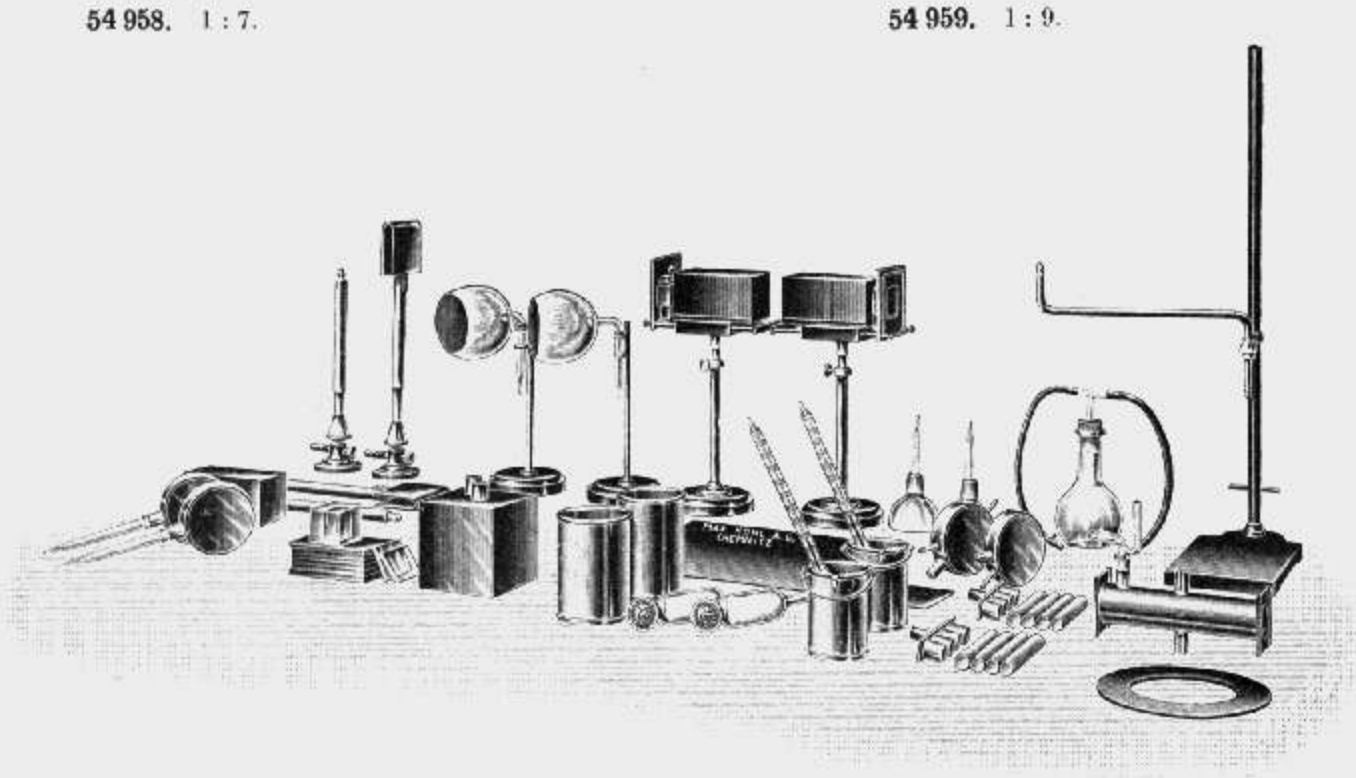
54,957a. **Small Collection of Accessories for Experiments on Thermal Expansion** (for Experiments Nos. 1, 2, 3, 4 and 6), consisting solely of the accessories marked † in No. 54,957 . . . . . 0. 8. 0



54 958. 1 : 7.



54 959. 1 : 9.



54 962. 1 : 10.

Max Kohl A. G. Chemnitz, Germany.

£ s. d.

54,958. **Accessories for Experiments on Specific Heats,** Figure (Experiments Nos. 10—14) 0. 12. 0

For shewing the different specific heats of metals and liquids, for determining the ratio of specific heats with unchanged pressure and volume, and for confirming Dulong and Petit's Law on Atomic Heat.

2 Copper Pieces and 1 Lead Piece of the same weight and area.
1 Lead Piece three times as heavy.
1 Pressure Flask (Fig. 9).

54,959. **Accessories for Experiments on Thermal Conduction,** Figure (Experiments Nos. 15—26) 3. 0. 0

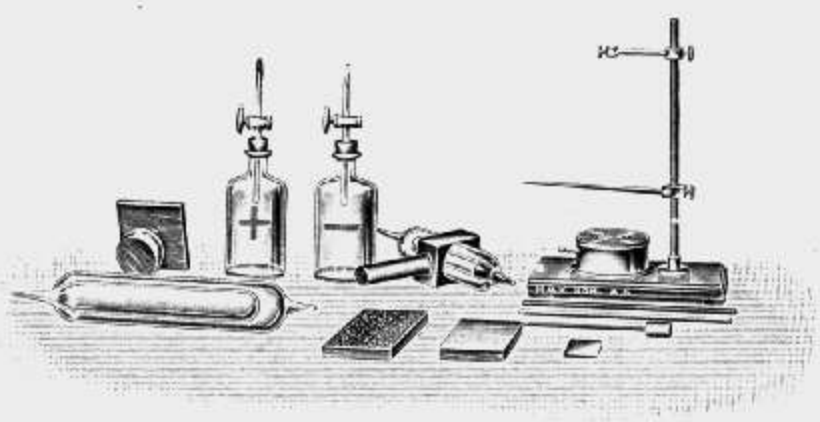
For demonstrating the different thermal conduction of metals, the influence of the direction of grain in wood, the axial direction in crystals, bad conductors, the influence of specific heat on thermal conduction, the so-called cold conduction, thermal insulators, thermal conduction of different liquids and gases, the decrease of thermal conduction with decreasing gas-density.

† 3 rectangular bent Rods, two of copper and one of iron (Fig. 10).
2 Rods twice bent, of copper and lead.
1 Glass Capsule with lead rod.
1 Glass Capsule with copper rod.
† 2 small ground Glass Hemispheres (Fig. 11), with cork and board.
† 2 Wood Slabs, one cut parallel and the other perpendicular to the grain.
† 2 Zinc Beakers (Fig. 11).
Slabs of iron, silk, cotton, copper, lead and marble.
2 Capsules weighted with shot.
† 2 Vessels with cylindrical capsules and with stoppers (Fig. 13).
2 Vessels for liquids, 2 small hemispheres, 2 sheet iron holders (Fig. 14).
2 Vessels with cylindrical capsules, 2 glass tubes and pierced rubber bungs (Fig. 15).

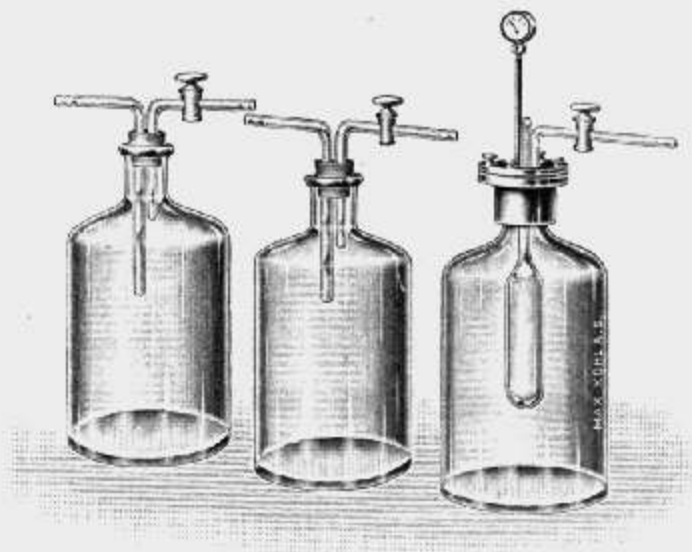
54,959 a. **Small Collection of Accessories for Experiments on Thermal Conduction** (Experiments 15, 17 and 23), consisting solely of the accessories marked † in No. 54,959, for demonstrating thermal conduction in metal rods, wood slabs and liquids 0. 12. 0

54,960. **2 Crystal Plates** cut parallel and perpendicular to axis (Experiment No. 19) 1. 4. 0

Cl. 6191, 6186, 6189.



54 963. 1 : 12.



54 964. 1 : 9.

54,962. **Accessories for Experiments on Radiant Heat** (Experiments Nos. 27 to 53), without concave mirror, Figure . . . . . £ 9. s. 0. d. 0

For demonstrating the unequal absorption of luminous and dark rays through rock salt and glass, total thermal reflection, thermal absorption of different materials and surfaces (also when thermal sources are unequal), thermal emission of various surfaces, thermal reflection, dependence of radiation on the incident angle.

2 Teclu Burners (Fig. 15 b).
2 Attachments with slotted burner for luminous flames (Fig. 15 b).
2 Attachments for non-luminous flames (Fig. 15 b).
†2 large Glass Hemispheres (lamp-blacked) (also Fig. 22)
2 four-sided prismatic reflectors, nickelled (Figs. 15 b and 20).
†4 thick and 4 thin Glass Plates.
2 Rock Salt Slabs.
1 Rock Salt Cube.
2 small ground Hemispheres.
2 Mica Discs and
1 Gypsum Slab for heat-absorption.
2 ground Glass Discs.
2 Glass Troughs for water and solution of iodine in carbon-disulphide respectively.
2 Stages for the reflectors with wire stands and holders for the glass troughs, on stands (Fig. 15 b).
2 cylindrical Sheet Iron Capsules for steam heating, with a bare and a sooted surface (cf. Fig. 19[1] and [4]).
Boiling Flask with T-tube and 2 lengths rubber tubing.
2 Capsules with glass attachments (Figs. 19[2] and 19[3]).
†1 Leslie Cube.
1 four-sided prismatic Reflector sooted inside (Fig. 15 b).
†2 Stands with rings.
1 bare and 1 sooted Metal Vessel.
2 Capsules weighted with shot.
1 bare and 1 sooted Beaker with thermometers.
†1 Screen (Fig. 21).
†1 white metal Reflector (Fig. 21).
†2 Holders for 4 candles each, with 8 candles.
1 Card with circular hole (Fig. 22).
1 Gas Burner or Candle Holder with pivotted arm, on stand (Fig. 22).
1 Tube for thermal absorption (Fig. 23).

Concave Mirrors for Experiments No. 51, p. 48: see Nos. 55,328—55,336.

54,962.a **Small Collection of Accessories for Experiments on Radiant Heat** (Experiments Nos. 45, 45b, 46, 48, 49), consisting solely of accessories marked † in No. 54,962, for demonstrating thermal absorption, thermal emission of different surfaces, a luminous and a non-luminous flame, thermal reflection, decrease of thermal radiation with distance 1. 12. 0

54,963. **Accessories for Experiments on Heat and Work,** Figure (Experiments Nos. 54—64 and 67) . . 2. 6. 0

The following can be demonstrated: generation of heat by friction, striking or bending, by shaking mercury and outflowing air; the freeing of heat by condensation, thermal consumption on rarifying gases.

†1 Small ground Hemisphere with cork and board.
†1 Board with emery cloth pasted on.
†1 Wood Block.
†1 Wire with a piece of raw tin.
†1 Lead Slab.
1 Capsule with mercury (Fig. 24), with long handle.
1 double Capsule, open (Fig. 24).
1 pressure flask (Fig. 25).
1 suction flask.
Sheet Metal Box with corrugated lid, stand and indicating device, brass rod and glass tube.[1])

Friction Apparatus for the Whirling Table: see No. 52,048.

Bellows for Experiments Nos. 17, 67 and 77: see No. 53,088.

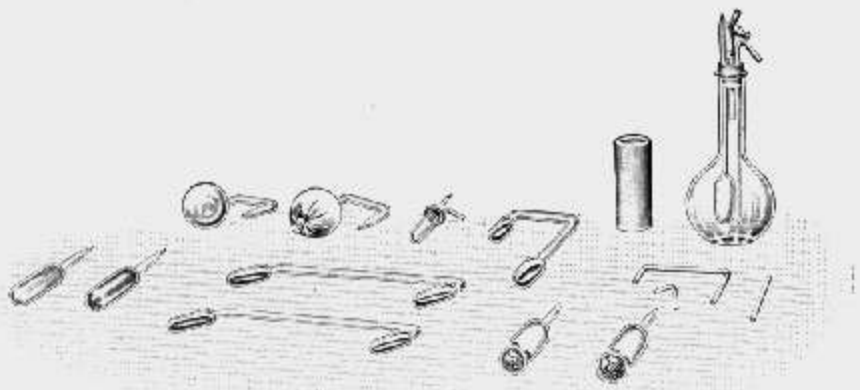
[1]) If No. 54,957 is already available, the price is decreased by the following amount owing to the omission of metal box with corrugated lid, stand and indicating device 0. 18. 0

54,963a. **Small Collection of Accessories for Experiments on Heat and Work** (Experiments Nos. 54, 55 and 59), consisting solely of the accessories marked † in No. 54,963, for demonstrating heat produced by friction, striking and bending 0. 4. 0

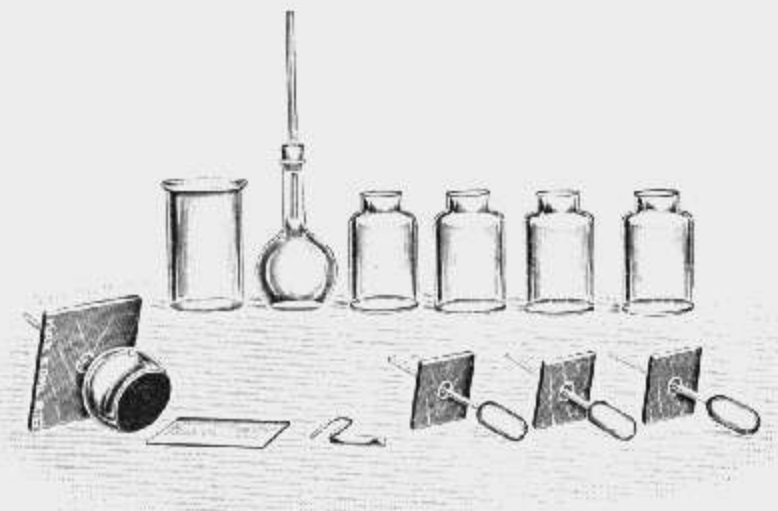
54,964. **Accessory Apparatus,** Figure, for shewing that the cooling of a gas when the pressure is reduced is proportional to the difference between initial and terminal pressure (Experiments Nos. 65 and 66) 1. 10. 0

2 large Compression Flasks, 4 litres capacity, with connecting tubes; one with cork (Fig. 26), the other with cylindrical capsule, screw stopper and air-pressure manometer (p. 61).
1 Compression Flask, 8 litres capacity, with connecting tubes and cork.

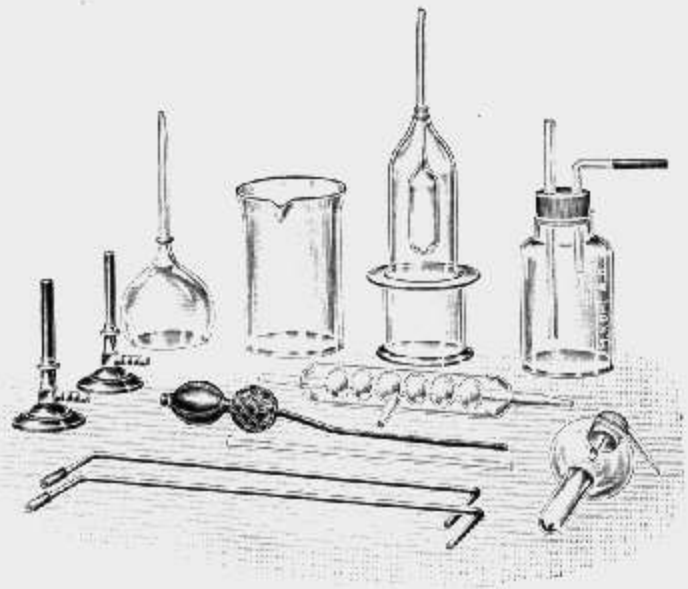
Max Kohl A. G. Chemnitz, Germany.



54 965. 1 : 12.



54 966. 1 : 13.



54 967. 1 : 8.

£ s. d.

54,965. **Accessories for Experiments on Change of State** (Experiments Nos. 68—91), Fig. 54,965 . . . . . 1. 4. 0

The following can be demonstrated: different thermal consumptions on melting and dissolving; the action of the August psychrometer; the heat on increasing the disgregation (formation of ions); crystallising heat; cooling by evaporation; the degree of evaporation; velocity of evaporation; formation of ice on evaporation; formation of heat on freezing; cooling on evaporation in porous vessels; different heat of evaporation; constancy of the boiling point and melting point; raising and lowering of same by salts; the fact that the temperature of the water vapour formed from boiling salt solutions has the temperature of the solution; lowering the boiling point with decreasing pressure and raising it with increasing; the air thrown off from a rotating top.

† 2 double Capsules (Fig. 28), one with wax, one with cetin.
† 2 large Glass Hemispheres with straight tube.
2 spherical Capsules (Fig. 28a), one covered with muslin.
1 Device for evaporating ether by means of illuminating gas (Fig. 29).
1 Cryophorus.
1 Porous Pot.
2 Impulse Hammers (Fig. 30).
2 Capsules with shot.
1 Boiling Flask with capsule, syphon tube and closed tube (Fig. 32).
1 short and 1 long syphon tube.

54,965a. **Small Collection of Accessories for Experiments on Change of State** (Experiments Nos. 68, 69, 70, 70a, 71, 72, 73, 74, 75, 77), consisting solely of the items marked † under No. 54,965, for demonstrating the consumption of heat on melting, dissolving and evaporating, and of the heat on increasing the disgregation (formation of ions), of the influence of the degree of saturation, and of the formation of ice by evaporation 0. 10. 0

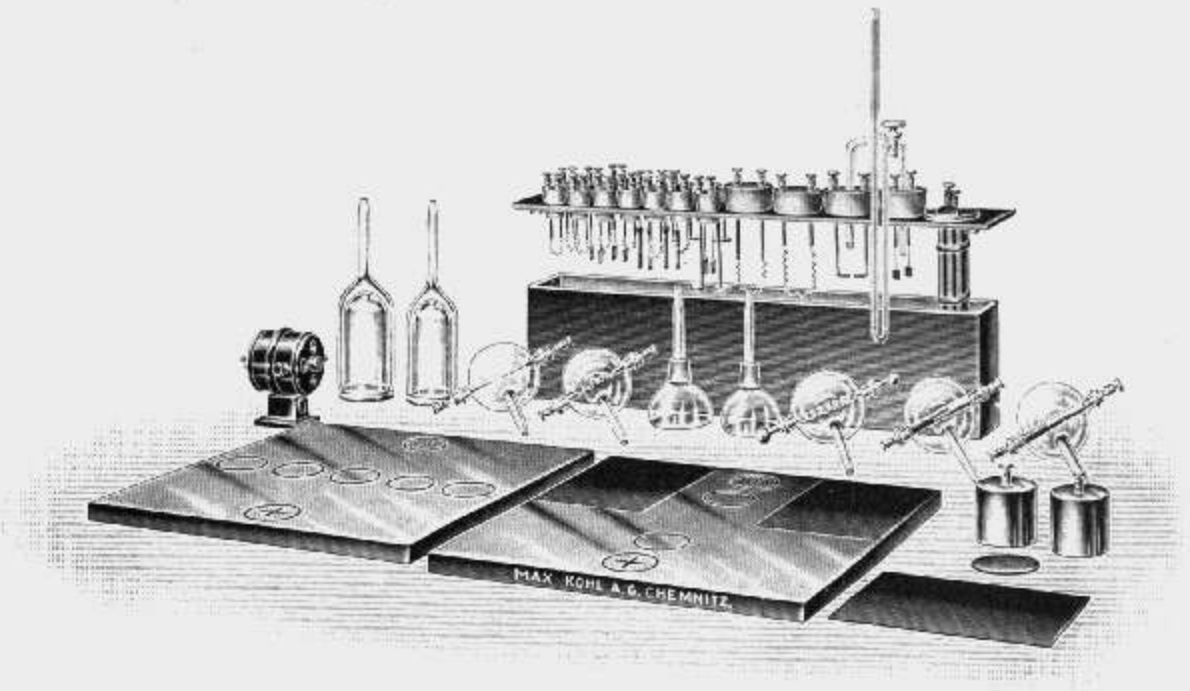
Tops for Experiment No. 91, p. 78: see No. 52,078/83, p. 291.

54,966. **Accessories for Heat Experiments on Condensation of Gases and Vapours** (Experiment Nos. 92—99) 0. 16. 0

For demonstrating the heat during the absorptions of gases through solids and liquids, the condensing of gases and water vapour on wearing apparel.

1 Gas Conduit Pipe (Fig. 33).
1 large Hemisphere with straight tube, with cork and board.
1 beaker (Fig. 35).
4 Glass Vessels for sulphuric acid and water respectively (Fig. 36).
1 Boiling Flask with cork and glass tube.
1 four-sided Glass Plate.
3 cylindrical Capsules, two covered with wool, one with cotton, with plugs and boards (Fig. 36).

Cl. 6194, 6182, 6181.



54 968. 1 : 9.

54,967. **Accessories for Experiments on Heat from chemical combinations,** Figure (Experiments Nos. 100 to 115) . . . . . £ s. d. 1. 10. 0

†1 large Hemisphere with straight tube.
1 spherically widened Vessel (Fig. 47).
†1 large Beaker.
1 cylindrical Glass with lid (Fig. 38).
1 Receiver with capsule and cover (Fig. 38).
1 Apparatus for combining ammoniacal gas with carbonic acid, with rubber bellows (Fig. 39).
2 rectangular bent Copper Rods.
2 Bunsen Burners No. 51,184.

54,967a. **Small Collection of Accessories for Experiments on Heat from chemical Combinations** (Experiments Nos. 100, 100 a, 101, 102—105, 107, 108, 109, 114), consisting solely of the apparatus marked † in No. 54,967 . . . . . 0. 3. 0

54,968. **Accessories for Experiments on Thermal Effects of the Electric Current,** Figure (Experiments Nos. 116 to 136 . . . . . Price (subject to fluctuation) 8. 5. 0

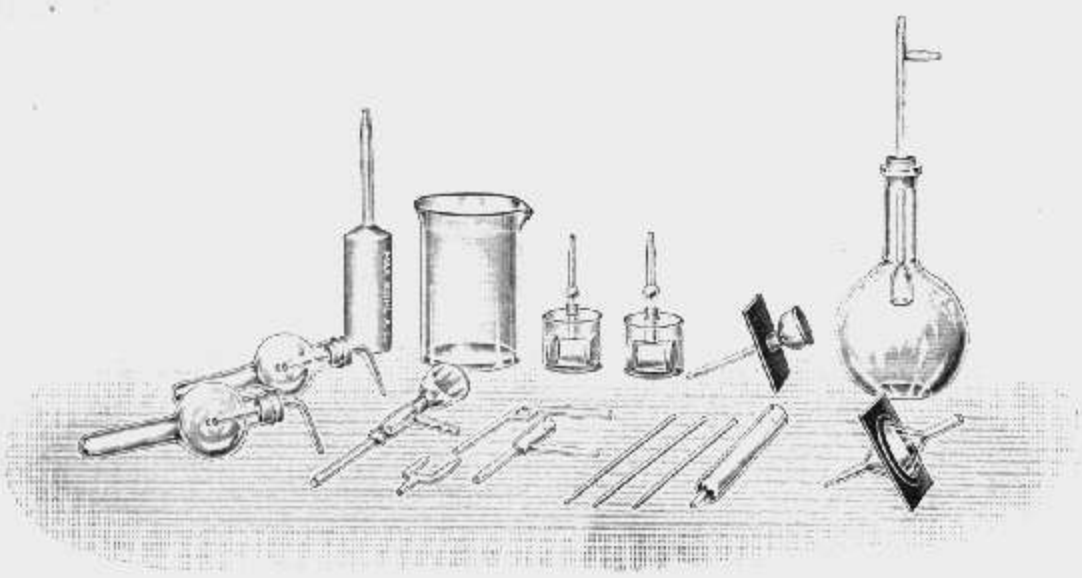
For showing that heating is proportional to the length of the conductor, that it is proportional to the square of the current density, that it is independent of the specific resistance and thickness of conductor, demonstration and propagation of electric current lines, heat on decomposition of water, heat during electrical work, heating of wires by a discharge impulse, heat of the induction current, heating in a Hittorf Tube and in a thermocouple, formation of ozone by electric sparks.

÷2 platinum wire Spirals 15 and 30 cm long resp., 0.2 mm thick.
÷2 pairs adjustable Copper Electrodes (Fig. 40).
2 further platinum wire Spirals 15 cm long, with plugs, 0.2 mm thick.
2 platinum wires in glass bulbs, single and double wire-lengths.
1 Silver Wire and 1 Copper Wire 15 cm long, with plugs.
1 platinum Wire of double thickness, 15 cm long, 0.4 mm diameter with plugs.
2 small Boards with tinfoil slabs, 2 connecting blocks, and some sheets tinfoil.
2 small Hemispheres.
2 pair platinum Electrodes.
1 Stopper with accumulator plates, size of 3,5 × 9 cm.
1 large Capsule for above.
2 platinum Wires of 2.5 and 1.5 ohm respectively.
1 pair Copper Electrodes.
2 small zinc-carbon Electrodes.
1 small electric Motor.
1 rubber Bung with manometer and 3-way cock, also with 2 platinum electrodes 1 sq. cm.
1 large Capsule for above.
†1 Riess Bulb with tube attachment.
2 Glass Bulbs with thermocouples.
1 rubber Bung with thick copper wires and eye for potassium iodide starch-paste paper, after Lüdke (Fig. 45).
1 Wood Box for containing preceding parts, see Fig. 54,968.

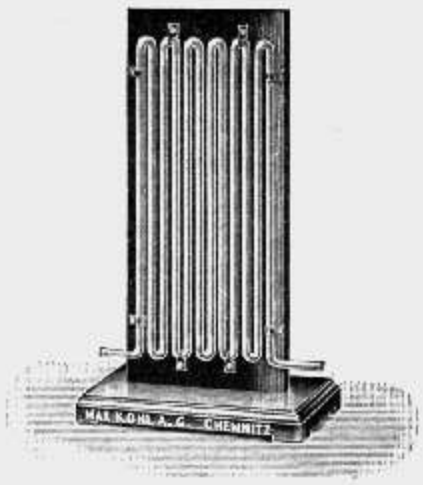
Batteries of Accumulators with pachytrope for connecting the cells singly and in parallel: see Nos. 60,946/93.

Influence Machines, Leyden Jar Batteries, Measuring Flasks, spark-drawing Devices, Induction Coils, Hittorf Tube: see "Electricity" Section.

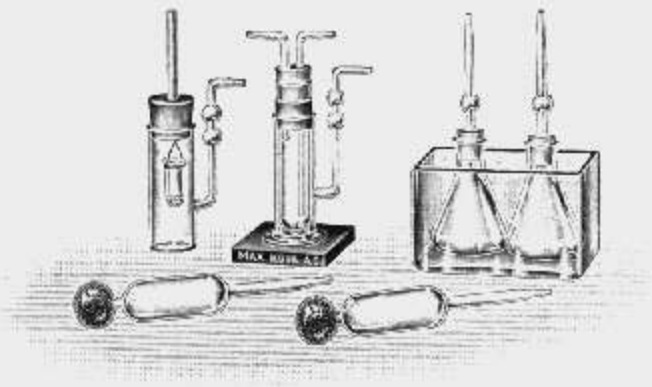
54,968a. **Small Collection of Accessories for Experiments on Thermal Effects of the Electric Current** (Experiments Nos. 116, 117, 118,[1] 119, 120, 121), comprising solely the items marked † in No. 54,968 . . . . . 0. 16. 0



54 969. 1 : 9.



54 969 A. 1 : 8.



54 970. 1 : 8.

54,969. **Accessories for using the Thermoscope as a Manometer** (Experiments Nos. 137—157a), Fig. 54,969 and 54,969 A . . . . . £. s. d. 1. 16. 0

For experiments on gas osmose, the absorption and ejection of gases, relations between carbonic acid and lime water (formation of stalactites), demonstration of water content and of carbon dioxide in air, vapour tension of water, alcohol and ether; buoyancy of gases, propagation of pressure, suction effect of outflowing air, measurement of adhesion in capillary tubes, pressure of a liquid column, demonstration of tension in soap bubbles, Newton's colour rings, porosity of clay.

1 Porous Pot.
1 Glass Beaker for above.
†2 Osmose Apparatus after Niemöller (Fig. 46 a).
†2 Vessels for inserting.
†1 Bell Funnel after Steinbrinck.
†2 spherical Capsules with constriction (Fig. 47).
1 forked Tube (Figs. 48 and 52).
1 multiple bent Glass Tube on stand (Fig. 54,969A) (Fig. 48).
1 Model of water air pump (Fig. 49).
1 Vaporiser (Fig. 50).
1 Tube for suction and pressure effects (Fig. 51).
3 different Capillary Tubes.
1 wide Glass Tube with point.
†1 soap-bubble Apparatus (Fig. 53).
1 Clay Slab with funnels attached

54,969 a. **Small Collection of Accessories for using the Thermoscope as a Manometer** (Experiments Nos. 137a, 137 b, 138—149, 157), comprising solely the items marked † in No. 54, 969, for experiments on gas osmose, absorption and ejection, tension in soap-bubbles 0. 12. 0

54,970. **Accessories for various Experiments,** Figure (Experiments Nos. 158—161) 1. 0. 0

Demonstration of heat by physiological processes, proving that solutions of salts take up sometimes a smaller and sometimes a larger space than the individual substances together, inequality of dilatation of two liquids.

2 Capsules filled with shot.
Cylindrical Vessel with tube attached.
Stopper with glass rod and perforated reagent glass.
2 Erlenmeyer Flasks with stoppers, spherical tubes and water bath.
Apparatus for expansion of water on freezing (Fig. 55).

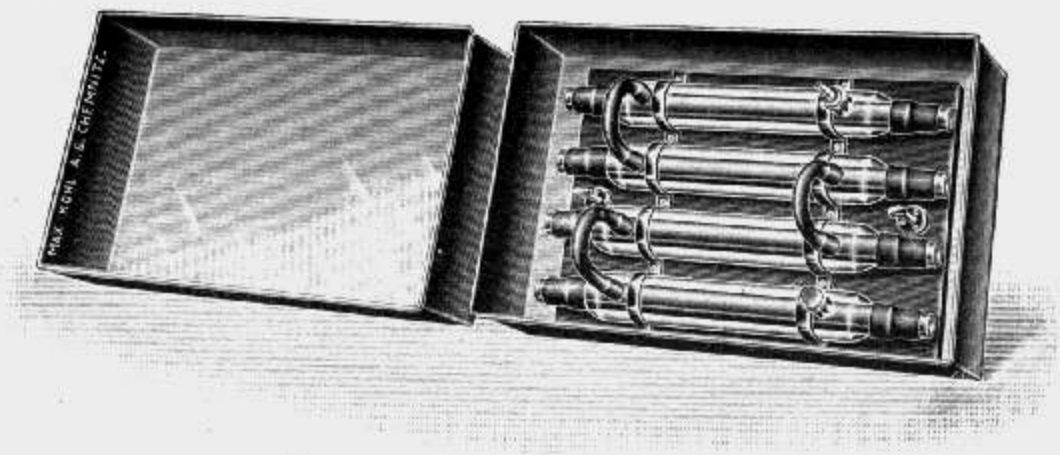
54,971. **Accessory Apparatus for Determining the absolute Expansion of Water,** Figure (Figs. 56—58) . 2. 10. 0

54,972. **Dew-point Finder** after Looser, Figure (Experiment No. 163, Fig. 59) 0. 10. 0

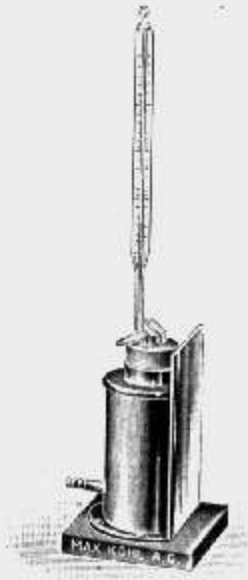
Boxes and Stands for taking the various accessories are prepared on application and charged at lowest possible cost. We would ask in this case that the collections of accessories should be mentioned which are to be placed in boxes or on stands.

Cl. 6198, 5509, 6197.

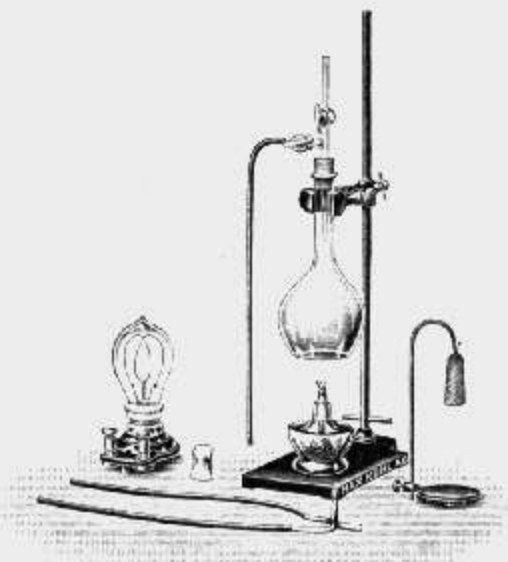
Max Kohl A. G. Chemnitz, Germany.



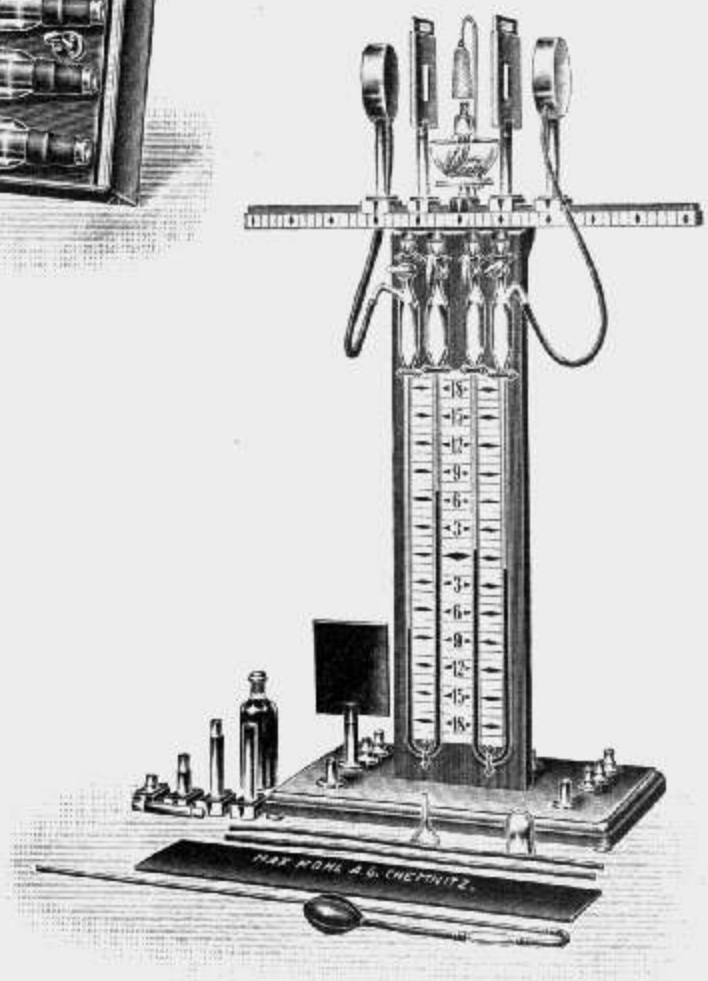
54 971. 1 : 11.



54 972. 1 : 6.



54 975. 1 : 10.



54 973, 54 975, 54 976. 1 : 10.

54,973. **Differential and Double Thermoscope** after Kolbe, Figure, for experiments on heat and electricity (Ztschr. f. d. phys. u. chem. U. **15**, 1902, p. 333; Kolbe, „Anleitung zu 30 der wichtigsten Schulversuche", see No. 54,974). For making the experiments a suitable selection should be ordered with the apparatus from Nos. 54,975—54,997 . £ s. d. 4. 8. 0

In some of the collections of accessories, e. g., in No. 54,995, a few necessary apparatus for the experiments are mentioned at the end, these not being included in the price. These articles must be specially ordered unless already available.

The Figure Numbers mentioned in the Accessories refer to the Introduction Number 54,974.

The apparatus consists of a polished wood stand to the back wall of which are fixed two manometers having plain scale. The two limbs of the manometers are provided with enlargements and have each at their upper end a stopcock and a funnel-shaped opening for filling. The enlargements have tube attachments so as to be capable of being connected to receivers by lengths of rubber tubing. The receivers are attached to sliders which can be slipped along a bar, provided with a scale and fixed above the stand.

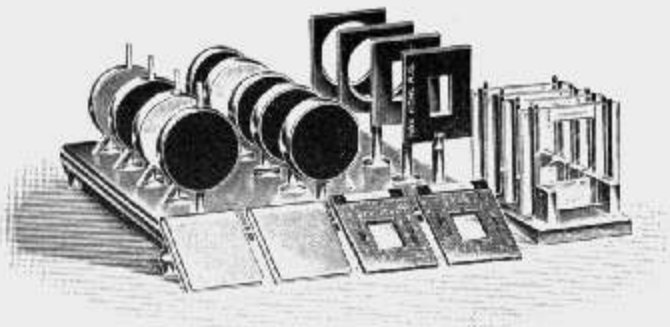
Supplied with the apparatus are: 9 sliders, four with long tubes for the receivers, three with medium long tubes for the double screens, two with short tubes for the thermal sources; 1 attachable tube for the sources of heat (box shape); 4 lengths rubber tubing, each 400 mm long; 1 filler (Fig. 2); 1 piece cardboard for concealing the second scale; 1 small funnel for flushing the manometer tubes; 1 small flask with 100 ccm of aqueous solution of acetine blue (ready for use); 1 double screen without piece cut out.

54,974. **Introduction** to 30 of the most important School Experiments with the Kolbe Differential and Double Thermoscope (48 pages, 34 illustrations) (in German). **Gratis and post-free.**

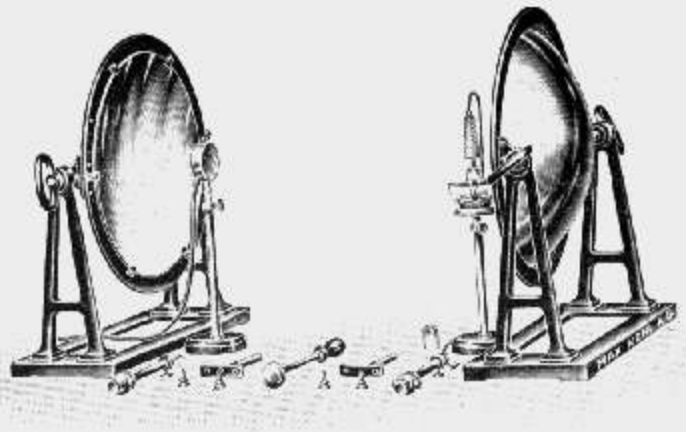
The Figure Numbers mentioned in the following lists of accessories refer to this Introduction.

54,975. **General Accessories for Experiments on Heat,** Fig. 54,973 (Fig. 1, Experiments Nos. 1—16) 1. 6. 0

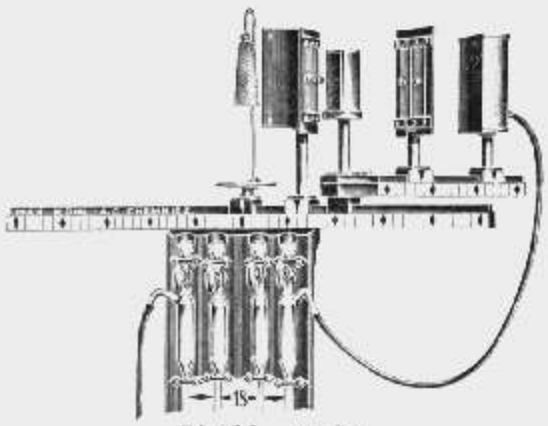
(a) 1 Boiling Flask with rubber bung; 1 Tube with 2 stopcocks; 1 thick walled Rubber Tube 40 cm long; 1 fork-shaped Glass Tube with 2 short lengths rubber tubing and 1 metal stand for the boiling flask (£ **0. 11. 0**); (b) 1 small Stand with spirit lamp and wire gauze globe 50 cm high (£ **0. 6. 0**); (c) 1 Glow Lamp with socket, on plate with two terminals (£ **0. 9. 0**).



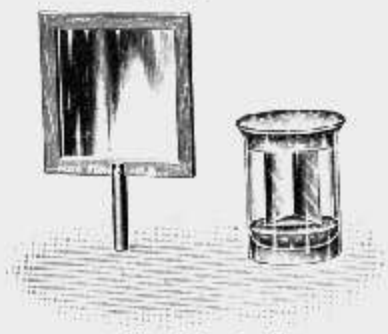
54 976, 54 977. 1 : 10.



54 983. 1 : 16.



54 984. 1 : 10.



54 985. 1 : 7.

	£ s. d.
54,976. **Accessories for Experiments on Absorption, Emission and Permeability of Heat Rays,** Figure (Experiments Nos. 1—4)	4. 10. 0
(a) **Thermal Sources:** 4 Metal Boxes for steam heating, black-black, black-white, black-polished, polished-dull (Figs. 3 and 4, £ **1. 2. 0**); (b) **Receivers:** 5 Metal Receivers, round pattern, 2 black-white, 1 each black-polished, white-dull, polished-dull (Figs. 3 and 4, £ **1. 7. 0**); (c) **2 double Screens** with rectangular piece cut away for taking rock salt, plate glass, etc. slabs (Fig. 4, £ **0. 6. 0**); (d) **2 U-shaped Aluminium Sheets** for closing the apertures (£ **0. 2. 0**); (e) **2 Slabs** mounted in cork, 40 × 30 mm, **of rock salt and plate glass** (Fig. 4, £ **0. 13. 0**); (f) **2 double Screens** with round opening 75 mm diameter for taking the flat glass vessels (Fig. 5a, £ **0. 7. 0**); (g) **4 flat thin-walled Glass Vessels** for distilled water, alcohol, iodine solution and concentrated ferrous sulphate solution (Fig. 5b, £ **0. 13. 0**). The accessories No. 54,975 should also be ordered and possibly also Nos. 54,978—54,982	
54,977. **Board** with 15 Brass Sockets for containing the Metal Receivers, with pasteboard cover, see Fig. 54,976	1. 12. 0
54,978. **Alum Slab,** mounted in cork (addition to Expt. No. 3)	0. 11. 0
54,979. **Gypsum Slab** ditto (ditto 3)	0. 11. 0
54,980. **Mica Slab** ditto (ditto 3)	0. 11. 0
54,981. **Rock Crystal Slab,** cut perpendicular to axis, mounted in cork (addition to Expt. No. 3)	0. 14. 0
54,982. **Rock Crystal Slab,** cut parallel to axis, mounted in cork (addition to Expt. No. 3)	0. 14. 0
54,983. **Accessories for Experiments on Reflection of Thermal Rays on concave Mirrors,** double and triple reflection, cold rays (Experiment No. 5, I—III), Figure	7. 0. 0
(a) **2 spherical concave Mirrors,** 400 mm diameter and 175 mm focal distance, of German Silver, on adjustable stands (Figs. 6 and 31, £ **6. 0. 0**); (b) **1 small Metal Receiver** 65 mm diameter on adjustable stand, and 1 rubber tube 55 cm long, and 1 small Glass Tube (Figs. 6 and 31, £ **0. 13. 0**); (c) **1 adjustable Stand** for the spirit lamp stage, with wire gauze globe (Figs. 6 and 31, £ **0. 6. 0**); (d) **1 White-metal Slab,** 600 and 400 mm (Fig. 7, £ **0. 1. 0**); Accessories No. 54,975 should also be ordered.	
54,984. **Accessories for Experiments on Refraction of Thermal Rays** (Experiment No. 6, Fig. 8), Figure . .	7. 8. 0
(a) **1 semi-cylindrical Double Screen** with adjustable gap (£ **1. 0. 0**); (b) **1 equilateral Rock Salt Prism,** 35 mm side and 70 mm height, with stage (£ **3. 17. 0**); (c) **1 rotary Bar** with divided circle (£ **1. 8. 0**); (d) 1 simple plane Gap (£ **0. 12. 0**); (e) **1 semi-cylindrical Receiver,** the plane side black (£ **0. 9. 0**); (f) **1 Wire Gauze Globe** 70 mm high, on thick wire stirrup (£ **0. 2. 0**). Accessories No. 54,975 should also be ordered.	
54,985. **Accessories for Experiments on Total Reflection and Reflection on plane Metal Mirrors** (Experiments Nos. 7 and 8, Fig. 8), Figure	4. 1. 0
(a) **1 rectangular Rock Salt Prism,** 35 mm side and 70 mm height, with stage (£ **3. 17. 0**); (b) **1 nickelled plane Mirror,** o. metal, 100 × 100 mm (£ **0. 4. 0**). Accessories Nos. 54,975 and 54,984 should also be ordered.	
54,986. **Accessories for Experiments on Thermal Conduction of Solids** (Experiments No. 9, Fig. 9), Figure	1. 2. 0
(a) **2 Metal Receivers** in the form of truncated cones (£ **0. 11. 0**); (b) **2 Sheet Iron Flasks** for hot water or steam heating (£ **0. 9. 0**); (c) **2 each round Wood Slabs** cut with and across the grain, of pine, poplar and oak, 50 mm diameter, 10 mm thick (£ **0. 2. 0**). Accessories No. 54,975 should also be ordered and perhaps also Nos. 54,987/90.	

Cl. 6166, 6164, 6168, 6175.

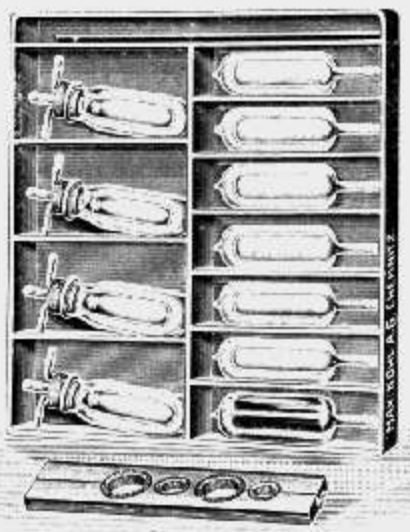
Max Kohl A. G. Chemnitz, Germany.



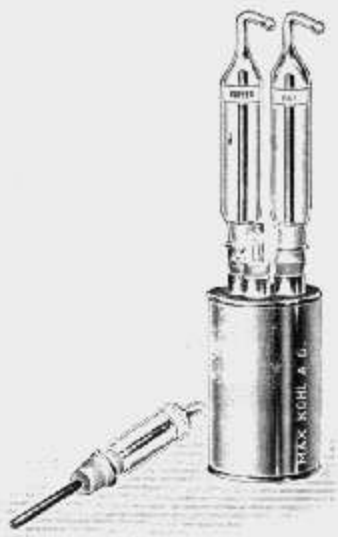
54 986. 1 : 7.



54 992. 1 : 10.



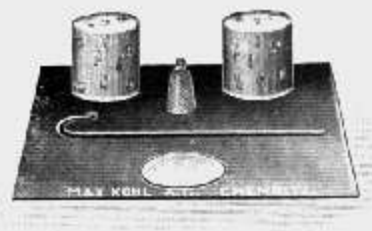
54 993. 1 : 7.



54 991. 1 : 7.



54 994. 1 : 6.

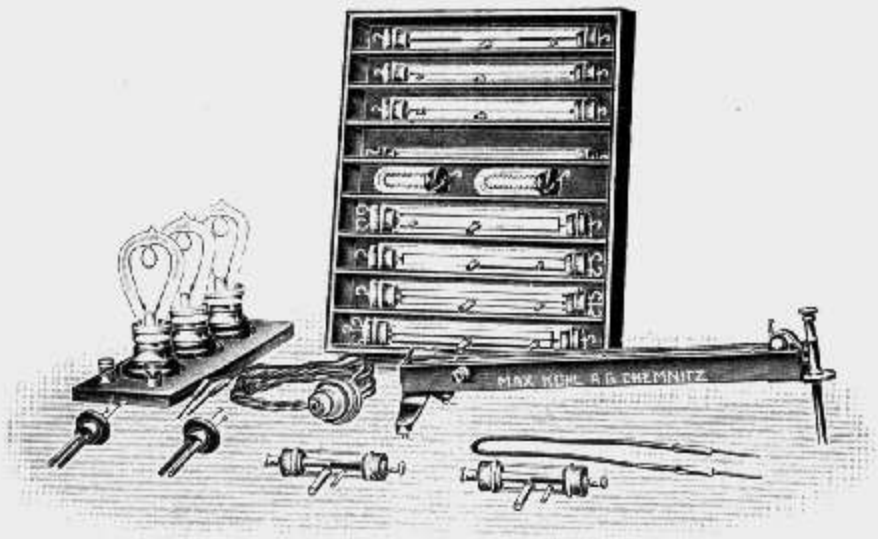


54 995. 1 : 7.

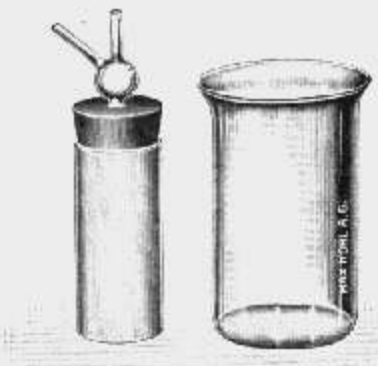
	£ s. d.
54,987. **Gypsum Slab,** round, 50 mm diameter, 10 mm thick (addition to Expt. No. 9)	0. 10. 0
54,988. **Alum Slab,** round, 50 mm diameter, 10 mm thick (addition to Expt. No. 9)	0. 10. 0
54,989. **Rock Crystal Slab,** round, 50 mm diameter, 10 mm thick, cut parallel to axis (addition to Expt. No. 9)	0. 13. 0
54,990. **Rock Crystal Slab,** round, 50 mm diameter, 10 mm thick, cut perpendicular to axis (addition to Experiment No. 9)	0. 13. 0
54,991. **Accessories for Experiments on Thermal Conduction of Metal Rods** (Experiment No. 10, Fig. 10), Figure (a) **1 Sheet Metal Vessel** with 3 necks (£ **0. 7. 0**); (b) **2 Copper Rods,** 250 mm long, 6 mm thick, in tubular glass receivers (£ **0. 6. 0**); (c) **1 Lead Rod,** 250 mm long, 6 mm thick, in tubular glass receiver (£ **0. 3. 0**). The following rods are also intended for these experiments.	0. 16. 0
54,992. **6 further Metal Rods,** Figure, 250 mm long, 6 mm thick, in tubular glass receivers (a) Aluminium (£ **0. 3. 0**); (b) Brass (£ **0. 3. 0**); (c) German Silver (£ **0. 3. 0**); (d) Zinc (£ **0. 3. 0**); (e) Tin (£ **0. 3. 0**); (f) Iron (£ **0. 3. 0**).	0. 18. 0
54,993. **Accessories for Experiments on Thermal Conduction of Liquids and Gases** (Experiment No. 11), Figure without box . . . . . (a) **4 Double Vessels** of glass, for water, alcohol, oil and mercury; **1 length Rubber Tubing** with glass tube (£ **0. 18. 0**); (b) **1 Wood Fillet** with hinge, for taking two double vessels (£ **0. 3. 0**); (c) **5 Glass Double Vessels,** filled with air, oxygen, hydrogen, illuminating gas, and carbon dioxide, sealed up (£ **1. 8. 0**); (d) **1 evacuated Double Vessel,** unsilvered (£ **0. 5. 0**); (e) **1 evacuated Double Vessel** silvered inside (£ **0. 8. 0**).	3. 2. 0
54,994. **Accessories** for Experiments on **Specific Heat of Solids and Liquids** (Experiments Nos. 12 and 13) Figure . . . . . (a) **2 Double-walled Glass Receivers** with ccm graduation and wood lids (Fig. 12, £ **0. 9. 0**); (b) **5 Metal Bodies** of same weight and same area, 2 of copper, 1 each of lead, tin and iron (£ **0. 9. 0**). In addition, the sheet iron vessel No. 54,991a must be available.	0. 18. 0
54,995. **Accessories for Experiments on Thermal Consumption on Evaporating, Generation of Heat by Mechanical Work, Decrease of Heating with the Square of the Distance** (Experiment No. 14—16), Figure . . (a) **2 thick artificial Corks,** 60 mm diameter, **12 round blotting paper discs,** 50 mm diameter and 1 piece sandpaper (£ **0. 2. 0**); (b) **1 Wire Gauze Globe,** 30 mm high, on wire stirrup (£ **0. 2. 0**). In addition, the two Receivers No. 54,985a and the two Receivers No. 54,976b, black-white, must be available.	0. 4. 0

Cl. 6160, 6170, 6165, 6162, 6172, 6159.

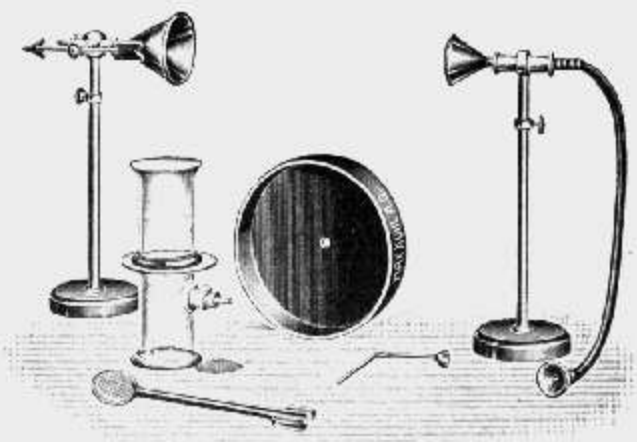
Max Kohl A. G. Chemnitz, Germany.



54 996. 1 : 7.



54 997. 1 : 7.



54 998. 1 : 10.

54,996. **Accessories for Experiments on the Heating Effect of the electric Current** (Experiments Nos. 17—23), Figure . . . . . £ s. d. 5. 10. 0

(a) 1 tubular Receiver with a constantan wire 100 mm long (Fig. 13, £ **0. 4. 0**); (b) 2 tubular Receivers each with constantan wire 200 mm long (Figs. 13 and 15, £ **0. 9. 0**); (c) 1 Series Resistance with a constantan wire 200 mm long (Fig. 15, £ **0. 4. 0**); (d) 1 Closed Circuit Fall Trough No. 51,729 (Fig. 14, £ **1. 6. 0**); (e) 2 Constantan Wire Spirals with cork mount, contained in reagent glasses (Fig. 16, £ **0. 5. 0**); (f) 2 tubular Receivers each with 2 constantan wires (£ **0. 9. 0**); (g) 1 tubular Receiver with three wires of copper, iron, and constantan (Fig. 18, £ **0. 5. 0**); (h) 1 tubular Receiver with three wires of different diameter (Fig. 19, £ **0. 5. 0**); (i) 1 Lamp Resistance with three 110 volt Glow lamps (£ **0. 16. 0**); (j) Double Conductor 2 m long with screw plug and plug contact and simple connecting lead 40 cm long (£ **0. 5. 0**); (k) 2 pair Copper and Zinc Rods in cork mount (Fig. 20, £ **0. 4. 0**); (l) 2 tubular Receivers with double rods of antimony and bismuth (Fig. 21, £ **0. 18. 0**).

If the network voltage is other than 110 volts kindly quote pressure when ordering. The two double-walled Receivers No. 54,994 a are also used.

54,997. **Accessories for Experiments on Gas Osmose** (Experiments Nos. 24 and 25), Figure 0. 5. 0

1 Porous Pot with rubber stopper and glass tube and a glass beaker (Figs. 22 and 23).

54,998. **Accessories for Manometric Experiments,** Figure (Experiments Nos. 26, 27, 29, 30), Action of the Looser-Dubrofski Aspirator, Reflection of Sound Waves after Trussevitch-Rostovzeff, Absorption of Gases through a rotating body carries air with it 2. 10. 0

(a) 1 Vaporiser as aspirator (Fig. 24, £ **0. 2. 0**); (b) 1 Kundt Manometer in a Trussevitch stop-cock arrangement, No. 53,191, with sound horn and with pointer for direction of air current, on stand (Figs. 25 and 32, £ **1. 0. 0**); (c) 1 tuned Pipe on stand (Figs. 25 and 32, £ **0. 12. 0**); (d) 1 Absorption Vessel, consisting of two tall cylinders, one spring wire net and one glass plate (£ **0. 10. 0**); (e) 1 pair Wire Net Tongs (Fig. 34, £ **0. 4. 0**); (f) 1 Pasteboard Cylinder with bottom, for fixing on the Whirling Table (£ **0. 2. 0**). In addition, spherical concave Mirror No. 54,983 a is used for Experiment No. 27, and one black-polished Receiver No. 54,976 b for Experiment No. 30.

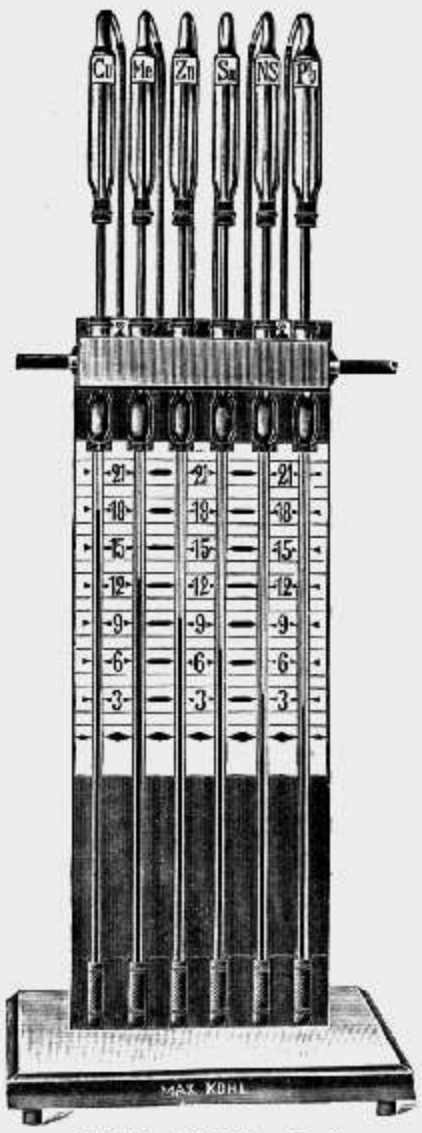
Boxes and Stands for taking the individual parts are constructed if desired and charged at lowest possible rate. It is requested that the collections of accessories that are to be fitted in boxes or on stands should be stated.

Speaking generally, it is advisable to provide a separate box for each of the collections listed under a separate List No.; only the smaller collections are combined with the larger. The boxes and stands are made of wood or pasteboard.

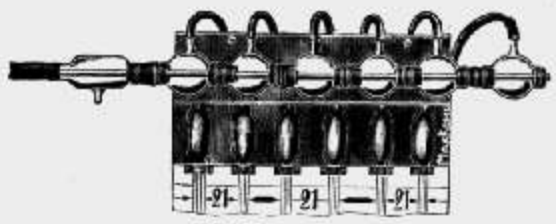
Cl. 6173, 6176, 6167.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



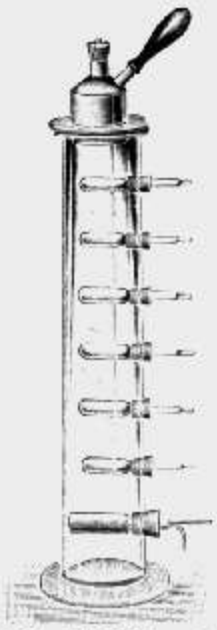
54 999, 55 000. 1 : 8.



55 001. 1 : 8.



55 003 (55 000). 1 : 7.



55 002, 54 986 b. 1 : 8.



55 005. 1 : 7.

54,999. **Sextuple Manometer** after Kolbe, Figure, for demonstrating simultaneously the thermal conduction of six different solids, the temperature drop in a solid, the thermal conduction in a liquid from top to bottom and vice versa; and electric conductivity, in conjunction with the accessories listed under Nos. 55 000—55 009 and 54,975, which should be ordered separately. The price does not include the receivers for heat experiments, illustrated in the Figure, or the heating box (Kolbe-Skellon, Introduction to electricity, part 2, Fig. 127) . . . . . £ 3. 17. 0

A detailed description of the apparatus and the experiments which can be made with it is contained in the Introduction Nr. 54.974 (sent free on application). The illustration numbers mentioned in the accessories refer to this Introduction.

55,000. **6 Receivers with Metal Rods** and Heating Box, Fig. 54,999, for demonstrating the thermal conduction of different metals (Fig. 28), with rods of copper, brass, zinc, tin, German Silver, and lead, coated with thermo-paint 1. 0. 0

55,001. **Copper Rod with 6 Receivers,** for the thermal drop, Figure (Fig. 29) 1. 0. 0

55,002. **Tall Glass Vessel with 6 Receivers (Glass)** and 1 Heating Box for Experiments on Thermal Conduction in Liquids, Figure, arranged for heating the liquid columns from below and from above 1. 8. 0

For heating from above one Sheet Iron Flask No. 54,986 b is necessary, this being excluded from the price 0. 4. 6

55,003. **6 Tube Receivers with Metal Wires** for electric Resistance Comparisons, Figure, with wood fillet for placing on the sextuple manometer 1. 4. 0

The wires included in the Receivers are of equal length and thickness.

These Receivers can also be inserted in the heating boxes contained in No. 55,000.

A closed-circuit fall trough No. 54,996 d is necessary for the experiment and should be ordered with the above if not already available.

55,004. — idem, without the receiver with platinum wire 1. 0. 0

55,005. **6 Double Glass Vessels** for Comparison of electrical Resistance (Kolbe-Skellon, Introduction to electricity, part 2, Fig. 128), divided in cubic centimetres, and **6 Wires conducted through Corks,** with wood fillet for placing on the sextuple manometer, for the Lenz-Looser experiment, Figure . . . 2. 0. 0

55,008. **Box** for storing the glass parts of Nos. 55,000—55,005 . . . . . 0. 15. 0

55,009. — idem, the removable lid being provided with 15 sockets 2. 0. 0

Cl. 1764, 6169, 1763, 3414, 6161.



55 010 A.
1 : 5.



55 010 B.
1 : 8.



55 010 C.
1 : 8.



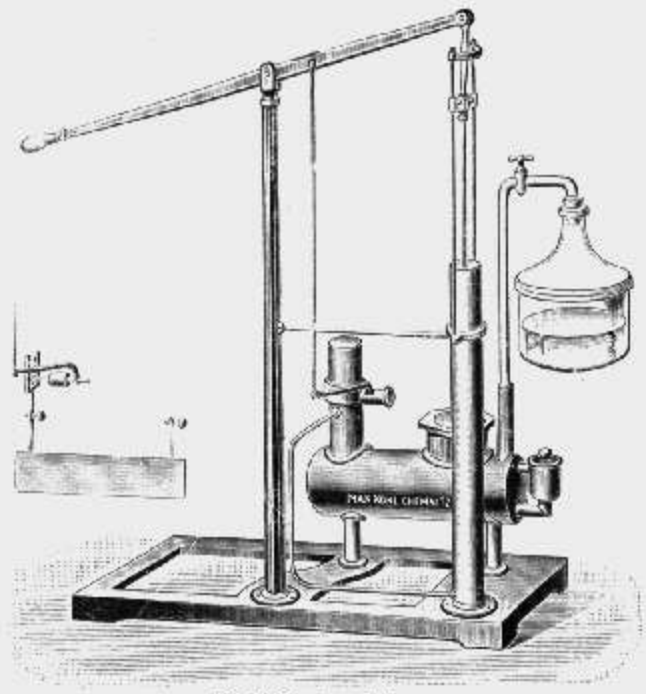
55 010 D.
1 : 8.



55 013. 1 : 4.



55 016. 1 : 3.



55 019. 1 : 12.

55,010. **Colour Thermoscope** after H. Rebenstorff, Figs. A—D (Ztschr. f. d. phys. u. chem. U. **9**, 1896, p. 227; and **15**, 1902, p. 145; W. D., 4th Edn., pp. 568 et seq.) . . . . £ 1. 2. 0

The mode of action is based on the fact that mercuric iodide with which the apparatus in question is coated changes its colour when submitted to temperature variations. While it is quite yellow at ordinary temperature, it becomes red when heated to from 45° to 50° C., assuming the yellow colour when cooled below 35° C.

The complete set of apparatus comprises: 1 Card with 5 thermopaints, 80 × 160 mm; Glass Tubes filled with hydrogen and air, Fig. C; 1 Tinfoil Screen, Fig. A; 1 Screen with rock salt and glass slab, Fig. D; 1 Sheet Iron Screen with two wood wedges, Fig. B; and 1 Brass Stand with polished wood base.

55,011. **10 thermoscopic coloured Sheets** after Rebenstorff (Ztschr. f. d. phys. u. chem. U. **21**, 1908, pp. 291 and 304) 0. 4. 0

55,012. **Autogram Discs for colour thermoscopes,** Figure 0. 3. 0

The disc is coated half yellow and half red (with silver mercury iodide and copper mercury iodide respectively) and transparent sections cut away. When held high above a flame the temperatures of the enantiomorphic molecular changes (45° and 70° C.) are shewn.

55,013. **Sensitive thermoscopic Sound,** Figure 0. 10. 0

The Sound, coated with thermoscopic paint, consists of a sheet iron capsule for lukewarm water or thermophoric substance.

Change of State.

55,014. **Freezing Thermometer,** for shewing the over-cooling of water and the generation of heat on freezing, with stand (M. P. III, Fig. 320 [II, 2, Fig. 88]; Gan.-Rein., Fig. 336) 0. 10. 0

* 55,015. — idem, Figure, with transparent scale for objective demonstration, small pattern, with stand 0. 7. 0

55,016. **Hollow Iron Sphere with closing screw** (Explosion Ball), Figure, for shewing the increase of volume when water freezes (W. D., Fig. 351 [331]; Gan.-Rein., Fig. 339; M. T., p. 153) 0. 1. 8

The closing screw need only be provided once and can be used for a number of experiments.

55,017. **Iron Sphere alone,** as spare 0. 0. 10

55,018. **Cooling Vessel** of stout wood, for above, with lid, for holding the fractured pieces of the bursting sphere 0. 5. 0

Ice Machines for generating Ice by a freezing Mixture or by the combination of Heat on dissolving Ammonium Nitrate: see p. 214.

Ice Machines after Carré, Figure, with air pump (M. P. III, Fig. 360 [II, 2, Fig 217]; Gan.-Man., Fig. 172, I, II; Gan.-Rein., Fig. 363).

List No.	55,019	55,020	55,021	55,022
Generates Ice, kg	2	3—4	4—6	10—12
£	**11. 0. 0**	**13. 10. 0**	**15. 0. 0**	**30. 0. 0**

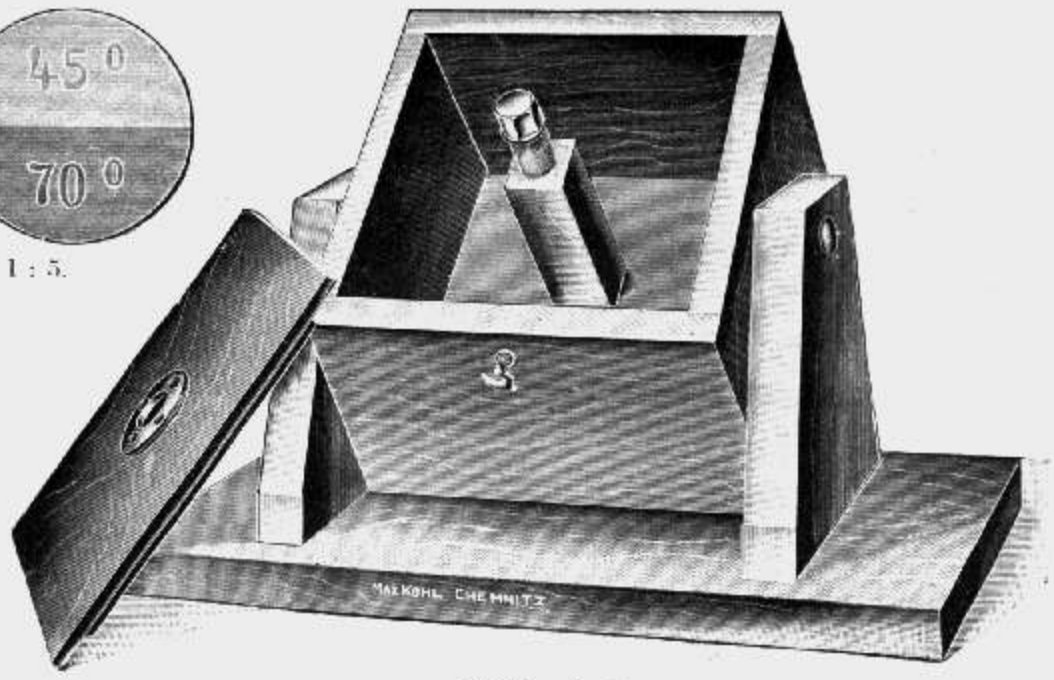
* Can be used with the Projection Apparatus.

Cl. 1765, 1766, 1767, 1768, 4504, 6207, 1777.

Max Kohl A. G. Chemnitz, Germany.



55 012. 1 : 5.



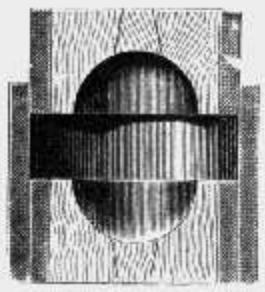
55 026. 1 : 6.



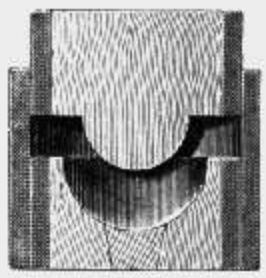
55 031. 1 : 9.



55 015. 1 : 3.



55 029 A. 1 : 2.



55 029 B. 1 : 2.

Max Kohl A. G. Chemnitz, Germany.

55,023. **Ice-breaking Machine,** 300 mm high, 165×125 mm upper aperture, width of rolls 90 mm . . . . . £ s. d. 0. 16. 0

55,024. — i d e m, 340 mm high, 165×130 mm opening above, width of rolls 120 mm . 1. 4. 0

These machines break up the ice with great ease and rapidity. They are supplied either tin plated, galvanised or lacquered.

55,025. **Wood's Metal** in bars, melting at 65° C. (W. D., p. 512) per 50 g 0. 2. 0

55,026. **Mousson's Apparatus,** F i g u r e (M. P. III, Figs. 330/2 [II, 2, Fig. 98—100]; Gan.-Rein., Fig. 333), for liquefying ice under high pressure at low temperatures, with stand, key and reversible wood vessel for inserting the apparatus and the cold mixture . . 2. 10. 0

55,027. **Small Thermocouple** of iron and German Silver, for inserting with ice in the hydraulic press in order to shew that melting brought about by pressure increase, and the combination of heat taking place, causes a decrease in temperature (W. D., Fig. 414 [390]) 0. 5. 0

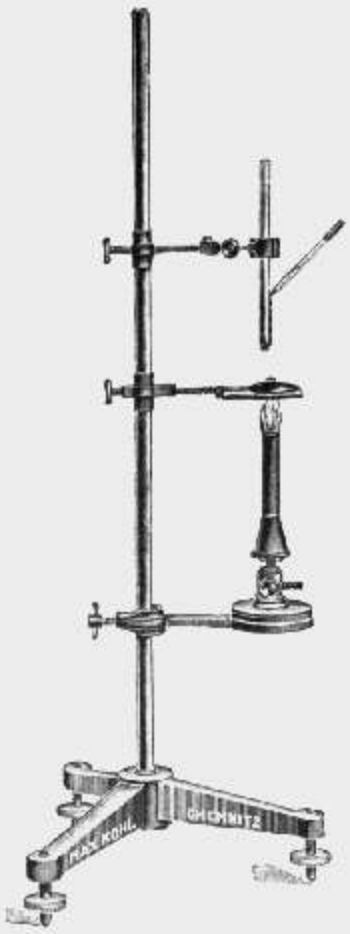
55,028. **Wood Frame, Hook and Wire** after Bottomley, for melting an ice block through by means of a heavily loaded wire (W. D., Fig. 415 [391]) 0. 5. 0

55,029. **3 Moulds for Ice Regelation,** Figs. A and B, of brass (W. D., Figs. 411—413 [387—389]), for use under the hydraulic press . . . . . Price, each £ **0. 6. 0** 0. 18. 0

55,030. **2 Iodine Tubes,** one filled with Air, the other exhausted (W. D., pp. 535 and 536), for shewing the vapour in the air-filled space and demonstrating critical pressure . . 0. 7. 0

55,031. **Steam Barometer,** F i g u r e, filled, for shewing the tension of water vapour with increasing temperature (W. D., Fig. 353 [333]), with stand, ready for use 1. 4. 0

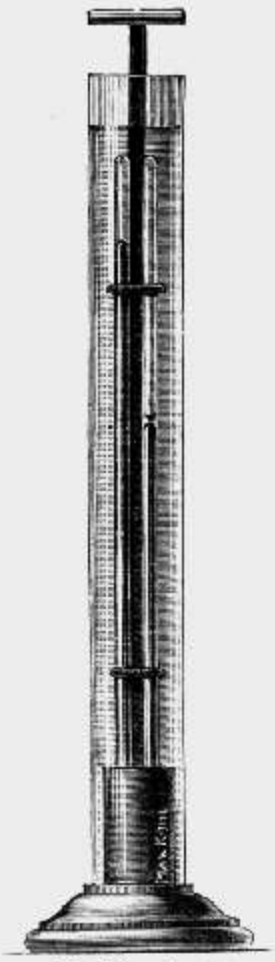
55,032. **Detonation Balls** (W. D., p. 518 [479]) . . . . . Per dozen 0. 0. 6



55 036. 1 : 7.



55 037. 1 : 12.



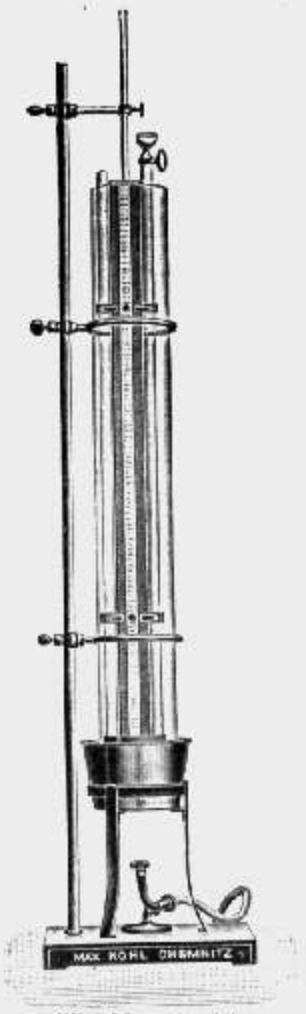
55 039. 1 : 10.

	£ s. d.
55,033. **Copper Dish with Wire Triangle,** for Leidenfrost's Experiment (W. D., Figs. 355 and [335]; M. T., p. 112)	0. 2. 0
55,034. **Aluminium Dish** after Rebenstorff (Ztschr. f. d. phys. u. chem. U. **19**, 1906, p. 29)	0. 1. 0
55,035. **Platinum Dish with Wire Triangle,** for the same experiment	0. 18. 0
* 55,036. **Apparatus** after Boutigny **for the Leidenfrost Experiment,** Figure, also adapted for projecting the phenomenon, with copper dish, Teclu burner, and glass rod, on tripod with levelling screws	2. 0. 0
55,037. **Apparatus** after Weinhold, Figure, **for shewing the behaviour of Saturated and Superheated Steam** (W. D., Fig. 357 [337]), height of apparatus 1.20 m	2. 0. 0
55,038. — idem, with iron stand (W. D., Fig. 357 [337] and p. 523 [485] — Remark) .	2. 10. 0
55,039. **Apparatus** after Dalton-Regnault, Figure, **for Measuring the Tension of Steam below the Boiling Point** (M. P. III, Fig. 249 [II, 2, Fig. 121]; the steam vessel is placed, together with the barometer, in one bath. The difference between the mercury columns (reduced to 0°) gives the pressure	2. 10. 0
55,040. **Apparatus** after Dalton, Figure, **for Measuring the Tension of Water Vapour between 0° and 100° C.,** with stand, burner, tripod, heating vessel, and thermometer (Gan.-Rein., Fig. 344)	3. 10. 0
55,041. **Apparatus for Measuring the Tension of Vapour from Salt Solutions,** Figure (W. D., Fig. 358 [338])	1. 0. 0
52,762. **Barometer Tube with iron tripod stand,** Fig. 52,762, p. 371, for shewing the difference between gases and vapours (M. P. III, Fig. 237 [II, 2, Fig. 109]), the glass tube with graduation, with Tube Holder and Index	1. 16. 0
52,752. **3 Barometer Tubes** in mercury bath, Fig. 52,752, p. 370, with stand (M. P. III, Fig. 236 [II, 2, Fig. 108]), suitable for shewing the difference between gases and vapours . .	1. 10. 0
51,412. **Filling Pipette,** Fig. 51,412, p. 220, for tubes the lower opening of which plunges in a liquid	0. 3. 0

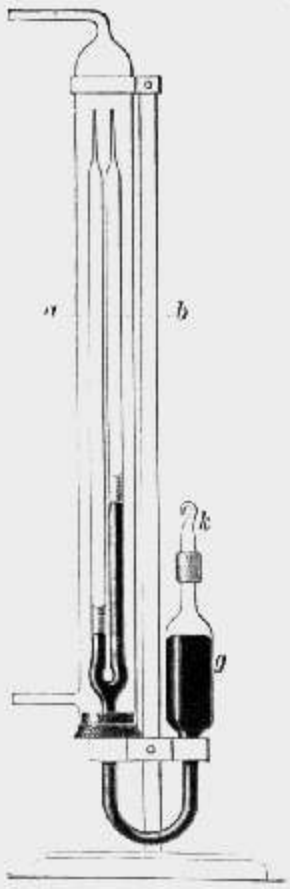
* Can be used with the Projection Apparatus.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



55 040. 1 : 14.



55 041. 1 : 5.



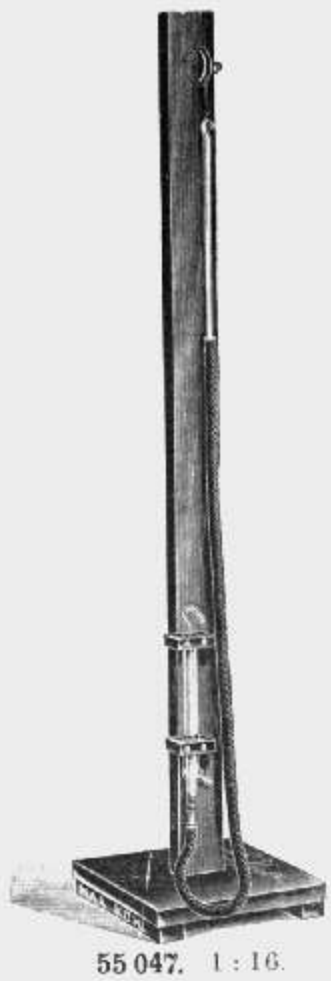
55 042. 1 : 2.



55 043. 1 : 6.



55 044. 1 : 6.



55 047. 1 : 16.

52,753. **3 Barometer Tubes** as No. 52,752, the tubes having etched graduation, with funnel-aperture and half-pierced stopcocks on the upper end, for conveniently introducing the liquids to be evaporated . . . . . £ 2. 0.0

52,653. **Piezometer inset with two gas pressure tubes,** after Despretz, for comparing the different tension of two gases at different pressures (different compressibility) 1. 0.0

55,042. **Apparatus** after Gay-Lussac, Figure, for proving Dalton's Law on the ratio of tension in gas-filled spaces and in vacuo (M. P. III, Fig. 267 [II, 2, Fig. 134]), with glass stopcock 0. 4.0

55,043. **Dalton's Law Apparatus,** Figure 0. 5.0

Ether or the like should be introduced drop by drop into the flask through the funnel. The glass tube passing through the second hole in the bung is connected up to an open manometer.

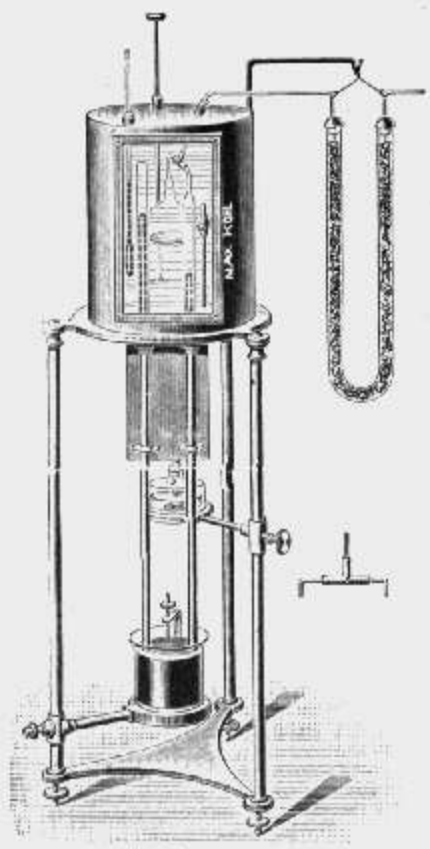
55,044. **Dalton's Law Apparatus** after Frick, Figure (M. P. III, Fig. 269 [II, 2, Fig. 136]) 0. 6.0

55,045. **Apparatus for Measuring the Vapour Tension in an air-filled Space by means of Ether,** Figure (W. D., Fig. 361 [341]) 0. 10.0

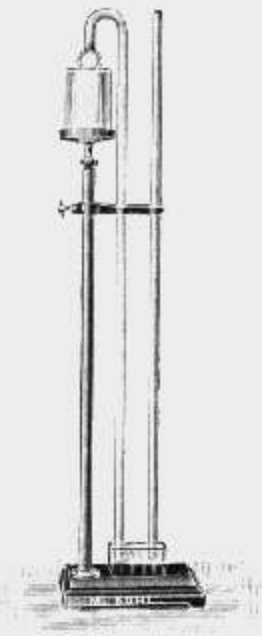
55,046. **Apparatus for Measuring the Tension of Water Vapour in a non-vacuous space** (W. D., Fig. 362 [342]), of glass, with rubber tubing 0. 10.0

55,047. — idem, **on stand,** Figure 1. 2.0

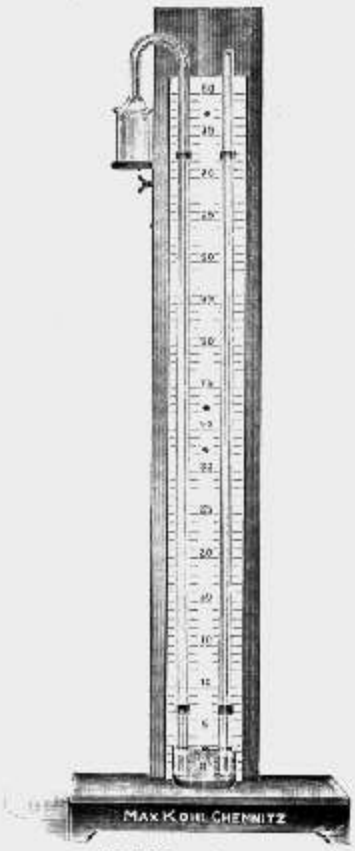
Cl. 1790, 1791, 1795, 1789, 5797, 1787, 1796.



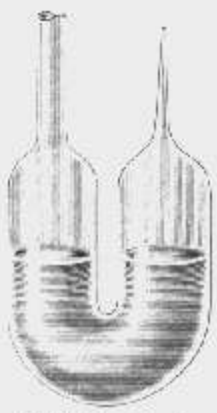
55 048. 1 : 15.



55 049. 1 : 14.



55 050. 1 : 10.



55 051. 1 : 3.



55 052. 1 : 3.



55 053. 1 : 10.

	£ s. d.
55,048. **Apparatus for the Tension of Water Vapour,** after Watt-Regnault, Figure, for temperatures from 0° to +50° C. (M. P. III, Fig. 254 [II, 2, Fig. 126]; Gan.-Man., Fig. 494; Gan.-Rein., Fig. 345), for readings with the cathetometer	8. 10. 0
55,049. **Apparatus** after Gay-Lussac, Figure, **for Determining the Tensions of Water Vapour** for Temperatures below Zero (M. P. III, Fig. 243 [II, 2, Fig. 115]; Gan.-Man., Fig. 492; Gan.-Rein., Fig. 343); **with iron stand**	2. 16. 0
55,050. — idem, Figure, **with wood stand and graduation**	2. 4. 0
55,051. **Tube** after Lehmann, Figure, for Determining the **Vapour Tension** of Liquids (Fr. phys. Techn. I, 2, Fig. 2781), for connecting up to the air pump	0. 2. 0
55,052. — idem, Figure, with vessels fitting into each other (Fr. phys. Techn. I, 2, Fig. 2782)	0. 3. 0
55,053. **Apparatus** after Dalton, Figure, **for Shewing that the Tension of Vapours in a gas-filled Space is the same as in Vacuo** (Chwolson, Lehrb. d. Phys., III, Fig. 211), with union tube for the air pump, dropping vessel and barometer tube	2. 14. 0
55,054. **Apparatus for Measuring the Expansibility of Saturated Steam** at temperatures of from +42° to +140° C., after Régnault, Figure (M. P. III, Fig. 258 [II, 2, Fig. 129]; Gan.-Man., Fig. 495; Gan.-Rein., Fig. 347), by observing the boiling point at different pressures	16. 0. 0
55,055. **Apparatus** after Gay-Lussac and Thénard, Figure, for Determining the **Tension of Vapours** mixed with Gases (Gan.-Man., Fig. 498; Gan.-Rein., Fig. 378)	4. 0. 0

Cl. 1797, 4157, 3417, 5024[1], 5024[2], 3415.

Max Kohl A. G. Chemnitz, Germany.

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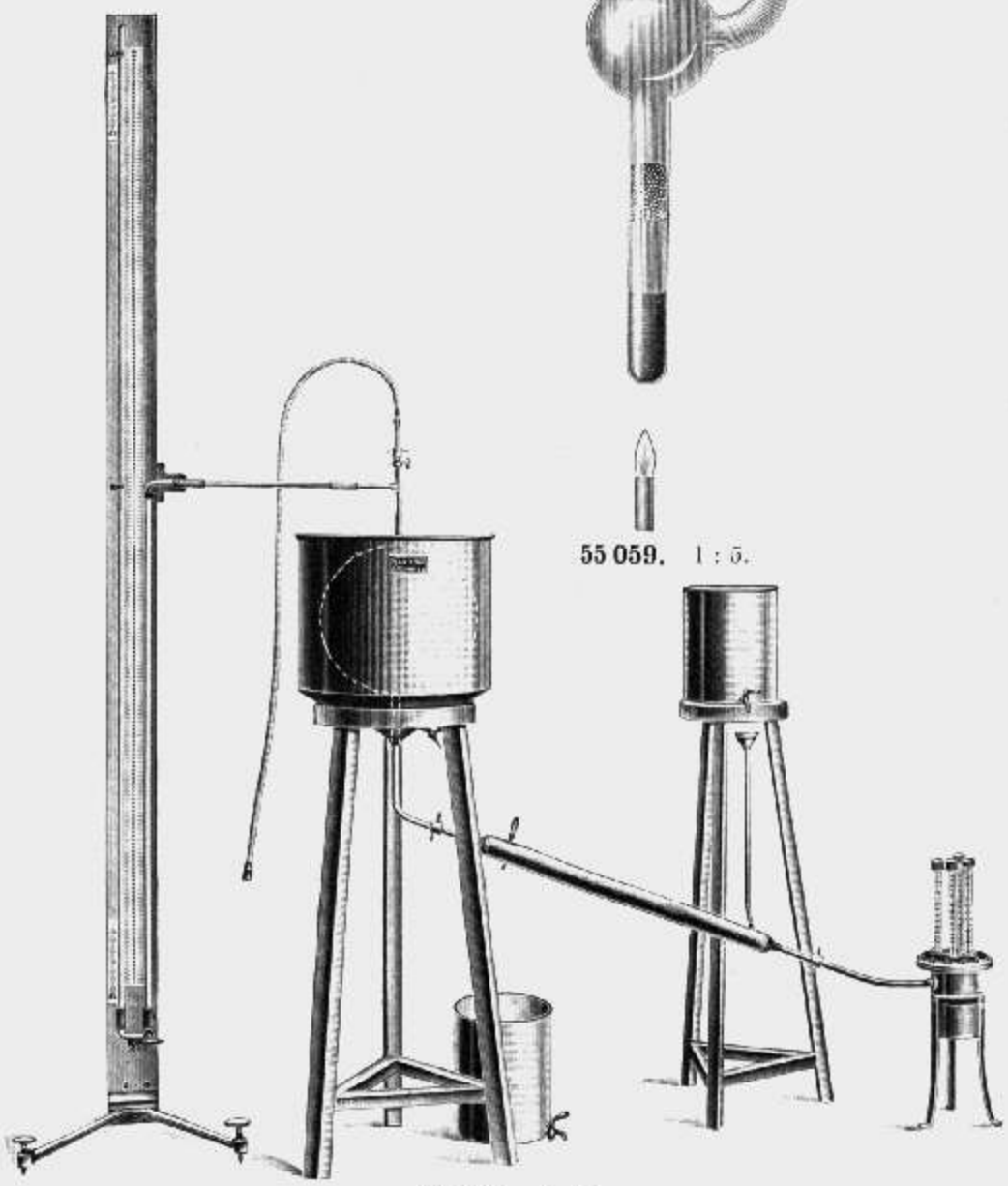
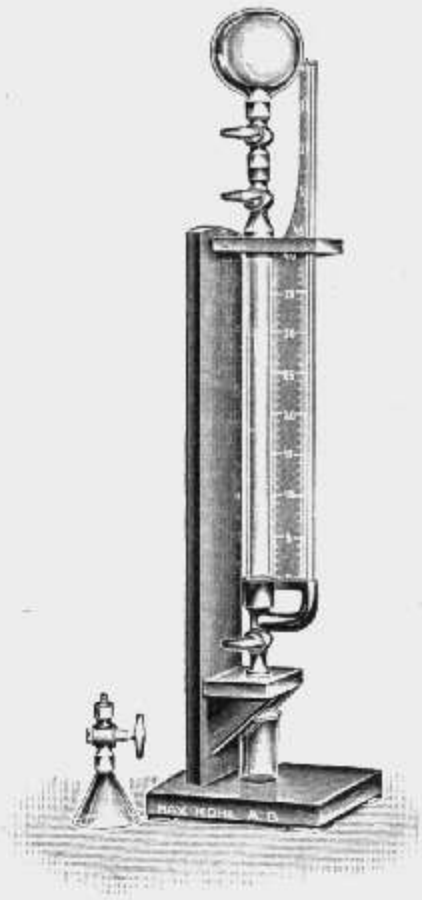


55 054. 1 : 20.

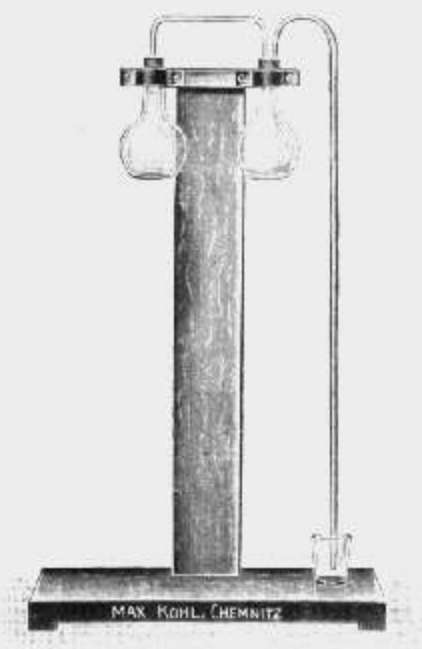
55 059. 1 : 5.



55 060. 1 : 6.



55 055. 1 : 11.



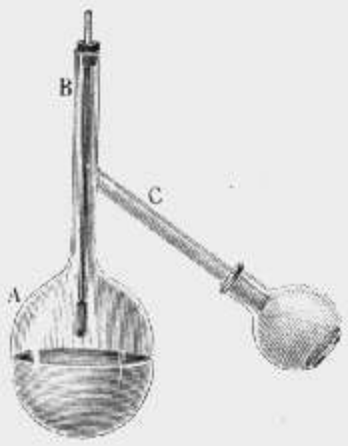
55 057. 1 : 12.

	£ s. d.
55,057. **Apparatus for Shewing the Equilibrium of Vapour Tensions in unequally heated communicating Spaces,** Figure (M. P. III, Fig. 216 [II, 2, Fig. 133]), on stand . . .	0. 18. 0
55,058. **Boiling Vessel** for Shewing Ebullition at higher or lower Pressure than the atmospheric, with tall cylinder and angle tube (W. D., Fig. 354 [334])	0. 6. 0
55,059. **Apparatus for Delaying Ebullition by a Soap Solution,** Figure (W. D., Fig. 359 [339])	0. 3. 0
55,060. **Apparatus for Retarding Ebullition with pure Water,** Figure (W. D., Fig. 360 [340]), so-called **Water-Hammer,** for shewing the force with which the water is impelled when the "retardation of ebullition" disappears; with sheet iron tube for heating by steam	0. 4. 0
55,061. — idem, without sheet iron tube	0. 3. 0

Cl. 1794, 6200
3418,
4810, 3886.



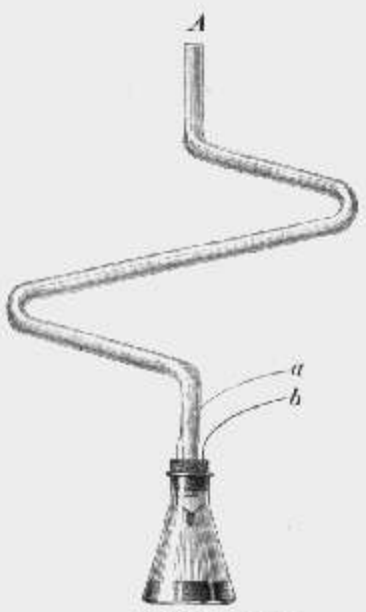
55 063.
1 : 10.



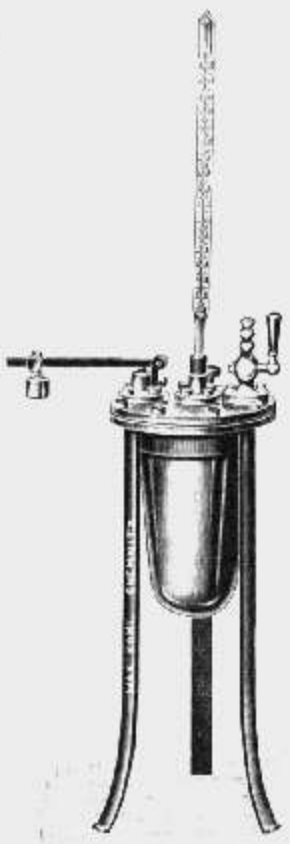
55 067. 1 : 5.



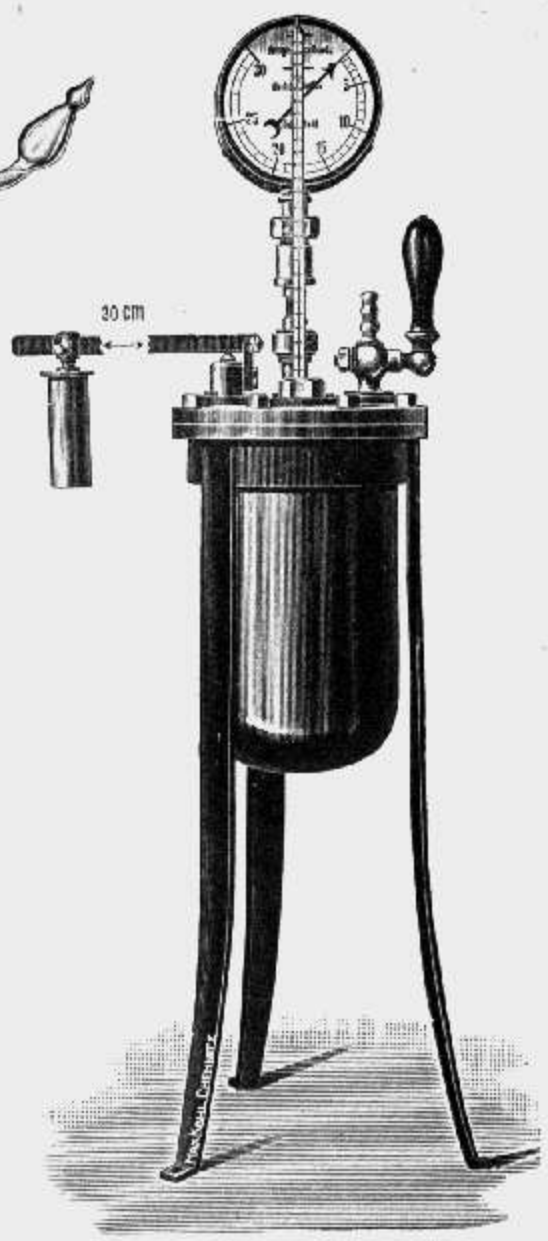
55 064. 1 : 10.



55 066. 1 : 5.



55 069. 1 : 6.



55 072, 55 074. 1 : 6.

	£ s. d.
55,062. **Water Hammer** (Fr. phys. Techn. I, 2, Fig. 2197 [I. Fig. 371]) . . . . . The water hammer is used, for example, in the following demonstrations: for Shewing Retardation of Ebullition; Retardation in Freezing (cooling down of water when freezing, M. T., p. 152), the lowest position of boiling point at low pressure (when warmed with the hand, M. T., p. 157), the Falling of a liquid in vacuo without splitting up.	0. 2. 0
55,063. — i d e m, with constriction and point (**Singing Water Hammer**), F i g u r e (Fr. phys. Techn. I, 2, Fig. 2919)	0. 2. 0
55,064. — i d e m, after Donney, F i g u r e	0. 3. 0
55,065. **Pulse Hammer** (Fr. phys. Techn. I, 2, Fig. 2916 [I, Fig. 373]), for shewing the boiling of ether in vacuo	0. 1. 6
55,066. **Apparatus,** F i g u r e, **for Shewing that the Boiling Point of Salt Solutions is higher than of pure Water,** with thermocouple (W. D., Fig. 356 [336])	0. 6. 0
55,067. **Apparatus for Determining Boiling Point,** F i g u r e, with thermometer (W. u. E., phys. Prakt., Fig. 101), especially for water, ethyl and amyl alcohol	0. 12. 0
55,068. **Apparatus for Ebullition under low Pressure at low Temperature** (M. P. III, Fig. 256 [II, 2, Fig. 127])	0. 6. 0
55,069. **Papin's Digester,** of brass, on tripod, for $1^1/_2$ atmospheres, with safety valve and thermometer . . . . . We shall be pleased to have the Papin Digesters tested officially on receipt of the fees (**£ 1. 0. 0** to **£ 1. 5. 0**) for the tests.	2. 0. 0
55,070. — i d e m, with **Spring Manometer** 70 mm diameter	2. 8. 0
55,071. **Papin's Digester, larger,** F i g u r e, of stout brass, for 10 atmospheres, with safety valve and thermometer	3. 16. 0
55,072. — i d e m, with **Spring Manometer** 70 mm diameter	4. 10. 0

Cl. 5386, 1803, 5387, 1784, 4704, 1805.

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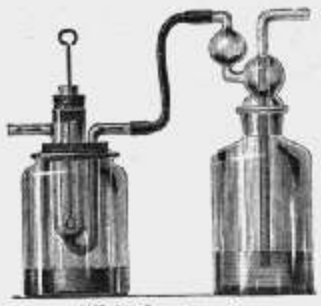
55 075. 1 : 8.



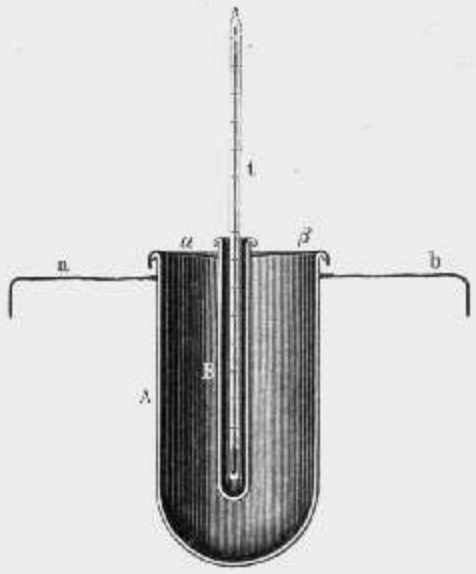
55 080. 1 : 5.



55 079 A. 1 : 12.

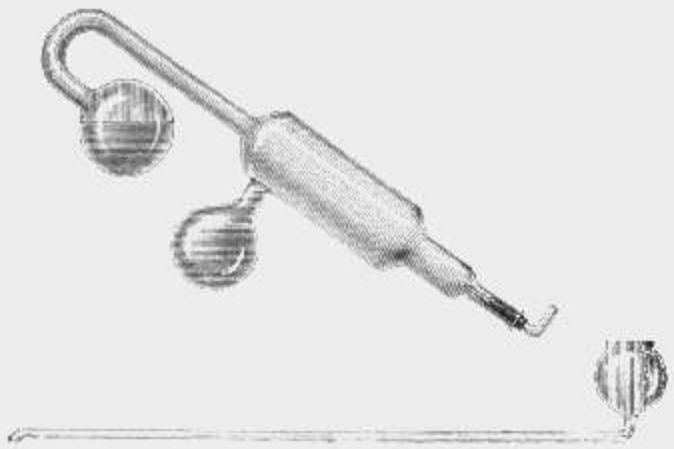


55 076. 1 : 6.



55 079 B. 1 : 3.

	£ s. d.
55,073. **Papin's Digester** for 20 atmospheres, of stout copper with gunmetal top, with safety valve, thermometer and cock (M. P. III, Fig. 257). The thermometer is divided to 250° C. and plunges in an iron box which should be filled with mercury	5. 4. 0
55,074. — i d e m, with **Spring Manometer** 100 mm diameter, F i g u r e (M. T., p. 159).	6. 4. 0
55,075. **Device** after Faraday, **for freezing mercury in a powerful flame by means of solid carbon-dioxide,** F i g u r e (W. D., Figs. 401 and 402 [381 and 382]; M. P. III, Fig. 304 [II, 2, Fig. 161]), consisting of cloth bag, stand, plate, small iron vessel on long stem and platinum wound wire triangle; but without platinum crucible and blast lamp .	1. 4. 0
55,076. **Apparatus for Freezing Mercury by Evaporating Sulphurous Acid,** F i g u r e (W. D., Fig. 405 [385]), consisting of a flask with inset, a drying flask, and 6 condensing vessels	0. 15. 0
55,077. — i d e m, without drying flask	0. 10. 0
55,078. — i d e m, for producing temperatures to about — 101 ° C. by a mixture of solid carbon dioxide and ether (W. D., Fig. 406 [386])	0. 12. 0
52,655. **Inset for the Oersted Piezometer,** for demonstrating the lowering of the melting point of water by pressure, after Thomson (M. P. III, Fig. 327 [II, 2, Fig. 95]; Gan.-Rein., Fig. 332)	2. 5. 0
This apparatus consists of a lead slab, a sensitive ether thermometer in protecting tube and a manometer.	
55,079. **Melting Point Determination Apparatus,** Figs. A and B, with stand and thermometer to 360° C. (W. u. E. phys. Prakt., Fig. 98)	1. 0. 0
55,080. **Apparatus for Producing Ice by the Evaporation of Sulphuric Acid in Vacuo,** F i g u r e, after Leslie (M. P. III, Fig. 358 [II, 2, Fig. 215]), consisting of one small receiver, sulphuric acid vessel, and cork dish on tripod, for the air pump	0. 3. 0
55,081. **Thin-walled Dish** of Sheet Copper with Wood Slab after Böttger, for producing ice by evaporation of ether or carbon-disulphide (M. P. III, Fig. 362 [II, 2, Fig. 219])	0. 1. 3
53,073. — i d e m, for the air pump (W. V., Fig. 409), see Fig. 53,073, p. 405, without receiver	0. 3. 0



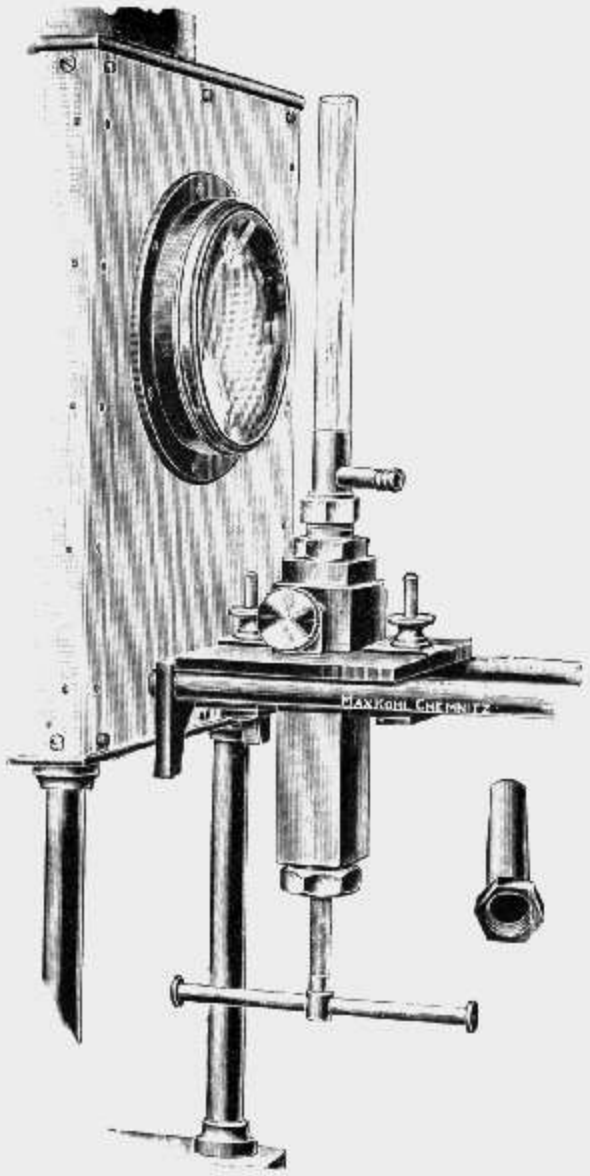
55 087. 1 : 5.



55 089. 1 : 5.



55 088. 1 : 3.



55 090. 1 : 4.

	£ s. d.
53,074. **Refrigerator** after Carré, Fig. 53,074, p. 405 (W. D., Fig. 391 [371]), for producing ice by evaporation, and with enclosed ether glass for demonstration of the heat freed by condensation of steam, on stand	0.11.0
53,075. — i d e m, without ether glass, after Berberich (W. D., Fig. 390 [370]; Fr. phys. Techn. II, 2, Fig. 3631)	0. 9. 0
53,076. **Refrigerator** after Weinhold, Fig. 53,076, p. 405, completely assembled for setting on the plate of the air pump (W. D., Fig. 392 [372])	0.10. 0
55,083. **Apparatus for the Retardation of Freezing,** after Weinhold (W. D., Fig. 350 [330])	0. 2. 0
55,084. **Cryophorous** after Wollaston (M. P. III, Fig. 361 [II, 2, Fig. 218])	0. 2. 6
55,085. **Cryophorous** after Weinhold (W. D., Fig. 393 [373])	0. 3. 0
55,086. **Cryophorous** after Grimsehl, specially adapted for demonstrating ebullition at low temperature (Ztschr. f. d. phys. u. chem. U. **16**, 1903, p. 376), with thermometer. .	0.10. 0
55,087. **Sulphuric Acid Cryophorous** after Weinhold, F i g u r e (W. D., Fig. 394 [374]), with funnel for filling	0. 4. 0
55,088. **Apparatus for Evaporating Ice,** F i g u r e (W. D., Fig. 395 [375])	0.10. 0
55,089. — i d e m, F i g u r e, with platinum gauze for rendering incandescent by a voltaic current (W. D. Fig. 396 [376])	0.15. 0
* 55,090. **Andrews' Press for Compressing and Liquefying Carbonic Acid,** F i g u r e, arranged for the Projection Lantern (W. D., Fig. 363 [343])	2. 4. 0

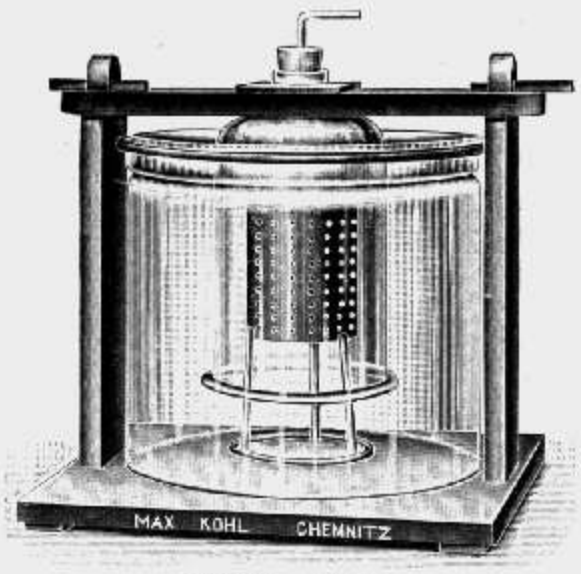
The carbonic acid tube is protected for transit by a screw-on metal sheath. The liquefaction of the carbon dioxide is plainly visible. If the apparatus is set up before the Projection Lantern (which can be done very conveniently), the carbonic acid tube is cooled by blowing air from above through a clean glass tube screwed on, see Fig. 55 090.

* Can be used with the Projection Apparatus.

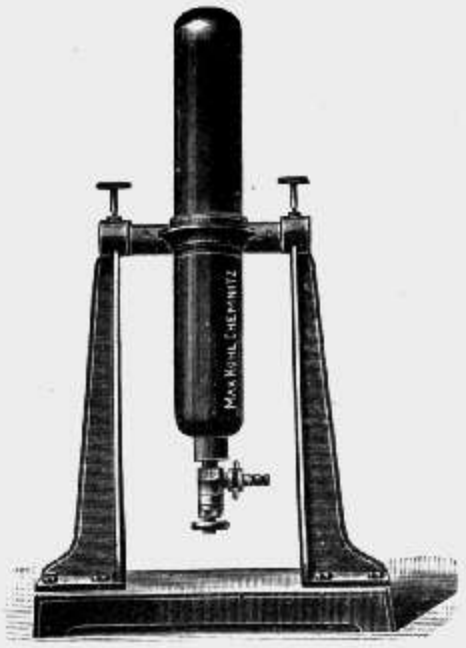
Cl. 1808, 5890, 1814, 363.

Max Kohl A. G. Chemnitz, Germany.

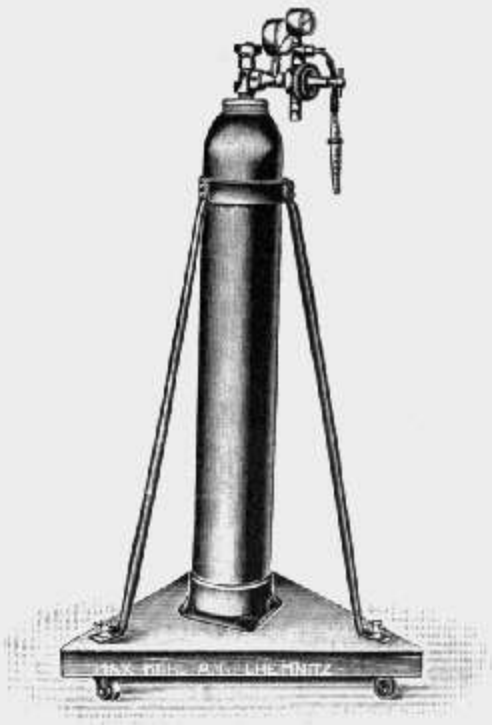
Max Kohl A. G. Chemnitz, Germany.



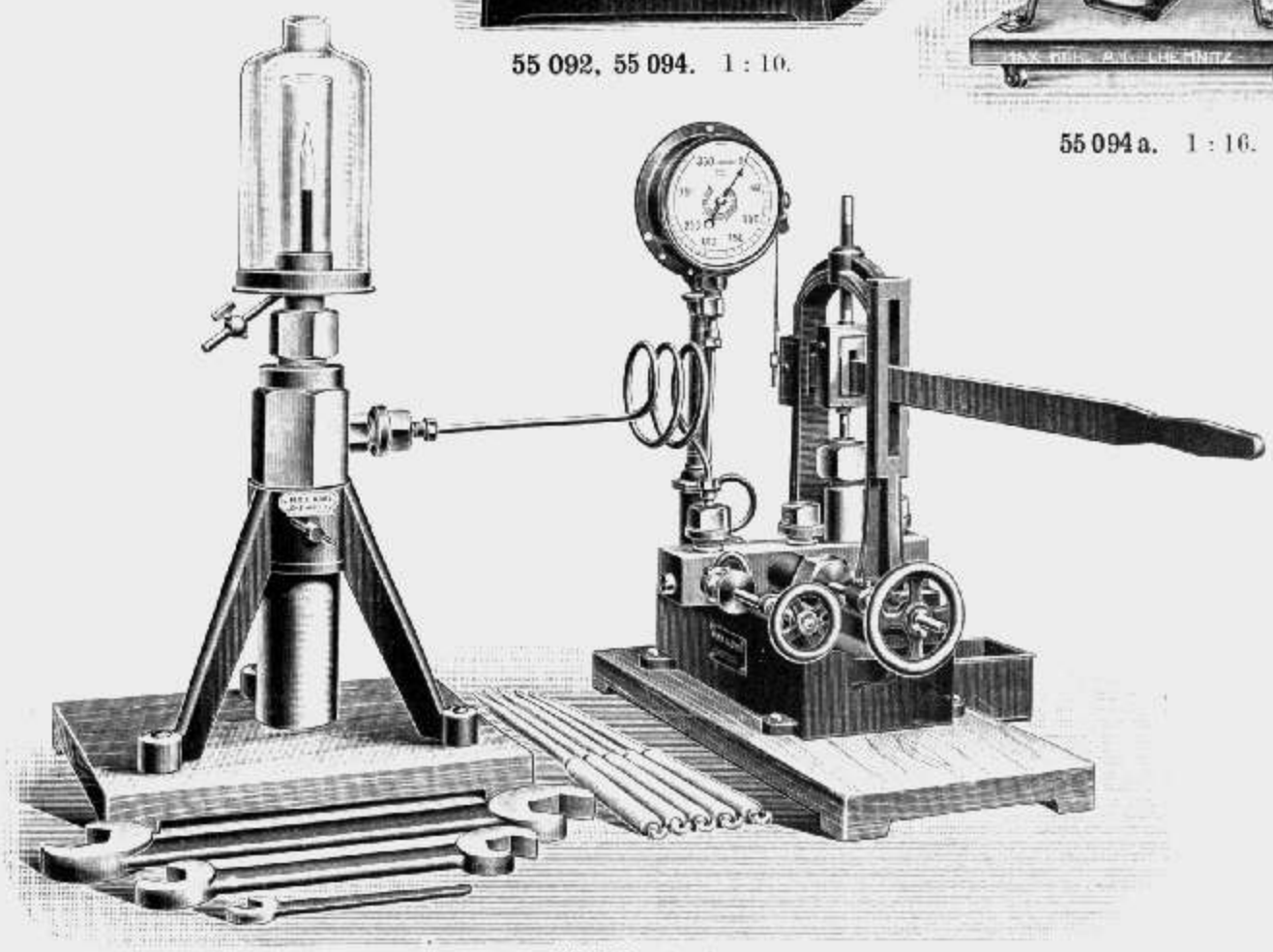
55 09 1. 1 : 10.



55 092, 55 094. 1 : 10.

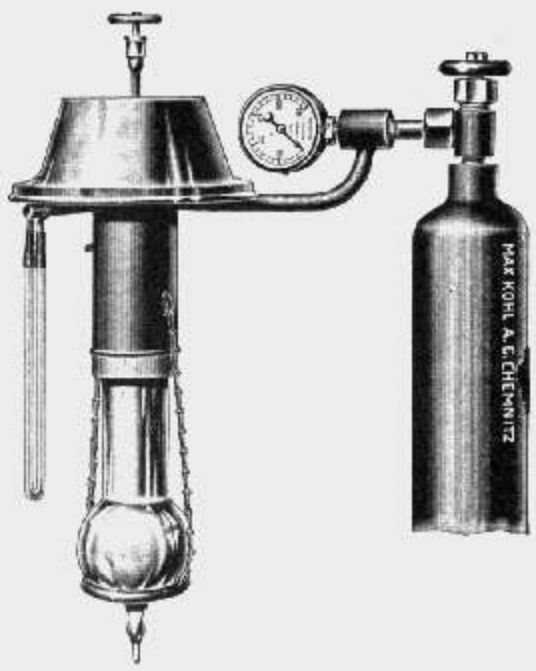


55 094 a. 1 : 16.

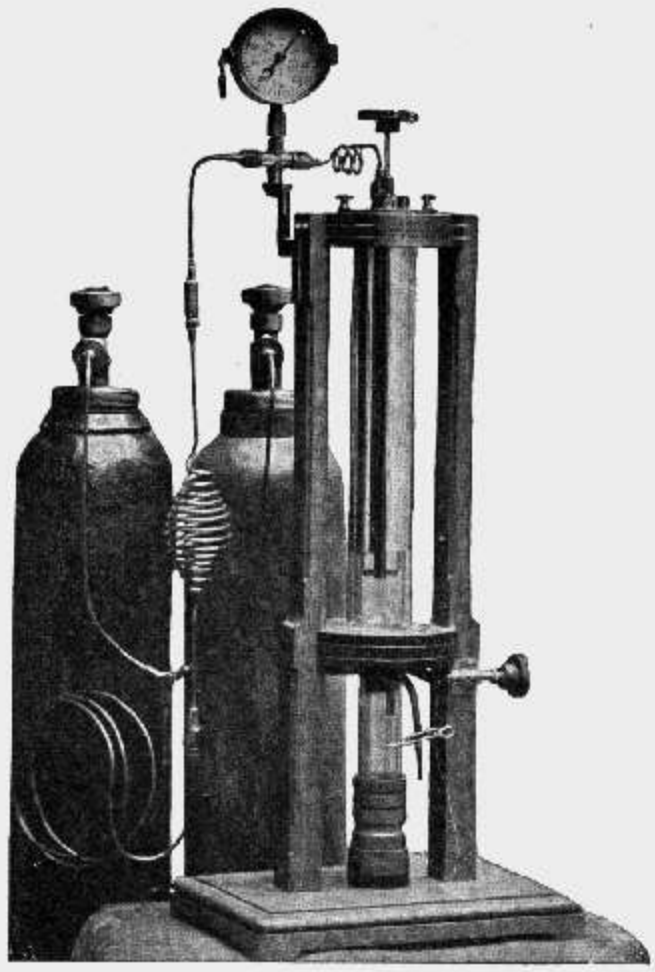


55 096. 1 : 6.

	£ s. d.
55,091. **Carbonic Acid Generator,** Figure (W. D., Fig. 398 [378])	3. 6. 0
55,092. **Steel Cylinder,** 3 litres capacity, Figure, filled with 2 kg Carbonic Acid (W. D., Fig. 397 [377]), without tipping device	1. 10. 0
55,093. **Filling No. 55,092 with 2 kg Carbonic Acid**	0. 5. 0
55,094. **Tipping Device for the Carbonic Acid Cylinder,** Fig. 55,092, without steel cylinder, reducing valve, or capacity indicator	1. 16. 0
55,094a. **Portable Stand** for large Steel Cylinders 10—12 litres, Figure	1. 10. 0
55,095. **Stamp, Plate, Mould and Frame** for pressing carbonic acid plates, also **polished Brass Ball** 2 cm diameter (Erdmann, Anorganische Chemie, Figs. 187—190)	0. 8. 0
55,096. **Apparatus for Demonstrating the Liquefaction of Gases,** after Cailletet, Figure (M. P., III, Fig. 309 [II, 2, Fig. 166]), for a pressure of 300 atmospheres, with Steel Pump and reservoir	32. 10. 0
55,097. — idem, for a pressure of 1000 at.	40. 0. 0



55 098. 1 : 8.



55 103. 1 : 7,5.

Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
55,098. **Demonstration Apparatus for Generating Liquid Air** after Heylandt (Ztschr. f. d. phys. u. chem. U., 22, 1909, p. 360), Figure	6. 10. 0
55,099. **Steel Cylinder containing Compressed Air** for above	2. 0. 0
55,100. **Auxiliary Apparatus** for Generating Solid Air	1. 10. 0
55,101. **Refrigeration Thermometer**	1. 0. 0
55,102. **Pressure Gauge for valve-regulation**	1. 4. 0
55,103. **Demonstration Apparatus for Generating Liquid Air** after Olszevski, Figure (Drudes Annalen der Physik, **10**, 1903, p. 776)	31. 0. 0

It is possible to make in a few minutes with this apparatus and the aid of two cylinders of compressed air of 13 litres capacity, 100 ccm of liquid air.

Steel Cylinders: see No. 55,099.

If a compressor of at least 7 HP. is used instead of the steel cylinders it is possible to produce about 600 ccm of liquid air per hour with the apparatus. Prices of compressors quoted on application.

55,103 a. **Apparatus for the Liquefaction of Air and Hydrogen in large quantities,** Figure, after Olszevski, for use with steel cylinders or with a compressor; with spare glass reservoirs	70. 0. 0

Generates about 1 litre compressed air per hour with a 7 HP compressor and about 3 litres with a 19 HP compressor.

55,103 b. **Apparatus for the Liquefaction of Air in large quantities,** Figure, entirely of metal in wood casing	55. 0. 0

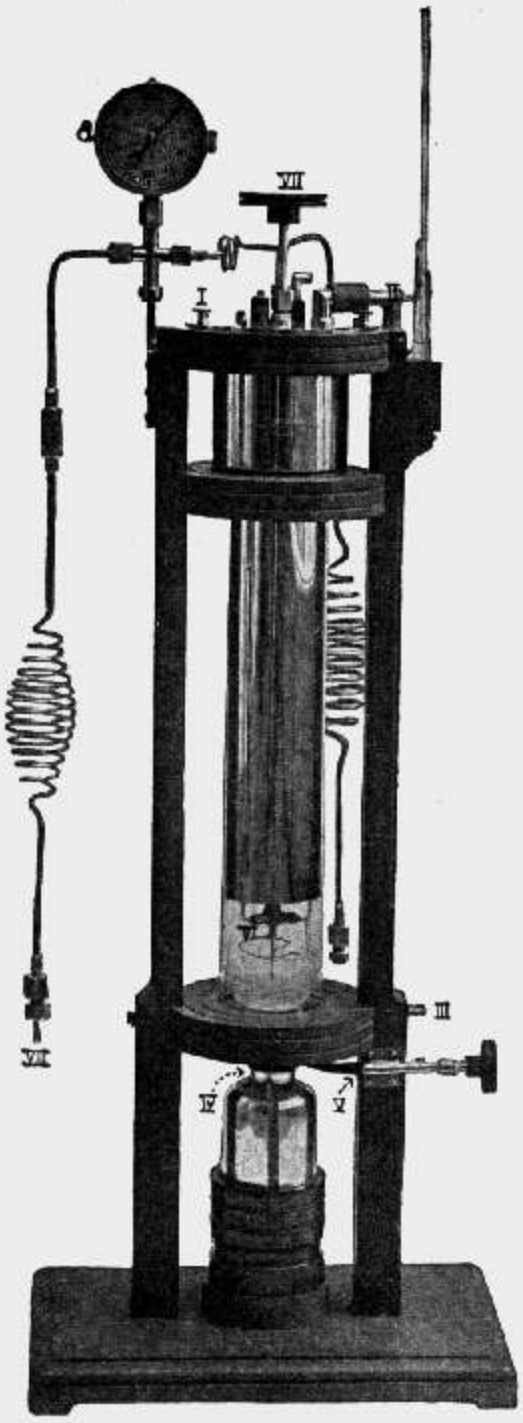
The output is the same as with No. 55,103 a.

55,103 c. **Plate of Sketches for Explaining Linde's Counter-current Machine** (M. T., § 68)	0. 3. 0

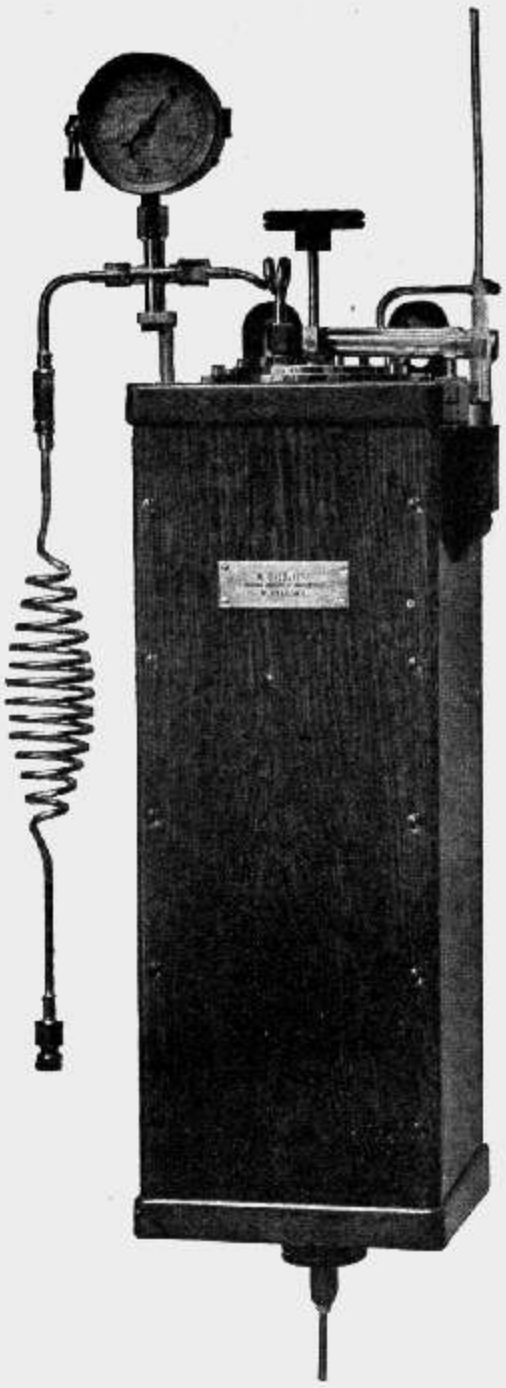
Liquid air can be obtained ready for use, immediately before using, from the suppliers.

Cl. 6213, 6555.

Max Kohl A. G. Chemnitz, Germany.



55 103 a. 1 : 7.



55 103 b. 1 : 6.



55 106. 1 : 10.



55 113. 1 : 10.



55 115 A. 1 : 8.



55 115 B. 1 : 6.

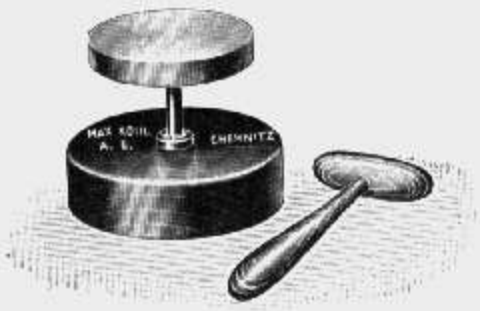
Cylindrical Beakers with Evacuated Double Wall after Dewar, Figure, for keeping cool liquid air, liquid hydrogen, etc., **silvered inside.**

List No.	55,104	55,105	55,106	55,107	55,108
External Height, mm	160	250	350	400	300
Internal Width, mm	35	40	60	75	100
(a) **Beaker** . . . . . £	**0. 3. 6**	**0. 6. 0**	**0. 10. 0**	**0. 15. 0**	**1. 2. 0**
(b) **Polished Wood Base** . . £	**0. 1. 6**	**0. 1. 9**	**0. 2. 0**	**0. 2. 6**	**0. 3. 0**
(c) **Polished Wood Lid,** lined with felt . . . . . £	**0. 1. 6**	**0. 1. 9**	**0. 2. 0**	**0. 2. 6**	**0. 3. 0**

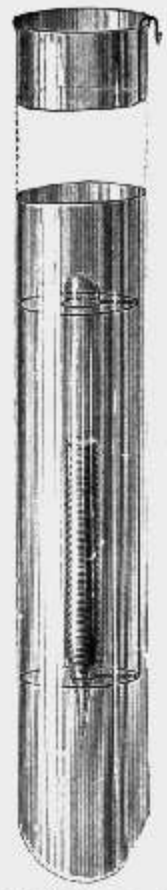
Flasks with evacuated Double Wall, silvered inside, for the same purpose, Figure.

List No.	55,109	55,110	55,111	55,112	55,113	55,114
Capacity, approx. ccm	150	300	500	750	1000	2000
(a) **Beaker** . . . . . £	**0. 3. 0**	**0. 3. 6**	**0. 4. 6**	**0. 6. 0**	**0. 8. 0**	**0. 16. 0**
(b) **Polished Wood Bases** for same £	**0. 1. 6**	**0. 1. 9**	**0. 2. 0**	**0. 2. 3**	**0. 2. 6**	**0. 3. 0**

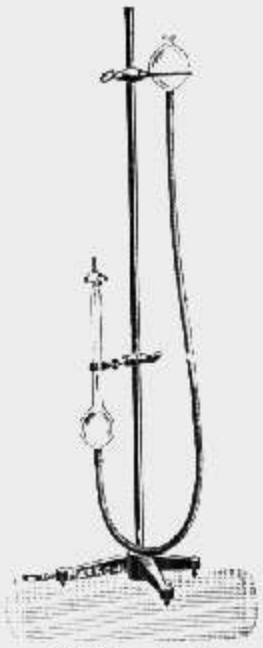
55,115. **Cylindrical Beaker** after Weinhold, Figs. A & B, for storing liquid air, liquid hydrogen etc. (W. D. 4th Edn. Fig. 407; Erdmann Anor. Chemie, Figs. 42 and 94), **with evacuated quadruple wall** and side tube on neck; internal height 180 mm, internal width 35 mm, with base . . . . . £ 1. 8. 0



55 117. 1 : 5.



55 123. 3 : 1.



55 125. 1 : 16.



55 126. 1 : 10.

55,116. **Double-walled Capsule** for obtaining solid air by means of liquid hydrogen (Erdmann, Anor. Chemie, Fig. 43), 80 mm diameter . . . . . £ s. d. 0. 5. 0

55,117. **Lead Plate** on Wood Base together with **Hammer** and **Porcelain Bowl**, Figure, for shewing the change in state of the lead plate when placed in liquid air (W. D., 4th Edn., Fig. 408) 0. 6. 0

55,118. 2 **small Glasses, with Ether and Alcohol,** in one cork mount, fitting cylindrical Beaker No. 55,115 (W. D., 4th Edn., Fig. 409) 0. 8. 0

When plunged in liquid air the ether is converted into a crystalline mass: the alcohol first becomes viscous, solidifying finally into a transparent mass.

54,188. **Hollow Cube** of Crystal Glass, 8 cm side, for demonstrating the attraction of liquid air by an electromagnet (W. D., 4th Edn., p. 615) 0. 6. 0

A suitable Electromagnet to use is No. 62.280.

55,119. **Apparatus for the Liquefaction and Freezing of Oxygen** by the aid of liquid air (W. D., 4th Edn., Fig. 410) 1. 6. 0

Ozone Tubes, for producing solid ozone by means of liquid air (W. D., 4th Edn., p. 619): see Section "**Electricity**", p. 1017.

55,121. **Apparatus** after Erdmann **for Freezing Water** in liquid air (Erdmann, Anor. Chemie, Fig. 97) 0. 10. 0

* 55,123. **Apparatus for the Critical Temperature Phenomena,** Figure (W. D., Fig. 365 [345]), with instructions for use, for objective projection 0. 6. 0

* 55,123a. **Protecting Case** for above of black sheet iron 0. 12. 0

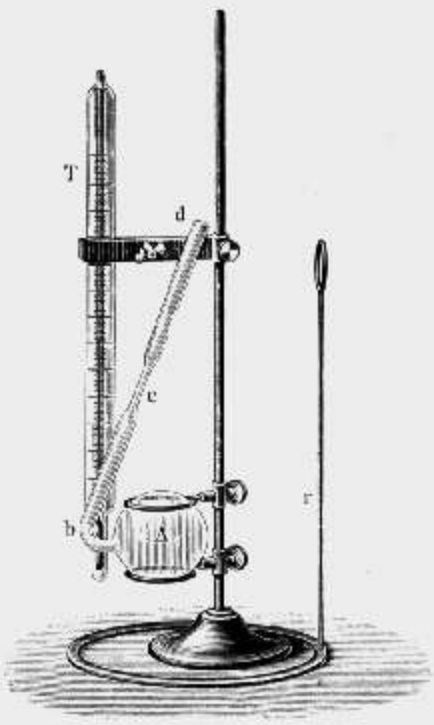
55,124. **Apparatus for the Liquefaction of Sulphurous Acid** (W. D., Fig. 366 [346]) 0. 4. 0

55,125. **Apparatus** after Noack **for Liquefying Gases by Pressure and Cooling** (Ztschr. z. Förderung d. phys. U., **1886**, p. 208), simple pattern, Figure 1. 13. 0

* Can be used with the Projection Apparatus.

Max Kohl A G. Chemnitz, Germany.

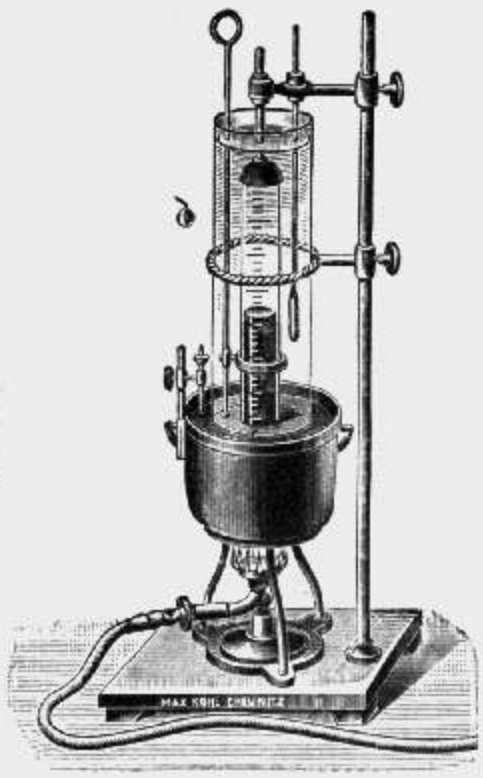
Max Kohl A. G. Chemnitz, Germany.



55 136. 1 : 6.



55 129. 1 : 4.



55 137. 1 : 8.

55,126. **Apparatus for the Liquefaction of Gases by Cooling,** without the application of pressure, Figure . . . . . £ 0. 10. 0

The lower part of the apparatus — the small flask — is placed in a cold mixture while the lower eduction pipe, which is provided with a U-tube connected to the small flask and is also surrounded by a cold mixture, is traversed by the gas being dealt with. The following are well adapted for this experiment: sulphurous acid, nitrous acid, ammonium cyanide and methyl chloride gas.

52,656. **Piezometer inset with Four Tubes,** after Magnus, **for the liquefaction of Gases by pressure,** Fig. 52,656, p. 359 (M. P., III, Fig. 306 [II, 2, Fig. 163]) 1. 10. 0

Three short syphon barometers are contained in one vessel and can be fed with mercury and various gases above the latter, while the fourth barometer serves as a manometer.

55,127. **Carbonic Acid Gas Tube,** appearing vacuous at ordinary temperature; only when cooled does some liquid carbon dioxide become visible. In box 0. 18. 0

55,128. — i d e m, with perfectly **anhydrous,** pure carbonic acid 1. 5. 0

55,129. **Carbonic Acid Tube with some liquid Carbonic Acid,** Figure. At ordinary temperature 2—5 ccm are visible, but when heated with the hand the tube appears empty. In small box 0. 18. 0

55,130. — i d e m, with perfectly **anhydrous,** pure carbonic acid 1. 5. 0

55,131. **Carbonic Acid Tube, about half-filled with liquid carbonic acid,** for shewing the great mobility of the same. In case 0. 18. 0

55,132. — i d e m, with perfectly **anhydrous,** pure carbonic acid 1. 8. 0

55,133. **Carbonic Acid Tube,** entirely filled with liquid at 25° C. In case 0. 18. 0

55,134. — i d e m, with perfectly **anhydrous,** pure carbonic acid 1. 8. 0

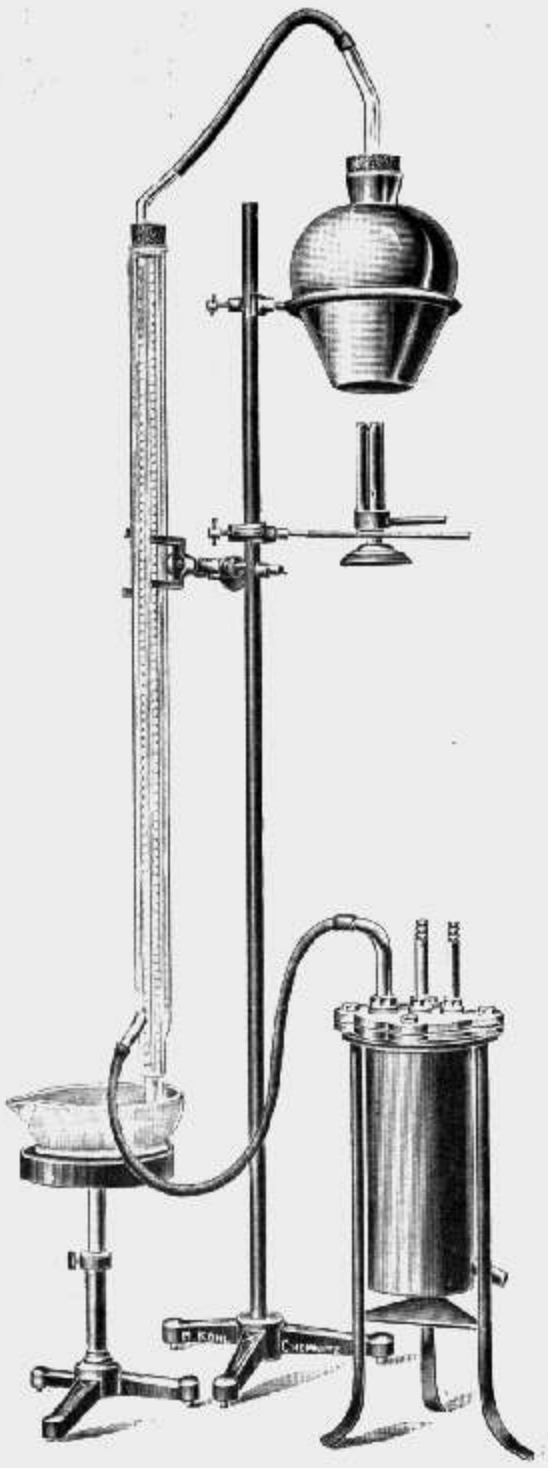
55,135. **Tubes with Liquefied Gases:**

(a) Ammonia	£ 0. 12. 0	(e) Carbonic Acid .	£ 0. 18. 0	(i) Sulphurous Acid .	£ 0. 10. 0
(b) Chlorine	£ 0. 12. 0	(f) Nitrosyl Chloride	£ 0. 18. 0	(j) Sulphuretted Hydrogen	£ 0. 18. 0
(c) Cyanogen	£ 0. 18. 0	(g) Phosgene . . .	£ 0. 10. 0	(k) Nitrous Oxide . .	£ 0. 18. 0
(d) Carbon Oxysulphide	£ 0. 18. 0	(h) Muriatic Acid .	£ 0. 15. 0	(l) Nitrogen Dioxide	£ 0. 18. 0

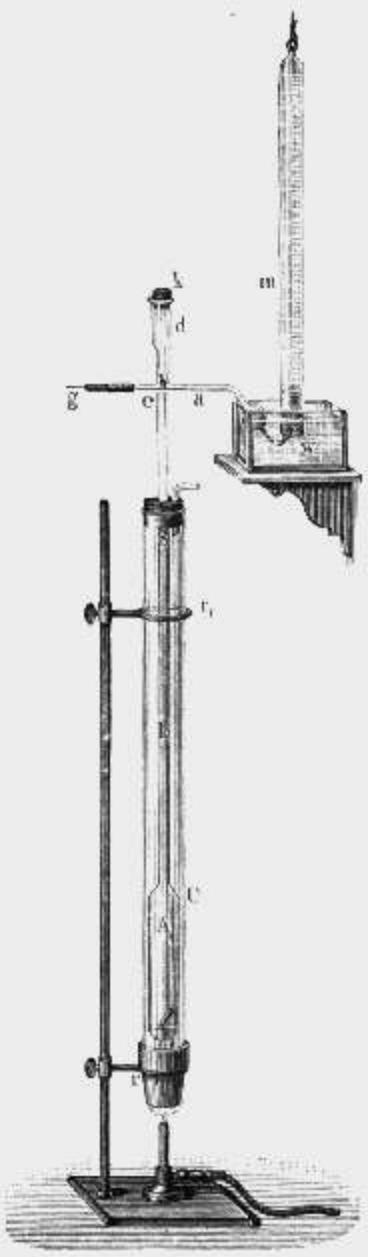
55,136. **Apparatus for Determining Gas and Vapour Densities** by Dumas' Method, Figure, by determining the weight of a definite vapour volume (W. u. E., phys. Prakt., Fig. 56; Chwolson, I, Fig. 225) 1. 6. 0

1 Stand, 3 narrow-necked glass Flasks, 1 Thermometer, 1 Stirrer and 1 Wire Triangle.

55,137. **Apparatus for Determining Vapour Density** by Gay-Lussac's method, Figure (Determination of Volume of the Vapour yielded by a given weight of Liquid), complete with stand, graduated tube, thermometer, stirrer and burner, but without mercury (M. P., III, Fig. 134 [II, 2, Fig. 142]) 3. 15. 0



55 138, 55 139. 1 : 10.



55 140. 1 : 10.



55 141. 1 : 6.

55,138. **Apparatus for Determining Vapour Density** by A. W. Hofmann's method (Determining the Volume of Vapour yielded by a given weight of Liquid) see F i g u r e, with barometer tube, steam jacket, mercury bath, steam boiler, burner and small flask with glass stopper, stand and stage (W. u. E. phys. Prakt., Figs. 57—59; M. P., III, Fig. 135 [II, 2, Fig. 143]); **without Mercury or Cooling Vessel** . . . . . £ 3. 0. 0

55,139. **Cooling Vessel** for above, see Fig. 55,138, of copper 2. 10. 0

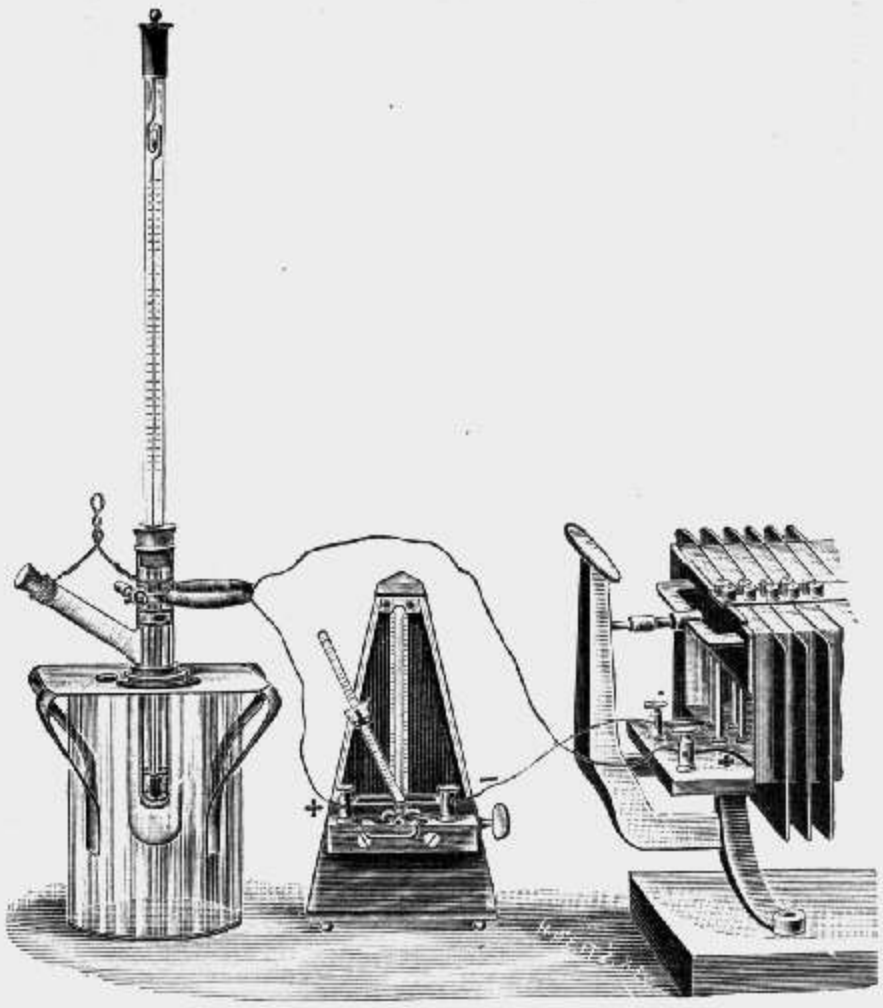
55,140. **Apparatus for Determining Vapour Density by the Air-displacement method** of V. Meyer, F i g u r e, with measuring glass for catching the gas and with water vessel (W. u. E. phys. Prakt., Fig. 60), without bracket 1. 16. 0

55,141. **Effusiometer** after Bunsen for Determining Vapour Density by the Efflux Method, F i g u r e, with threeway cock and platinum diaphragm (W. u. E. phys. Prakt., Fig. 61; M. P. I, Fig. 574 [592]), without Mercury 2. 0. 0

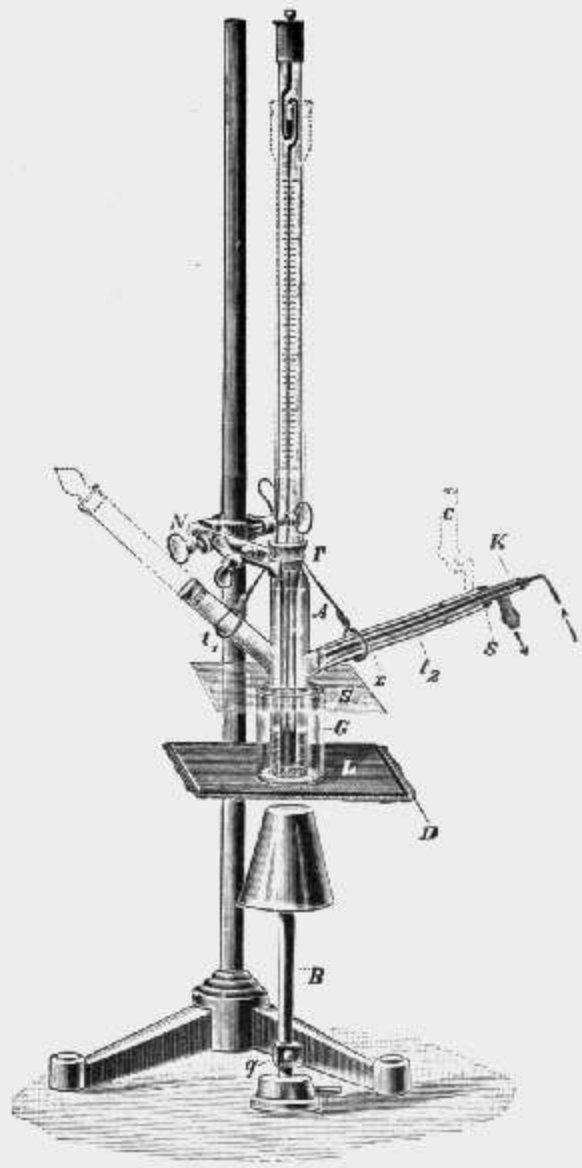
53,143. — i d e m, after Henniger, Fig. 53,143, p. 411 . . . . . 1. 6. 0

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



55 142, 54 874, 55 144, 51 727. 1 : 5.



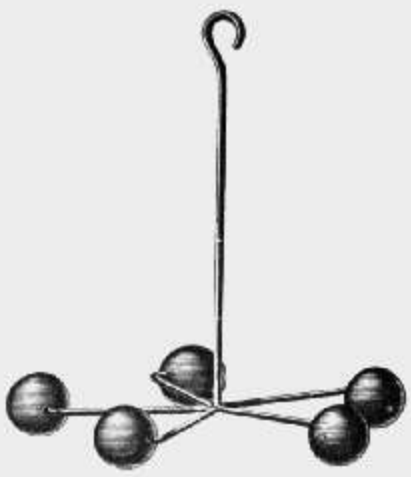
55 146, 55 147, 54 874, 55 148. 1 : 5.

Beckmann's Apparatus for Molecular Weight Determination by the Freezing Method, Fig. 55,142, improved pattern (Ztschr. für phys. Chemie, **21**, p. 239; W. u. E. phys. Prakt., Fig. 105), consisting of articles Nos. 55,142—55,144, 54,874, 51,727, 55,145.

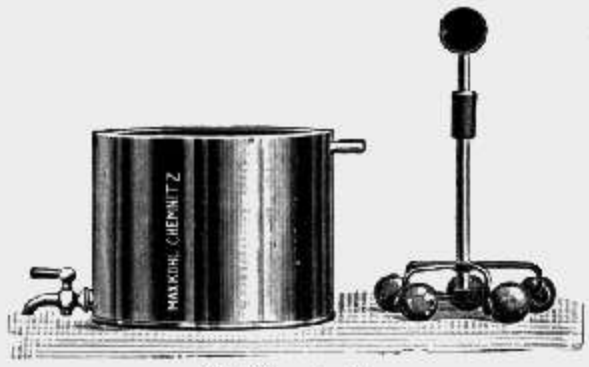
	£ s. d.
55,142. **Glass Cylinder** with lid and stirrer, 4 air jackets, 2 freezing tubes, 3 filling pipettes, Figure . .	0. 18. 0
55,143. **Platinum Stirrer,** according to market price . . . . . (Subject to fluctuation) .	2. 0. 0
54,874. **Metastatic Thermometer** after Walferdin, divided in 0,01° C., see Fig. 55,142	1. 10. 0
55,144. **Electromagnet,** see Fig. 55,142	0. 15. 0
51,727. **Metronome** with electric contacts, see Fig. 55,142 . . . . . The use of a thermopile, as the illustration shews, is only necessary when no other electric source is available. Prices of thermopiles are given in "Electricity" Section.	1. 5. 0
55,145. **Pastille Press** with steel mould	1. 4. 0

Beckmann's Apparatus for Molecular Weight Determination by the Ebullition Method, Fig. 55,146, also in improved pattern (Ztschr. für phys. Chemie, **21**, p. 245; W. u. E. phys. Prakt., Fig. 109), for solvents with a boiling point to about 130° C., comprising articles Nos. 55,146—55,148, 54,874.

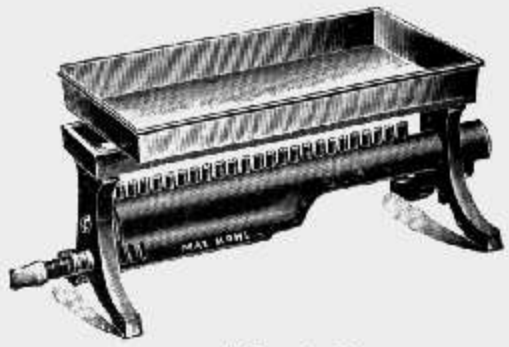
55,146. **Boiling Tube** with internal cooler and ground-on stopper, 2 air jackets with mica slab, stand on tripod with clamp, sleeve, ring with asbestos wire net, Figure	1. 0. 0
55,147. **Micro Gas Burner,** see Fig. 55,146	0. 6. 0
54,874. **Metastatic Thermometer** after Walferdin, divided in 0.01° C., see Fig. 55,146	1. 10. 0
55,148. **Platinum Tetrahedron,** according to market value; about 8—10 g platinum tetrahedron is necessary, see Fig. 55,146	Price on application
55,148 a. **Reduction Table for Gas Volumes measured wet,** after Friedr. C. G. Müller (Ztschr. f. d. phys. u. chem. U., **23**, 1910, p. 354), magnified five-fold	1. 8. 0



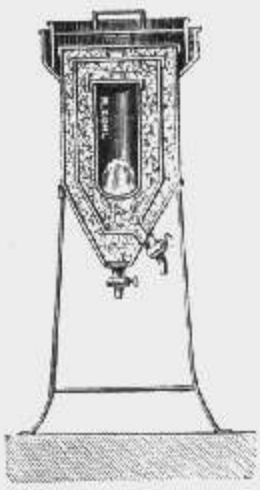
55 149. 1 : 2.



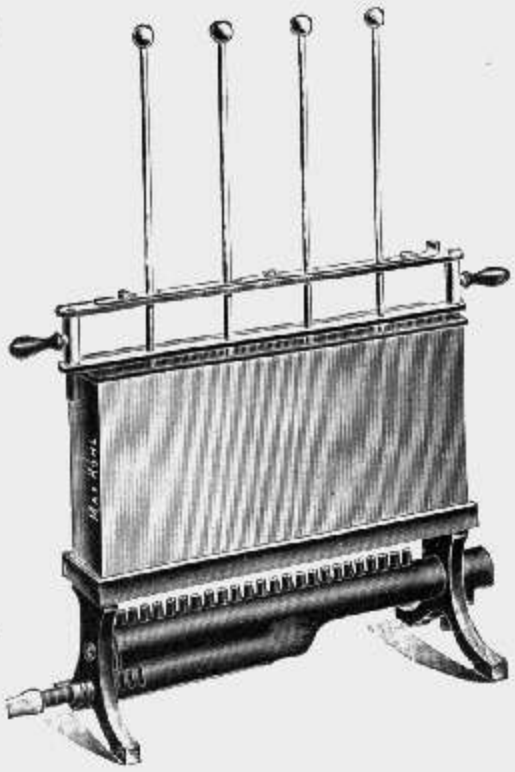
55 150. 1 : 3.



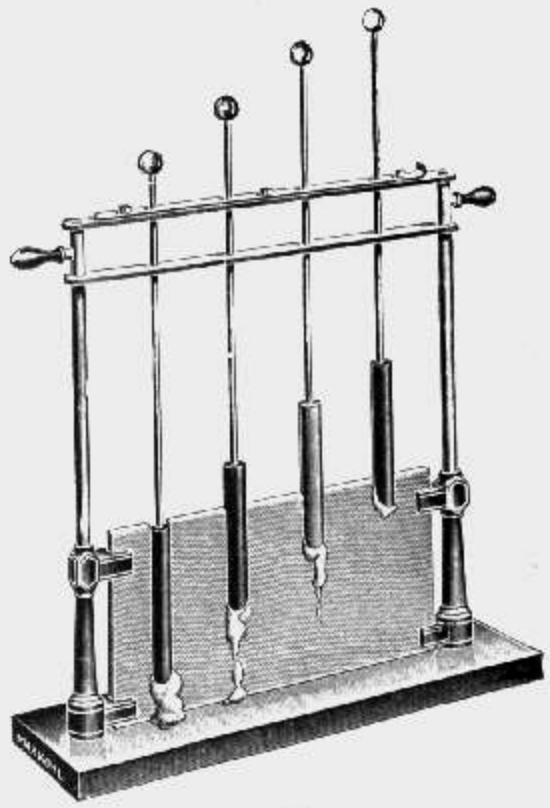
55 151 A. 1 : 5.



55 152. 1 : 11.



55 151 B. 1 : 5.



55 151 C. 1 : 5.

Specific Heat. Calorimetry. Determination of Calorific Value.

£ s. d.

55,149. **Apparatus** after Tyndall **for Shewing the Relative Magnitude of Specific Heat of Different Metals,** Figure (W. D., Fig. 385 [365]; M. P., III, Fig. 97 [II, 2, Fig. 175]), with five metal spheres of iron, zinc, copper, bismuth and lead, tripod and six paraffin slabs 0.12.0

55,150. — idem, after Kolbe, Figure, with device for scraping the spheres, heating vessel, tripod and glass cylinder with vaseline mixture for catching the heated spheres of iron, zinc, copper, bismuth and brass (Ztschr. f. d. phys. u. chem. U., **14,** 1901, page 160) 1. 2.0

55,151. **Apparatus for Specific Heat,** after Schoentjes, Figs. A, B and C (Ztschr. f. d. phys. u. chem. U., **14,** 1901, p. 31) 3. 5.0

The apparatus comprises four parts: a gas burner, a casting mould for paraffin slabs, Fig. A; a heating vessel, Fig. B; and the main part — a stand and a frame with four cylinders (of the same weight), of iron, brass, tin and lead, which are of the same external diameter and the same height and which are fastened on sliding rods, Fig. C.

After the cylinders have been sufficiently heated in the bath, Fig. B, the frame is placed on the stand in which a paraffin slab has been fixed; the cylinders are then allowed to fall simultaneously on the slab by releasing a catch. The four cylinders then sink into the slab to different depths in proportion to their specific heat (see Fig. C).

55,152. **Ice Calorimeter** after Lavoisier and Laplace, Figure (M. P., III, Fig. 99 [II, 2, Fig. 177]; Gan.-Rein., Fig. 426; M. T., p. 151) 2. 0.0

55,153. — idem, after Bunsen, Figure (M. P., III, Fig. 101 [II, 2, Fig. 179]; Gan.-Man., Fig. 528; Gan.-Rein., Fig. 427) 1.16.0

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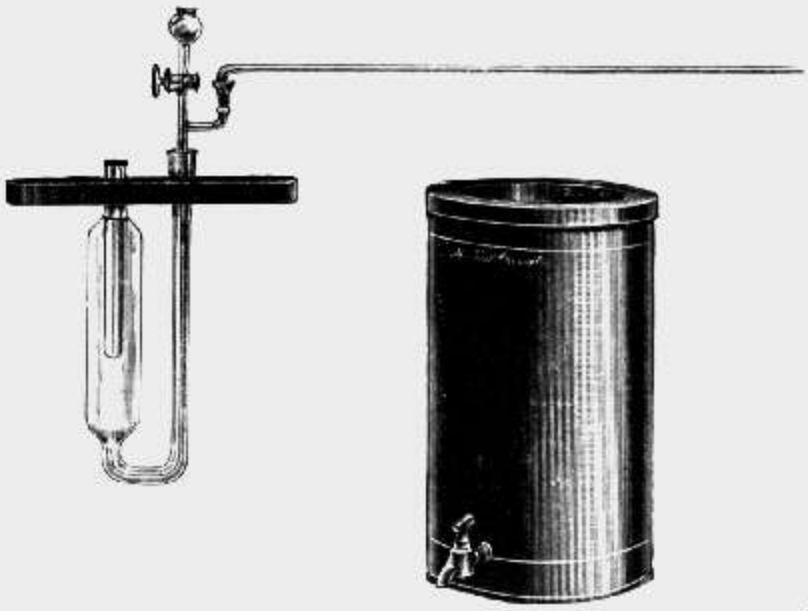
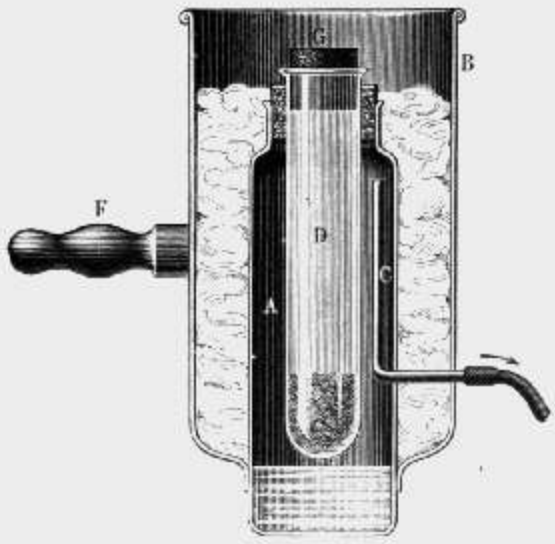


55 153. 1 : 7.



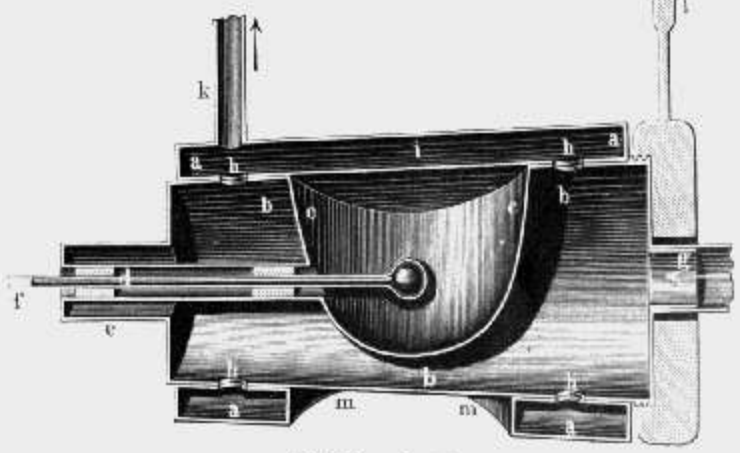
55 154. 1 : 8.



55 156. 3 : 7.



55 157. 1 : 4.



55 158. 1 : 2.

55,154. **Ice Calorimeter** after Reichert, Figure, for lecture purposes (Fr. phys. Techn., 1, 2, Fig. 3091 [I, Fig. 391]) . . . . . £ 0.15.0

55,155. **Heating Apparatus for Calorimetric Experiments,** after Régnault (M. P., III, Fig. 104 [II, 2, Fig. 182]; Gan.-Rein., Fig. 428), with tripod and burner 1. 0.0

55,156. — idem, after Pfaundler, Figure (W. u. E. phys. Prakt., Fig. 111) 1. 0.0

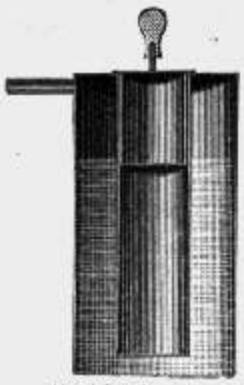
55,157. **Heating Apparatus** after Pettersson, Figure, of copper (W. u. E. phys. Prakt., Fig. 112) 1.13.0

55,158. — idem, after Neumann (**Neumann's Tap**), with thermometer, Figure (M. P., III, Fig. 114 [II, 2, Fig. 192]; W. u. E. phys. Prakt., Fig. 113), very neatly constructed of brass 3.12.0

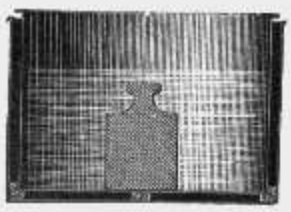
Metallic Bodies after Rebenstorff, for determining **Specific Heat** and proving **Dulong und Petit's Law,** calibrated to 10 grammes atomic weight.

Material	Zinc	Aluminium	Magnesium	Tin	Cadmium
List No.	55,159	55,160	55,161	55,162	55,163
£	0. 8. 0	0.11. 0	1. 0. 0	0.14. 0	1.10. 0

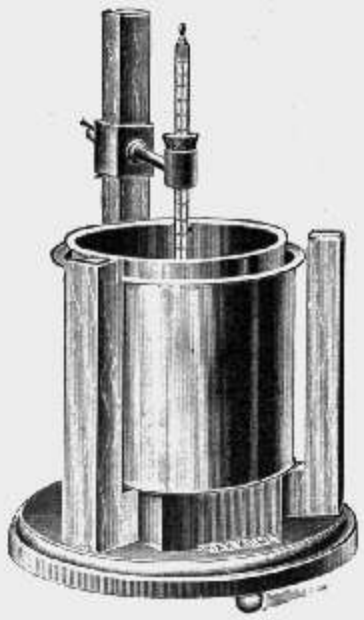
55,164. **Semi-cylindrically bent Plates** with eyes, of lead, copper and iron, with boiling flask for 1 kg mercury, for determining Specific Heat by the Mixing Method (M. T., p. 148) 0.12.0



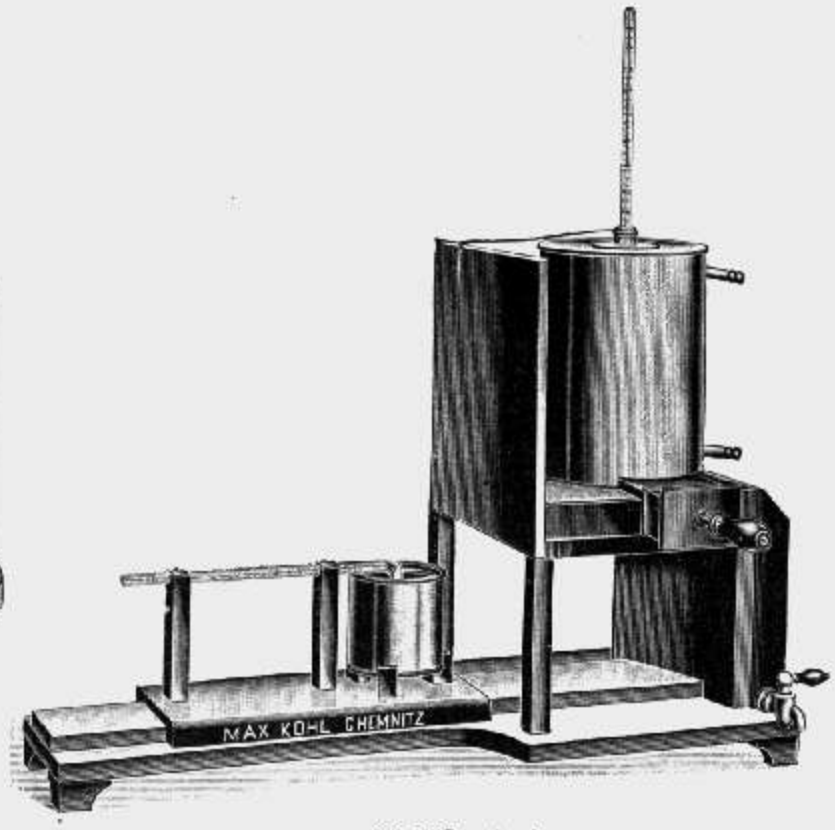
55 167 A. 1 : 5.



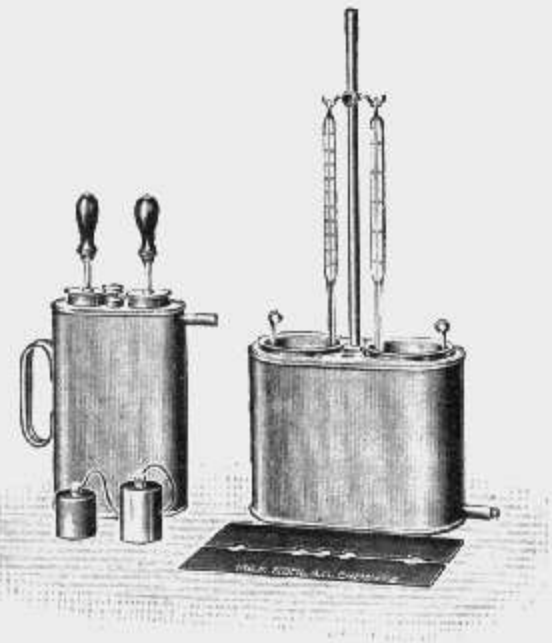
55 167 B. 1 : 5.



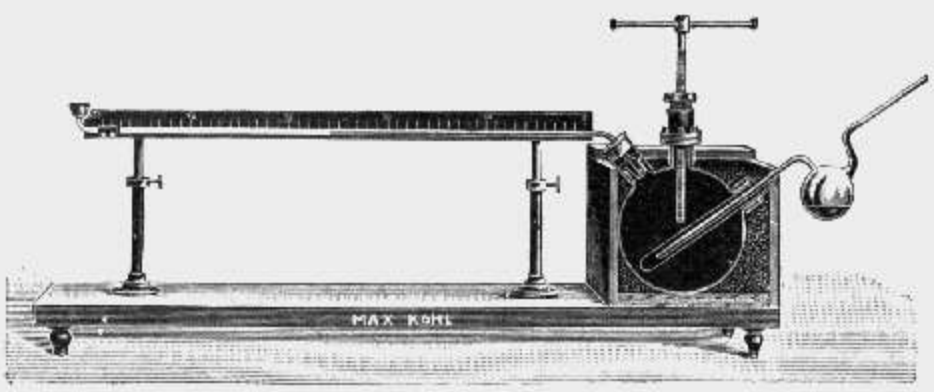
55 169. 1 : 6.



55 173. 1 : 8.



55 170. 1 : 8.



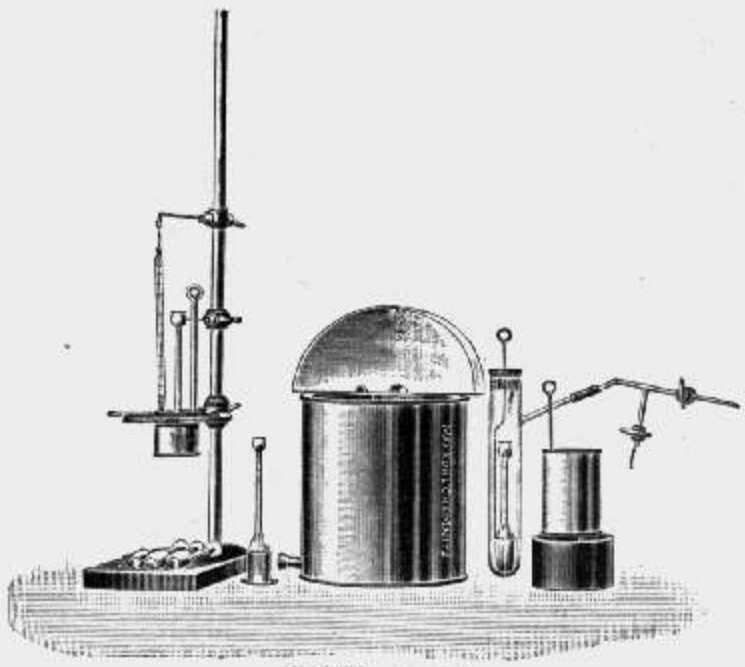
55 174. 1 : 9.

Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
55,165. **Calorimeter Vessel** after Friedr. C. G. Müller (M. T., Fig. 98), capacity **1.2 litres** .	0.10. 0
55,166. — i d e m, $^1/_4$ **litre** capacity	0. 8. 0
55,167. **Calorimeter** after Weinhold, Figs. A and B (W. D., Figs. 386 and 387 [366 and 367]), with heating vessel, double-walled measuring vessel and cylindrical test piece $^1/_2$ kg weight for determining the **specific heat** of a metal, the **latent heat of melting** of ice, and — in conjunction with No. 55,168 — the **latent heat of vaporisation** of water .	0.18. 0
55,168. **Water Trap** for No. 55,167, for keeping the water of condensation from the calorimeter in the experiment on the latent heat of vaporisation (W. D., Fig. 389 [369]) .	0. 3. 6
55,169. **Water Calorimeter,** F i g u r e, for determining Specific Heats by the Mixing Method, with thermometer divided in 0.2°	1. 4. 0
55,170. **Double Calorimeter,** F i g u r e, for rapidly comparing the specific heat of two bodies, with two test pieces of brass and lead of the same weight, two thermometers and steam-heating vessel for two bodies	2. 8. 0
55,171. **3 Test Pieces** of Copper, Iron and Zinc, of same weight	0.18. 0
55,172. **Calorimeter** after Wiedemann and Ebert, with wood block, stirrer, double-walled sheathing vessel and cover (W. u. E. phys. Prakt., Fig. 114)	1. 2. 0
55,173. **Calorimeter** after Régnault, F i g u r e, with two thermometers divided in 0.5°, for solids and liquids (M. P., III, Figs. 111 and 112 [II, 2, Figs. 189 and 190])	4. 4. 0

Cl. 1844, 1845, 1846, 1850, 5783, 1848.

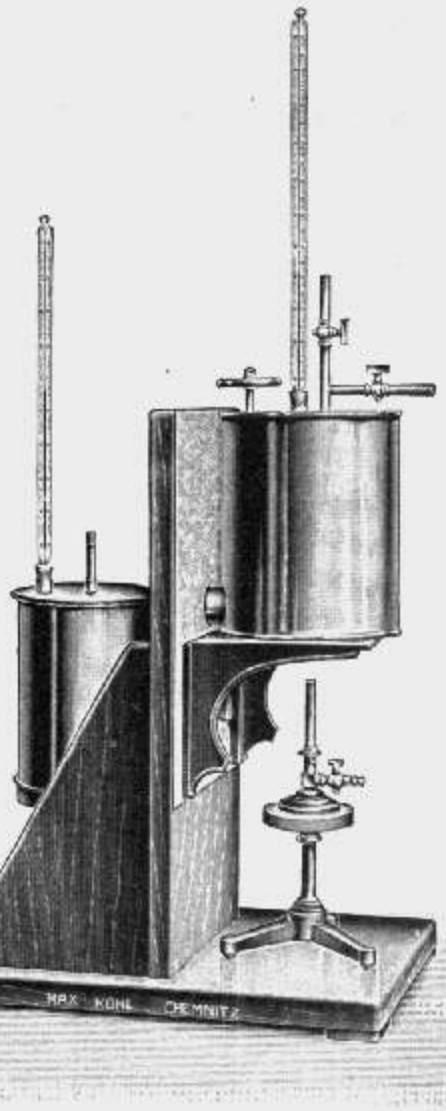
Max Kohl A. G. Chemnitz, Germany.



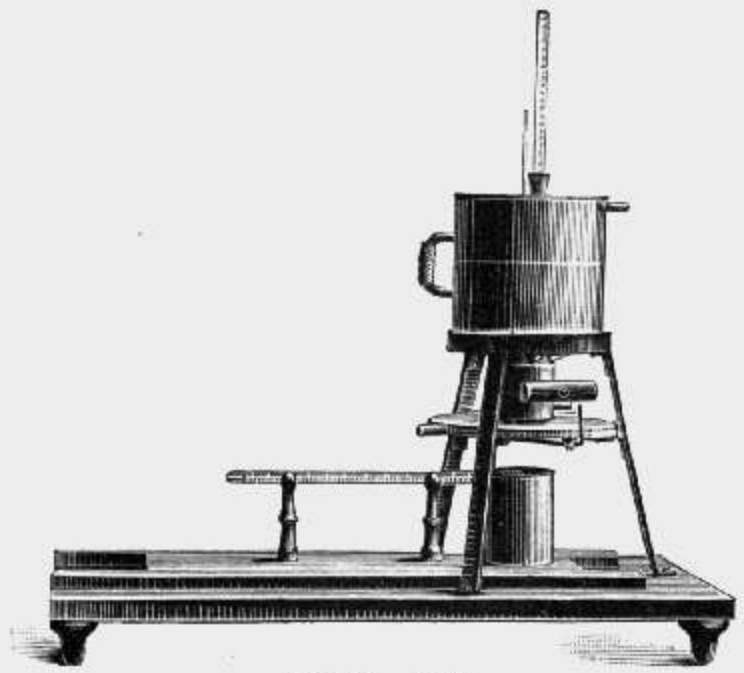
55 177. 1 : 10.



55 178.
1 : 4.



55 176. 1 : 8.



55 175. 1 : 9.

55,174. **Mercury Calorimeter** after Favre and Silbermann, Figure (M. P., III, Fig. 119 [II, 2, Fig. 197]), on polished oak stand; all metal parts of iron and heavily nickelled. Glass bulb 130 mm diameter, embedded in insulating material; capillary in front of a millimetre scale 500 mm long; with two retorts but without mercury . . . . . £ s. d. 4. 0. 0

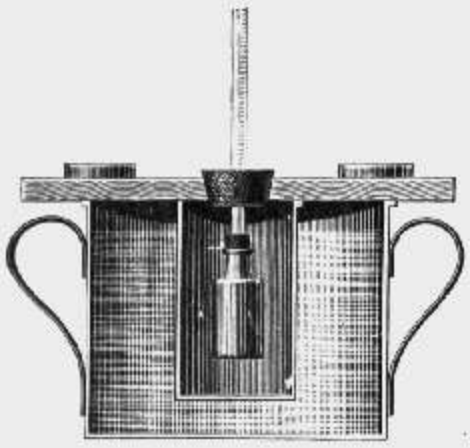
55,175. **Calorimeter for Liquids** after Wiedemann, Figure, consisting of a double-walled heating vessel with iron cylinder for taking mercury; with steel cock and, underneath same, a flat, hollow metal screen for holding off the heat rays; double-walled calorimeter with lateral thermometer, fixed on a slider movable in the base of the apparatus (Fr. phys. Techn., I, 2, Fig. 3074) 7. 0. 0

55,176. **Calorimeter for Liquids,** Figure, after Regnault, for determining specific heat by the mixing method 12. 10. 0

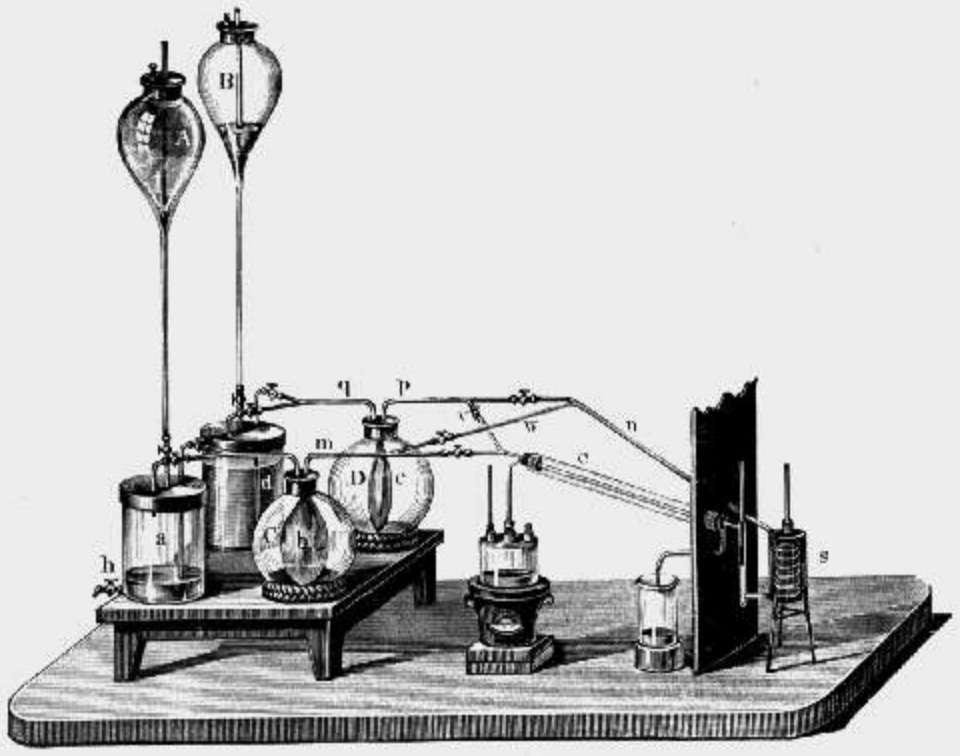
55,177. **Calorimeter for Liquids,** after Kopp, Figure (W. u. E. phys. Prakt., Fig. 194) 2. 8. 0
One filling vessel with wire holder, six glass vessels (long necked) for the liquids, one small base for same for holding when weighing; one calorimeter vessel of brass with wood block and stirrer, one iron mercury-vessel with wire triangle and glass stirrer, one double-walled sheathing vessel of brass with cardboard lid, one stand with two holders and one ring, and one thermometer.

55,178. **Calorifere** after Andrews, modified by Pfaundler, Figure (M. P., III, Fig. 118 [II, 2, Fig. 196]; W. u. E. phys. Prakt., Fig. 115) 0. 15. 0
The bulb is 44 mm diameter and holds 606 g mercury; the space between the two marks m and m′ holds 6,8 g mercury.

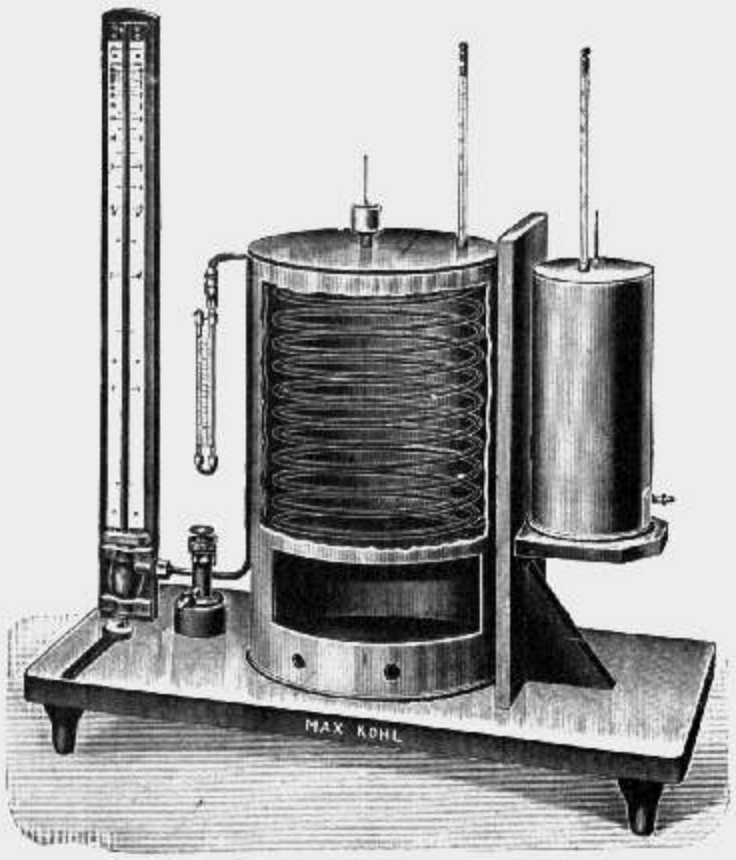
Cl. 1851, 1853, 1849, 4502.



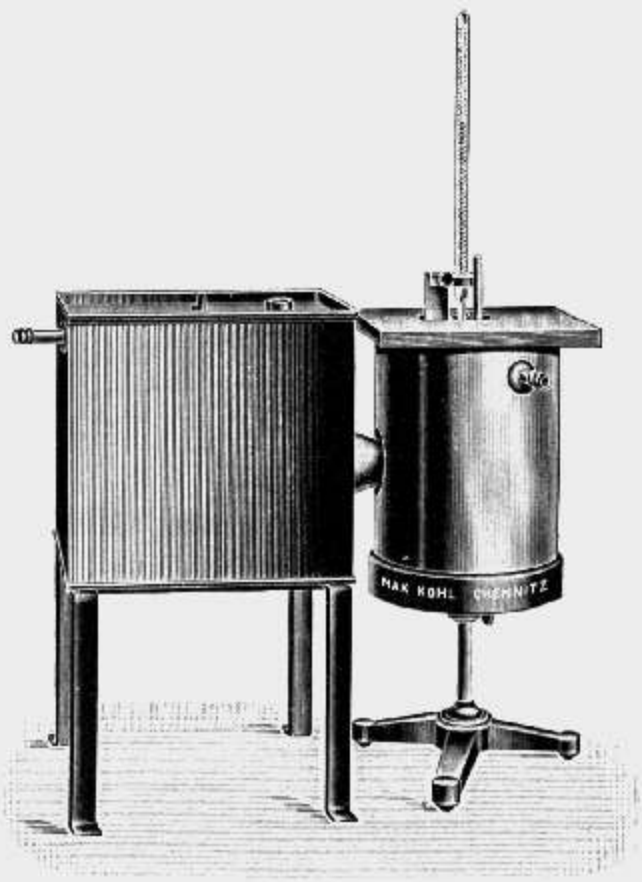
55 179. 1 : 6.



55 181. 1 : 15.



55 182. 1 : 14.



55 183. 1 : 10.

55,179. **Calorimeter** after Dulong and Petit, for the radiation method, Figure (M. P., III, Fig. 124 [II, 2, Fig. 201]; W. u. E. phys. Prakt., Fig. 117), with nickelled radiation vessel and thermometer . . . . . £ s. d. 1. 12. 0

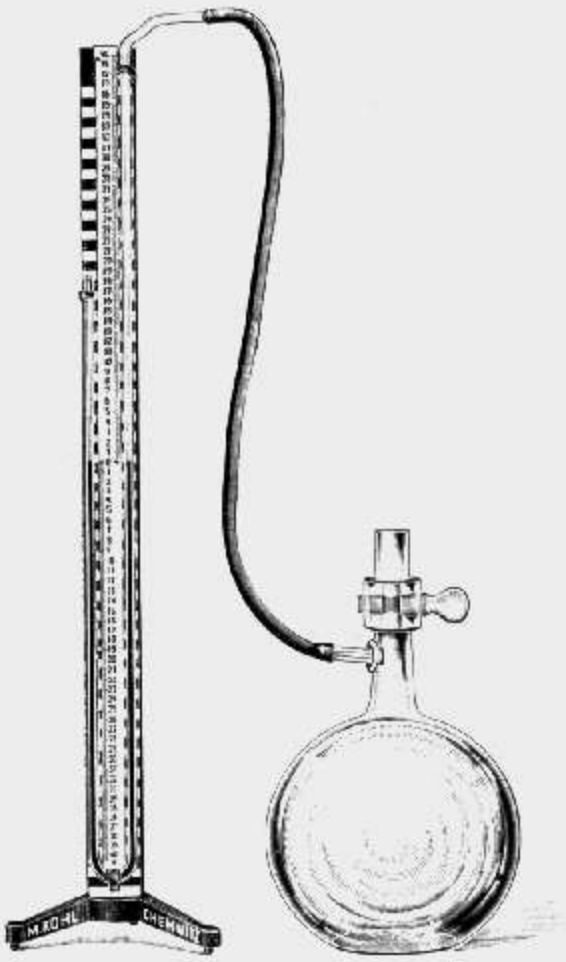
55,180. **Calorimeter** after Weinhold, **for high temperatures** (M. P., III, Figs. 127 and 128 [II, 2, Figs. 203 and 204]), arranged for tipping back, with iron bulb 4. 4. 0

Calorimeters (Water Pyrometers) after Siemens and after Fischer: see items Nos. 54,948 and 54,949, page 587.

Cl. 1854, 1856, 1857, 3053.

Max Kohl A. G. Chemnitz, Germany.

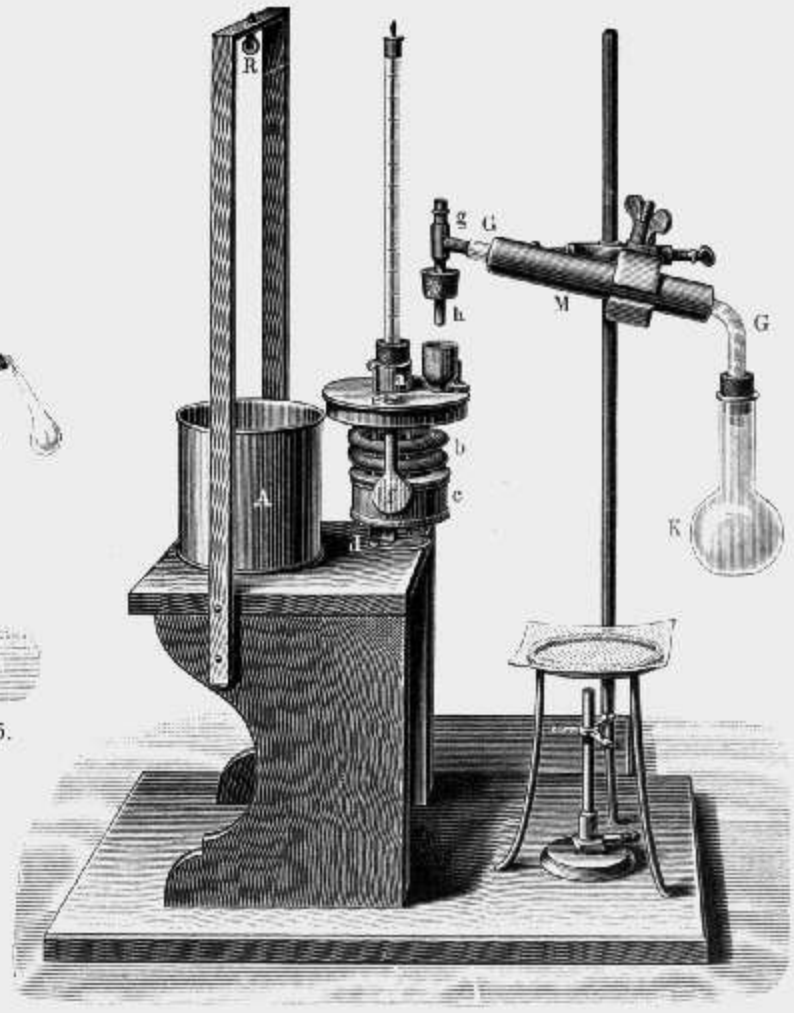
Max Kohl A. G. Chemnitz, Germany.



55185. 1 : 8.



55186. 1 : 5.



55187. 1 : 6.

55,181. **Apparatus** after De la Roche and Bérard, Figure, **for determining the Specific Heat of Gases at Constant Pressure** (M. P., III, Fig. 129 [II, 2, Fig. 205]) . . . . . £ 12. s. 0. d. 0

55,182. **Gas Calorimeter** after Régnault, for the same purpose, Figure (M. P., III, Figs. 130 and 131 [II, 2, Figs. 206/7]; Gan.-Rein., Fig. 433) 15. 0. 0

55,183. **Calorimeter** after Eilhard Wiedemann, **for determining the Specific Heat of Gases at constant Pressure,** Figure (Pogg. Ann. d. Phys. u. Chemie, Vol. 157, 1876, p. 1; M. P., III, Fig. 132 [II, 2, Fig. 208]) 17. 10. 0

The illustration includes only the Heating Apparatus with Water Bath and the Calorimeter. The following pertain to the complete apparatus: 1 flask with rubber ball, 1 water flask with tube and lead pipe, 1 large glass flask, 2 manometers, thermometer screen with thermometer. The heating bath has a stirring device, 1 thermometer and 1 burner; while the calorimeter vessel contains a measuring vessel with three small silver cylinders, filled with silver turnings.

Given in is one thermometer divided in $^1/_{10}{}^0$ C.

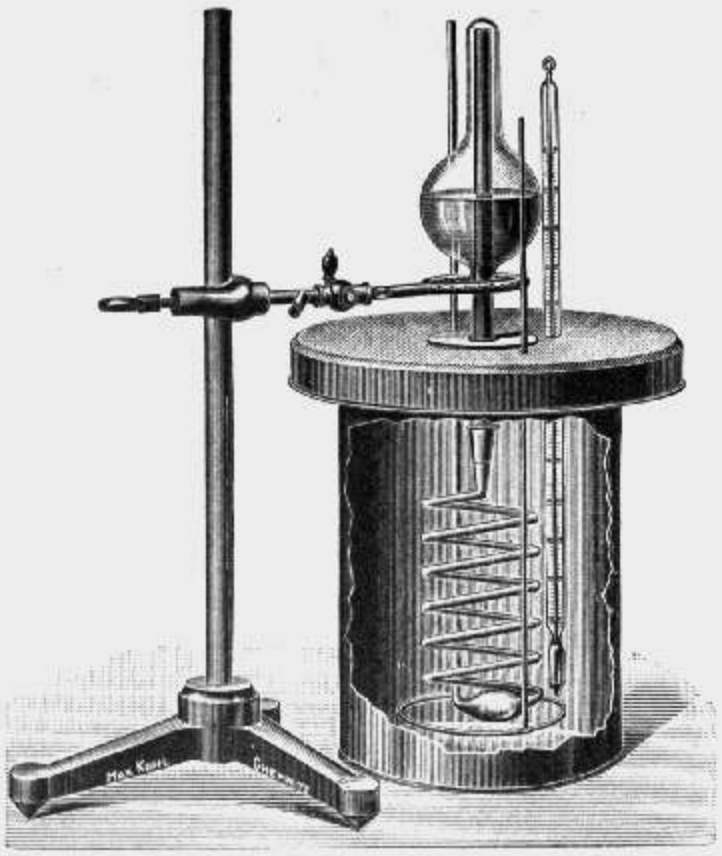
55,184. **Pendulum Clock** with electric $^1/_4$-minute contact, for calorimetric work, mounted open, at same time serving as model of a pendulum clock, see Fig. 52,428, p. 333 . 3. 0. 0

Chronoscopes: see p. 248.

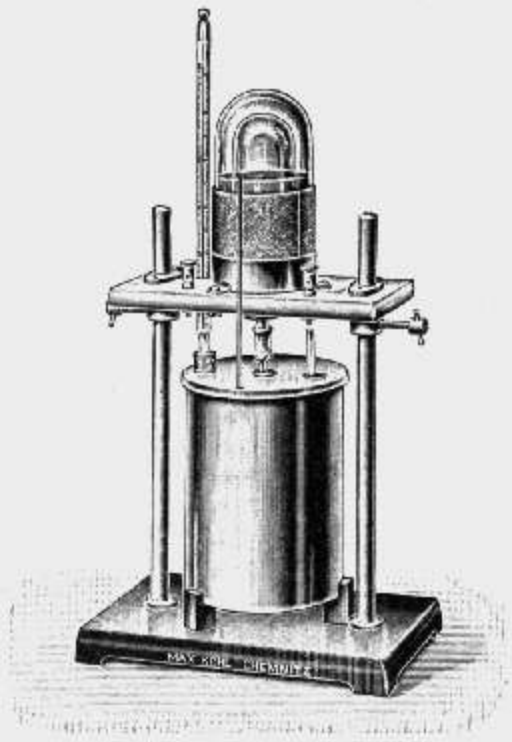
55,185. **Apparatus** after Clément and Désormes, Figure, **for determining the Specific Heat of Gases at Constant Volume** (M. P., III, Fig. 133 [II, 2, Fig. 209]), also for shewing the temperature change on the expansion and contraction of gases (W. D., Fig. 416 [392]) 1. 16. 0

55,186. **Calorimeter** after Brix, **for determining Heat of Vaporisation,** Figure (M. P., III, Fig. 371 [II, 2, Fig. 227]) 1. 10. 0

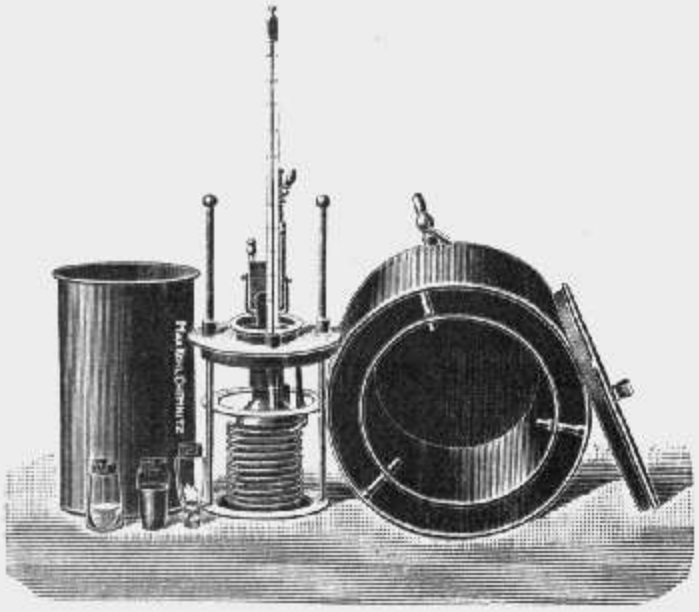
55,187. **Calorimeter** after Schiff, **for determining Heat of Vaporisation.** Figure, with thermometer, flask, stand, tripod, and wire netting (W. u. E., phys. Prakt., Fig. 124) . . . 4. 0. 0



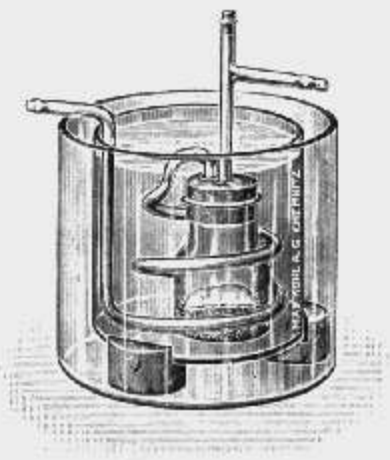
55 188. 1 : 5.



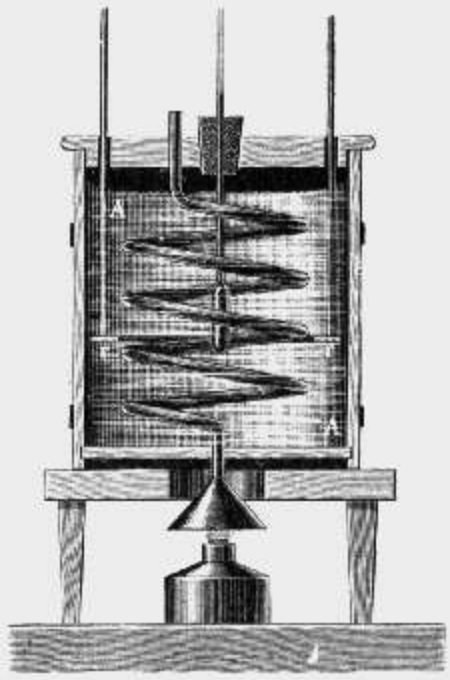
55 189. 1 : 6.



55 192. 1 : 7.



55 191. 1 : 6.



55 193. 1 : 7.

55,188. **Berthelot's Apparatus for determination of the total Heat of Steam,** Figure (M. P., III, Fig. 370 [II, 2, Fig. 226]; Gan.-Man., Fig. 530; Gan.-Rein., Fig. 435) . . . . . £ 3. 0. 0

55,189. — idem, **electrically heated,** Figure, for connecting up to 65—220 volts, without current regulator . . . . . £ 4. 4. 0

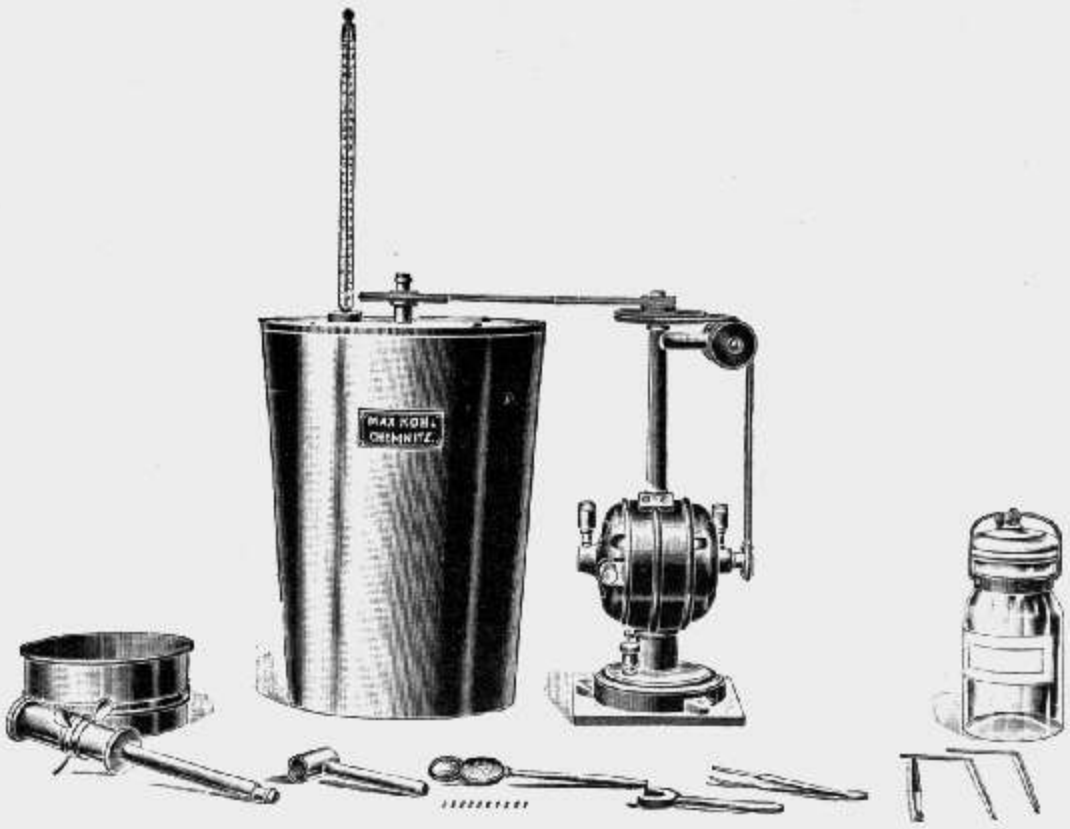
Current Regulator: (a) for 65 V., £ **1. 16. 0**; (b) for 110 V. £ **2. 6. 0**; (c) for 220 V., £ **3. 6. 0.**

55,190. **Apparatus for determining Calorific Value of Hydrogen (Calorimeter)** after Friedr. C. G. Müller (M. T., p. 148 and Fig. 245 on p. 351), consisting of an apparatus for the Synthesis of Water . . . . . £ 0. 16. 0

55,191. **Demonstration Calorimeter** after Friedr. C. G. Müller, Figure, for determining the Calorific Value of solid fuels such as charcoal, lignite, wood (M. T., Fig. 106), of glass . . . . . £ 0. 14. 0

Cl. 1861, 3888, 1862, 5405, 5018.

Max Kohl A. G. Chemnitz, Germany.



55 194, 55 195, 55 197. 1 : 7.



55 199. 1 : 3.

Max Kohl A. G. Chemnitz, Germany.

55,192. **Calorimeter** after Favre and Silbermann, for determining the Heat of Combustion of solid and liquid fuels at constant pressure, Figure (M. P., III, Figs. 377/80 [II, 2, Fig. 231]) . . . . . £ s. d. 11. 0. 0

The apparatus consists of a double-walled outer vessel with cock, which is filled with water. In this vessel is contained, insulated by a cork, the calorimeter vessel, which likewise should be filled with water. The combustion vessel is freely suspended in a calorimeter vessel. The combustion vessel possesses a gas lead, an oxygen lead, and a tube with spiral for carrying off the gases of combustion. In the combustion vessel it is possible to suspend one Platinum Crucible, with sieve bottom for burning coal, one Porcelain Crucible for burning sulphur, and one small Flask for the combustion of liquids; these three items are supplied with the apparatus. The combustion vessel is closed by a glass above which is a mirror for observing the process of combustion. All metal parts of brass.

55,193. **Demonstration Calorimeter** after Rumford, Figure, for determining the Calorific Value of liquid fuels (Fr. phys. Techn., 1, 2, Fig. 3158) 2. 4. 0

55,194. **Calorimeter** after Parr, Figure, for technical Calorific Value determinations of fuels, with Sieve, Reagent Flask with rubber stopper, Measuring Beaker, 12 small Ignition Rods, Tongs, Magnifier with stem, Spanner, and high-grade Thermometer divided in $^1/_{50}{}^0$ C. Price without motor or driving stand 10. 0. 0

The calorimeter supplies a convenient, cheap, reliable and indispensable means for officials and manufacturers for carrying out comparative determinations of the value of fuels (lignite, coal, coke, etc.) employed. An experiment, including the necessary weighings, occupies but half an hour. In this apparatus high pressure is neither used nor is it produced in the reaction, as a chemical auxiliary reagent gives the necessary oxygen for the combustion and, on the other hand, binds the products of combustion.

Complete description and instructions for use gladly sent on application.

Accessories for the Parr Calorimeter: see Nos. 55,195 et seq.

55,195. **Electric Motor** for 110 Volts D. C., with driving stand, see Fig. 55,194 . . . . . 3. 10. 0
If type of current or voltage differ from above, prices vary accordingly.

55,196. **Turbine** after Rabe, with driving stand, for connecting to the water lead 1. 5. 0

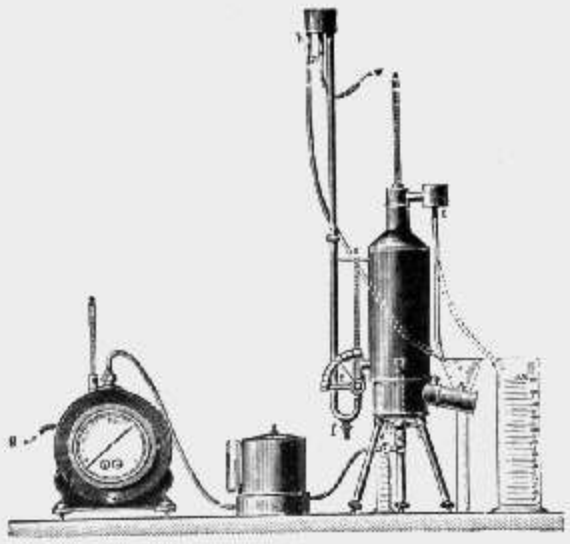
55,197. **Spare Cartridge** (Reaction Vessel), see Fig. 55,194 . . . . . 1. 11. 0

55,198. **Spare Thermometer,** divided in 0.02° C., with value for water given 1. 10. 0

51,546. **Chemico-technical Balance** in glazed walnut case, with arrestment and levelling screws, sensitivity 1 mg, to carry 20 g, cf. Fig. 51,548, p. 234 . . . . . 2. 0. 0

51,622. **Set of Weights,** from 1 mg to 20 g, of brass, gilt 1. 0. 0

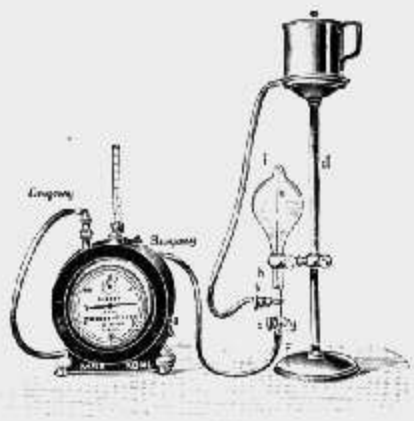
55,199. **Steel Cylinder for Calorimetric Experiments,** after Dr. Koneck, Figure 2. 0. 0



55 200—55 211. 1 : 15.



55 211. 1 : 5.



55 204, 55 212. 1 : 15.

		£ s. d.
55,200.	**Calorimeter** after Junkers, Figure, **for technical Calorific Value Determinations of Gases** and, in connection with auxiliary outfit No. 55,213, for calorific value determinations of **Liquids**, of copper and brass, carefully nickelled, with gas burner	17. 0. 0

For Accessories see Nos. 55,201—55,213.

The apparatus works continuously (since combustion is continuous), and even in the open air and, in view of the fact that a steady flow of water is used which carries from the instrument in each moment as much heat as is conducted into it. Two thermometer readings and the determination of gas and water volume suffice for estimating the calorific value. This can be done even by the unskilled and with an accuracy which attains, if not surpasses, the best of the scientific methods used up to now.

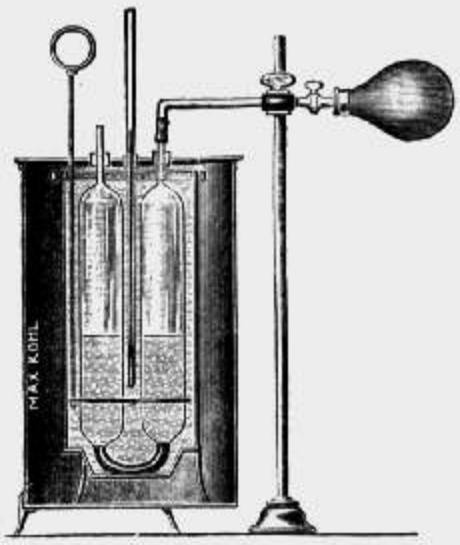
The calorimeter consists essentially of a special tube boiler which, while very compactly constructed allows the flame sufficient room to expand and permits of complete combustion, while at the same time it effects very energetic cooling of the gases in such a way that the heat is entirely taken up by the water current. At the same time sufficient draught is produced. The regularity of the water flow is secured by a special arrangement serving to keep the pressure of the water perfectly constant. A cock permits of adjusting the strength of the water flow and consequently of varying the temperature of eduction. By means of a throttle valve fitted in the flue it is possible to regulate the quantity of air necessary for combustion.

In order to avoid the absorption and emission of heat at the surroundings, the calorimeter is covered by a well-polished nickelled jacket. Between the two is a still stratum of air. Thermal transmission is therefore reduced to the lowest minimum and can even be avoided altogether by making the mean temperature of the instrument equal the room-temperature, which can easily be done by the regulating cock mentioned above. After the calorimeter is started, the water placed in it and the burner introduced, the steady state is attained in a few minutes and the measurements can be proceeded with.

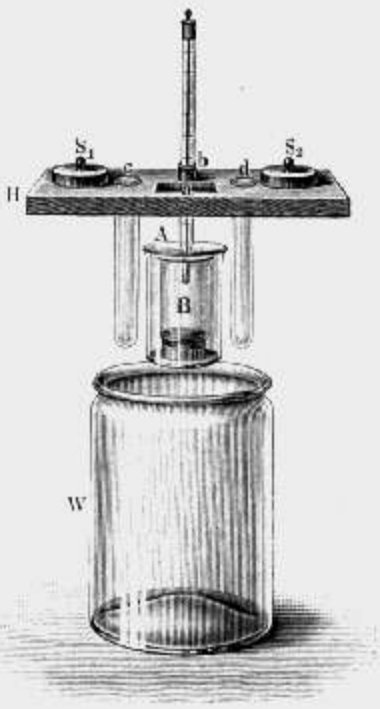
55,201.	**2 Thermometers** for 0° to + 50° C., divided in $^1/_{10}$°	Each £ **0. 7. 6**	0. 15. 0
55,202.	**2 Magnifiers** for reading	Each £ **0. 7. 6**	0. 15. 0
55,203.	**Case** for the Calorimeter, very neat pattern		1. 2. 0
55,204.	**Gas Meter** for 3 litres, Figs. 55,200 and 55,204		4. 16. 0
55,205.	**2 Thermometers** for 0° to + 50° C., divided in whole degrees	Each £ **0. 2. 6**	0. 5. 0
55,206.	**Cylindrical Glass Measure** for 2000 ccm, graduated every 20 ccm, for measuring the eduction water		0. 7. 0
55,207.	— idem, for 100 ccm, divided in $^1/_1$ ccm, for measuring the condensing water		0. 2. 0
55,208.	**Case** for the Gas Meter		0. 17. 0
55,209.	**4 Rubber Stoppers** for inserting the thermometer		0. 1. 0
55,210.	**5 m Rubber Tubing**		0. 7. 0
55,211.	**Gas Pressure Governor,** of brass, finely nickelled, with reservoir, Figure, with 6 brass plates and 1 extra valve		2. 15. 0
55,212.	**Gas-Meter Calibrating Device,** Fig. 55,204, for 1 litre calibration-volume, consisting of calibration flask, brass stand, nicely nickelled, and water vessel, without gas-meter		3. 15. 0
55,213.	**Auxiliary Outfit for Calorific Value determinations of liquid fuels,** Figure . . . . . The outfit consists of a **Precision Balance, 1 Carburetting Lamp for** liquid fuels and **1 extra Burner Head** for spirit.		8. 0. 0



55 213. 1 : 15.



55 216. 1 : 6.



55 217. 1 : 8.

55 214. 1 : 10.

55,214. **Calorimeter** after Bertholet-Mahler, improved by Kroeker, Figure, for calorimetric determinations by means of a combustion bomb, **for Technical Purposes** . . . £ s. d. 24. 15. 0 — Liable to alteration owing to fluctuating price of platinum

The apparatus consists of a steel bomb 300 ccm content, enamelled inside, polished and nickelled outside, with insulated platinum pole and platinum tube carried to the bottom of the bomb; Stirrer arranged for hand and motor drive; a nickelled Water Vessel with oak insulating jacket and thermometer holder; a Thermometer divided in $^1/_{50}{}^0$ C.; a Manometer on stand with parts for connecting to the bomb and to the oxygen cylinder; a Steel Mould for making coal briquettes; a Support for the Bomb for use while screwing down the lid; a Clay Capsule; various spanners; a Valve Adjusting Pin; Ignition Wire and spare Lead Packing Rings.

The bomb is filled with oxygen from a steel cylinder; this should be ordered separately if not available.

55,215. — idem, **for Scientific Use** . . . . . 38. 10. 0 — Liable to alteration owing to fluctuating price of platinum

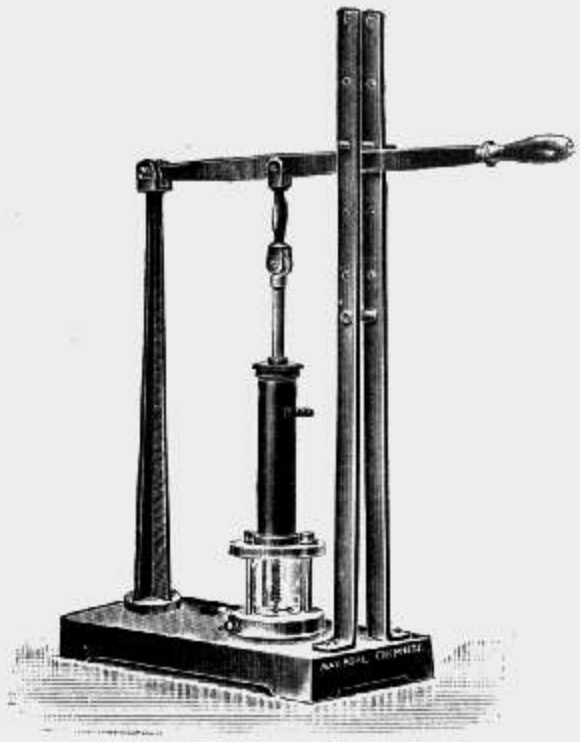
This apparatus differs from the preceding in that the inner surface of the bomb lid is coated with platinum and that the valve points are of platinum-iridium. Instead of the clay capsule there is a Platinum Crucible with platinum holder and clamping screw. The insulating vessel consists of a double-walled copper jacket and should be filled with water at room temperature. The thermometer is divided in $^1/_{100}{}^0$ C., is provided with a Test Certificate from the Physikalisch-Technische Reichsanstalt, and has a magnifier for reading.

55,216. **Apparatus for determining the Generation of Heat by the simple Mixing of different Liquids,** after Bussy and Buignet, Figure, with thermometer divided in 0.2° C. . 3. 15. 0

55,217. **Apparatus for determining the Heat of Neutralisation on mixing Acids and Bases,** Figure (W. u. E., phys. Prakt., Fig. 126) 1. 4. 0



55 218. 1 : 9.



55 220. 1 : 9.



55 221. 1 : 3.

Heat and Work.

	£ s. d.
52,048. **Apparatus for boiling Water, Alcohol or Ether by Friction;** for the whirling table (W. D., Fig. 417 [393]; Gan.-Rein., Fig. 451)	0. 5. 0
52,049. — i d e m, with arrangement in order to enable the spirit of wine to be ignited, F i g. 52,049, p. 285	0. 6. 0
55,185. **Apparatus for showing Temperature-change on Expansion and Contraction of Gases,** Fig. 55,185, p. 621 (W. D., Fig. 416 [392]), and for determining the specific heat of gases at constant volume	1. 16. 0
55,218. **Apparatus for showing the Temperature-change on the Compression and Expansion of Gases,** after Tyndall, F i g u r e (Tyndall, Die Wärme [Heat], Fig. 6, p. 18; Gan.-Man., Fig. 546; Gan.-Rein., Fig. 464)	2. 10. 0
1st Experiment. Air at the temperature of the surrounding space compressed in the vessel some hours previous to the experiment shows a cooling effect when flowing against a thermocouple. **2nd Experiment.** If air which has just been compressed in the flask and thereby become heated is allowed to flow against a thermopile, the latter indicates heat; on repeating this a number of times this heat is exhausted and the galvanometer pointer finally shows cold.	
55,220. **Apparatus** after Favre and Silbermann, **for showing Heating of the Air on Compression and Cooling on Expansion,** F i g u r e, with sensitive spiral thermometer (M. P., III, Fig. 400 [II, 2, Fig. 248])	6. 16. 0
A pointer is suspended on a Breguet platinum-silver spiral, above a graduation, in a glass vessel which is in direct communication with the pump cylinder (cf. Fig. 54,896, p. 581). This sensitive thermometer shows the increase of temperature ensuing when the air is compressed by pressing down the piston, and, inversely, the lowering of the temperature on rarifying.	
55,221. **Apparatus** after Behrendsen for the same purpose, F i g u r e, with stopcock and base for setting up on the air pump	1. 4. 0
A thermocouple is contained in the upper part of the apparatus, its ends leading to two terminals for the galvanometer leads.	
55,222. **Pneumatic Fire Syringe,** of metal, F i g u r e (Gan.-Man., Fig. 545; Gan.-Atk., Fig. 452)	0. 7. 0
55,223. — i d e m, of glass, F i g u r e	0. 16. 0
The syringe is constructed in such manner that the luminous phenomena occurring on ignition can plainly be seen through the glass. To make the experiment, the syringe should be pressed firmly against the wall of lecture table with the left hand and the piston pressed in smartly with the right hand, being drawn out immediately so that the tinder continues to smoulder. The slow match must be quite dry and have been previously ignited and extinguished once.	
55,224. **Apparatus for showing the Action of Gunpowder,** after Friedr. C. G. Müller (Ztschr. f. d. phys. u. chem. U., 2, p. 170; M. T., Fig. 89)	0. 10. 0

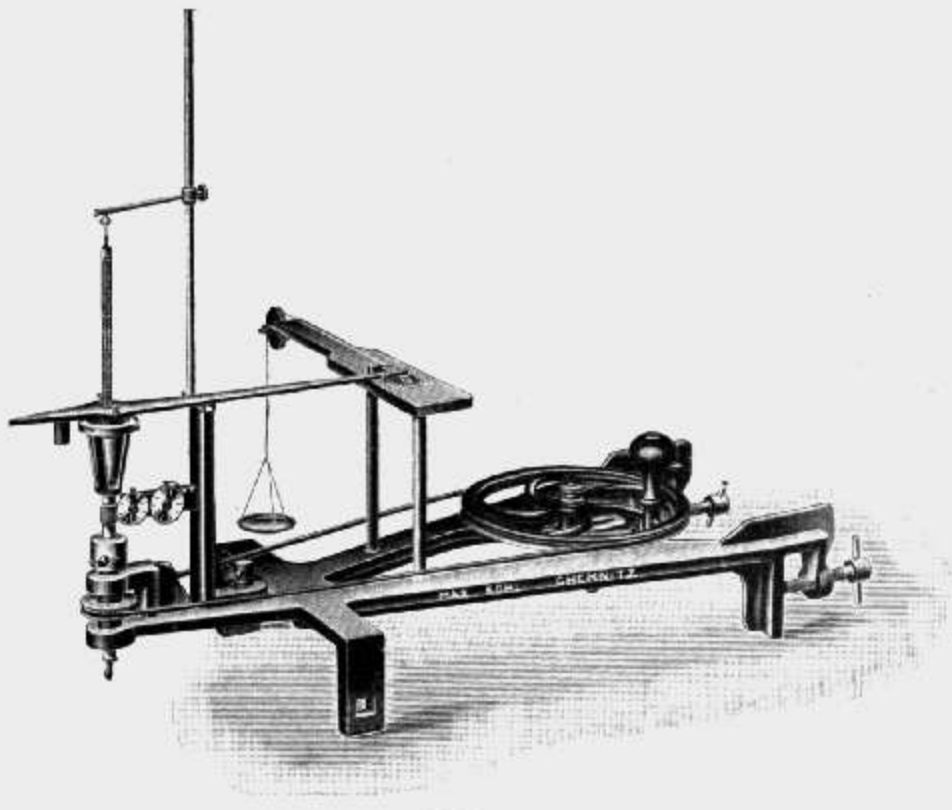
Max Kohl A. G. Chemnitz, Germany.



55 222. 1 : 4.



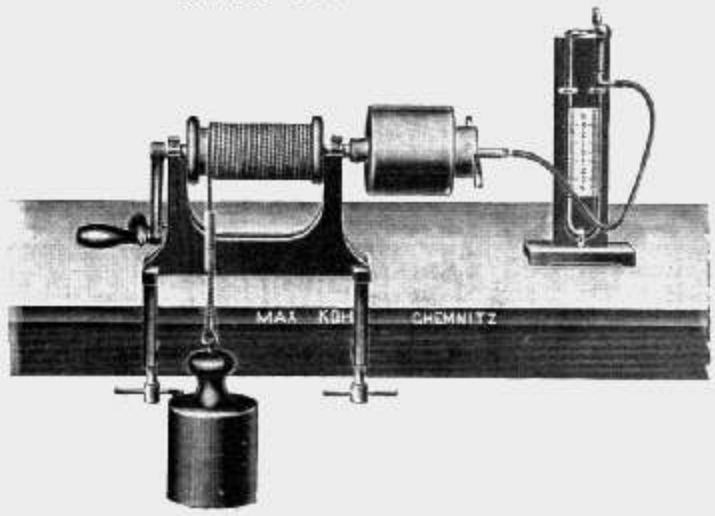
55 223. 1 : 4.



55 226. 1 : 9.

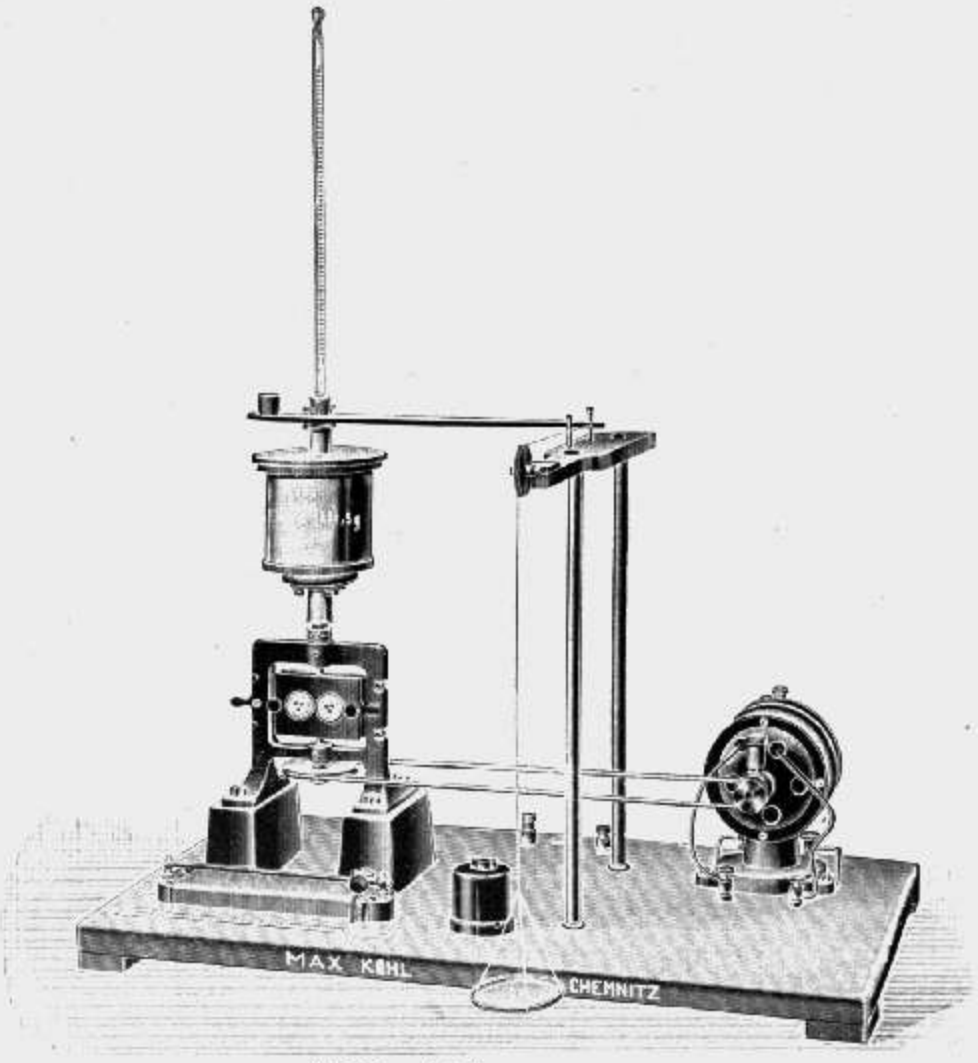


55 225. 1 : 7.



55 227. 1 : 10.

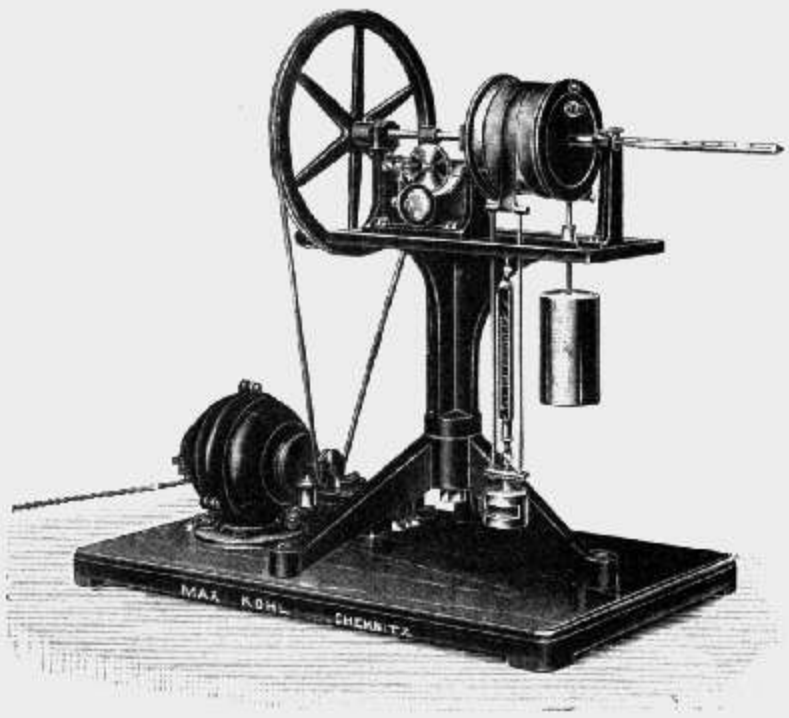
	£ s. d.
55,225. **Gore's Ball,** Figure, rotating by heat (Eisenlohr, p. 532) . . . . . The ball, 30 mm diameter, is solid so as to ensure good contact. If the ball and the track are well polished the experiment acts very well with an accumulator cell or a good Bunsen cell.	1. 14. 0
53,199. **Trevelyan's Rocker:** see Fig. 53,199, p. 420 . . . . . For other patterns, see Nos. 53,200/1, p. 420.	0. 15. 0
52,050. **Apparatus** after Puluj, **for determining the Mechanical Equivalent of Heat;** for placing on the whirling table, Fig. 52,050 p. 285	5. 5. 0
52,051. — idem, **with Whirling Table No. 51,949**	7. 0. 0
55,226. — idem, **with large Driving Stand,** Figure, and with thermometer divided in $^1/_{10}{}^0$ (W. D., Figs. 418—421 [394—397]; M. P., III, Fig. 406 [11, 2, Fig. 254]) . . . The inner cone is completely insulated by ivory. The type of instrument is excellent, and the experiment can be carried out with great accuracy. The driving stand can be used as a whirling table on removing the device for Puluj's experiment.	9. 0. 0
For **Patterns with Electric Motor drive,** also **Accessories** for same, see under Nos. 52,052—52,055 and the illustrations on p. 286.	
55,227. **Apparatus** after Grimsehl, **for Determining the Mechanical Equivalent of Heat,** Figure, with manometer, which serves as an air thermometer (Ztschr. f. d. phys. u. chem. U., **16**, 1903, p. 290), with cramps for screwing to the lecture table	3. 10. 0



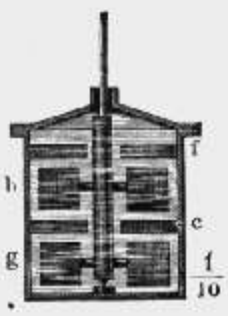
55 226. 1 : 8.



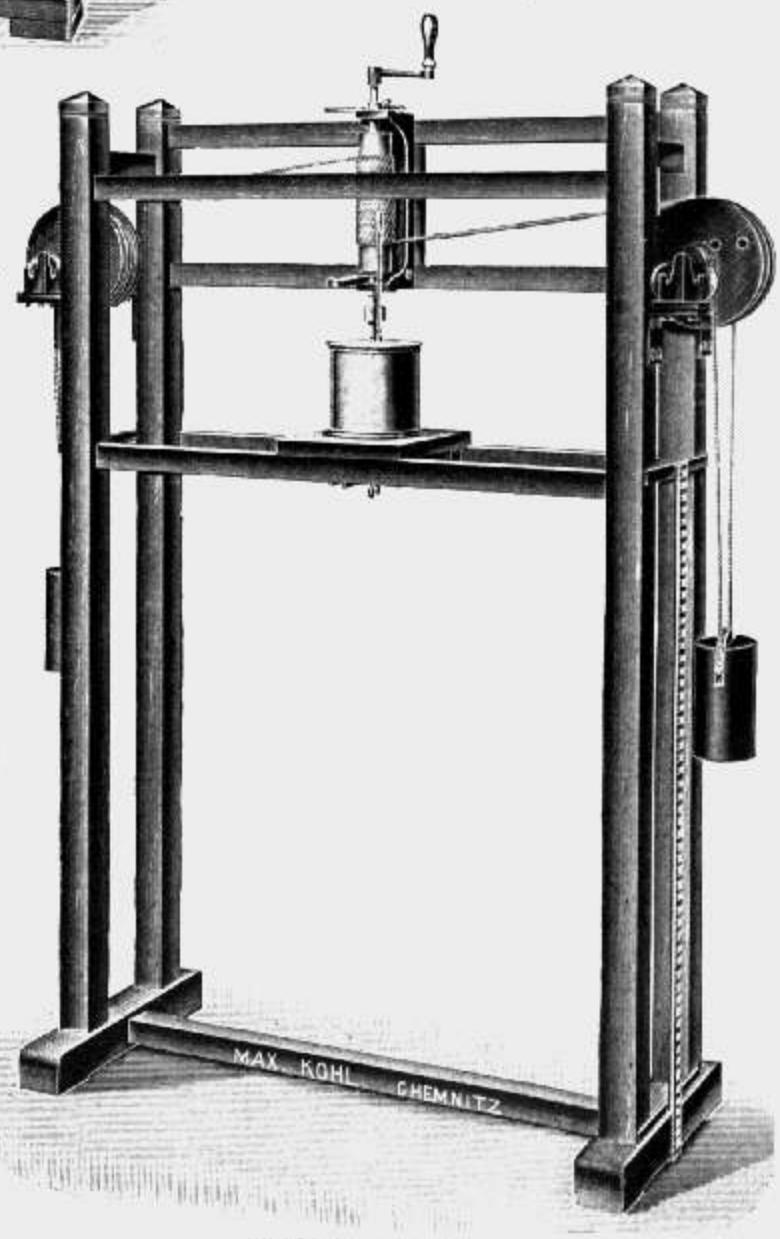
55 234. 1 : 7.



55 230. 1 : 8.



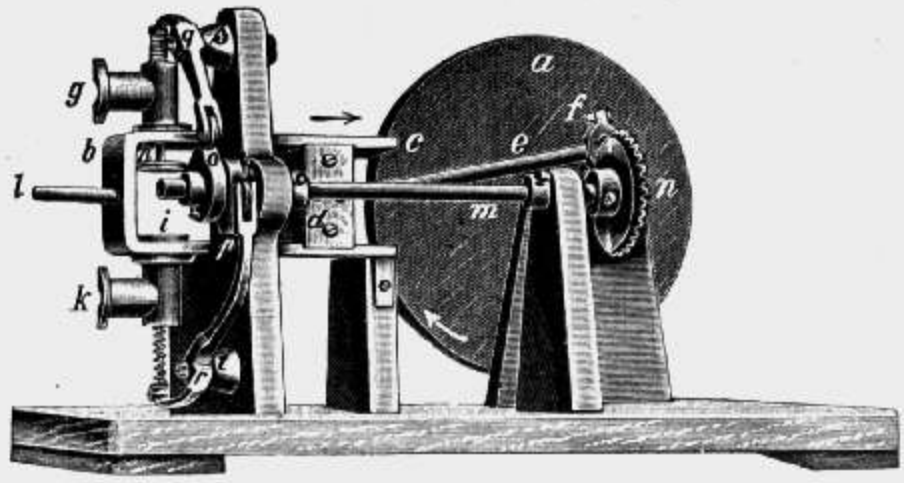
55 232 B. 1 : 10.



55 232 A. 1 : 15.

Cl. 3420[2], 1886, 5230, 1880, 4204.

Max Kohl A. G. Chemnitz, Germany.



55 241. 1 : 4.

52,228. **Apparatus** after Christiansen **for determining the Mechanical Equivalent of Heat.** Figure (M. P., III, Fig. 407 [II, 2, Fig. 255]; W. u. E. phys. Prakt., Fig. 121), with 110 volt D. C. motor, the accuracy of the apparatus is about 1% . . . . . £ 16. 0.0

55,230. **Apparatus** after Callendar, Figure, **for determining the Mechanical Equivalent of Heat,** driven by a 110 volt D. C. Motor.[1] Including motor 16. 0.0

The work of friction is generated by loaded silk brake bands laid round a rotating cylinder of thin brass filled with a certain quantity of water. The heat is measured by a thermometer introduced through a central aperture into one of the cylinder bases. The number of revolutions is indicated by a speed counter. Thermal loss can be eliminated by Rumford's compensation method by two measurements with different load. The lecturer can obtain values accurate to approx. $^1/_2$% in the presence of the audience within 10 minutes.

55,231. — idem, **for working by hand,** without motor 12. 10.0

55,232. **Apparatus** after Joule, Figs. A and B, **for determining the Mechanical Equivalent of Heat** (M. P., III, Figs. 404/5 [II, 2, Figs. 252/3]; Gan.-Man., Fig. 517; Gan.-Rein., Fig. 462), with Wood Stand and vertical rules 16. 0.0

Heat Engines.

Hot Air Engines with Ribbed Cooler. Fig. 55,234.

List No.	55,233	55,234	55,235	55,236	55,237	55,238	55,239	55,240
Piston Diamr., . mm	30	40	54	65	80	100	130	150
Flywheel Diamr., mm	118	170	200	260	330	410	550	590
Efficiency . . . HP	$^1/_{150}$	$^1/_{60}$	$^1/_{40}$	$^1/_{20}$	$^1/_{12}$	$^1/_8$	$^1/_4$	$^3/_{10}$
(a) Spirit-heated . £	**1. 16. 0**	**4. 10. 0**	**6. 10. 0**	**9. 0. 0**	**13. 0. 0**	**18. 10. 0**	—	—
(b) Gas-heated . . £	—	**4. 10. 0**	**5. 15. 0**	**8. 0. 0**	**12. 0. 0**	**17. 10. 0**	**33. 10. 0**	**41. 0. 0**
(c) Petroleum-heated£	—	—	—	—	—	**19. 10. 0**	**37. 0. 0**	**45. 0. 0**

This hot-air engine forms a very simple, cheap and safe motor. The ribbed cooling replaces the water-cooling adopted in other hot-air engines and their attendant disadvantages and simplifies the manipulation of the motor in that it is only necessary to light the heating jet — spirit, gas, petroleum or petrol — for starting.

55,241. **Instructional Model of a Gas Engine** after Richter, Figure (Ztschr. f. d. phys. u. chem. U., **12,** 1899 p. 265) 3. 4.0

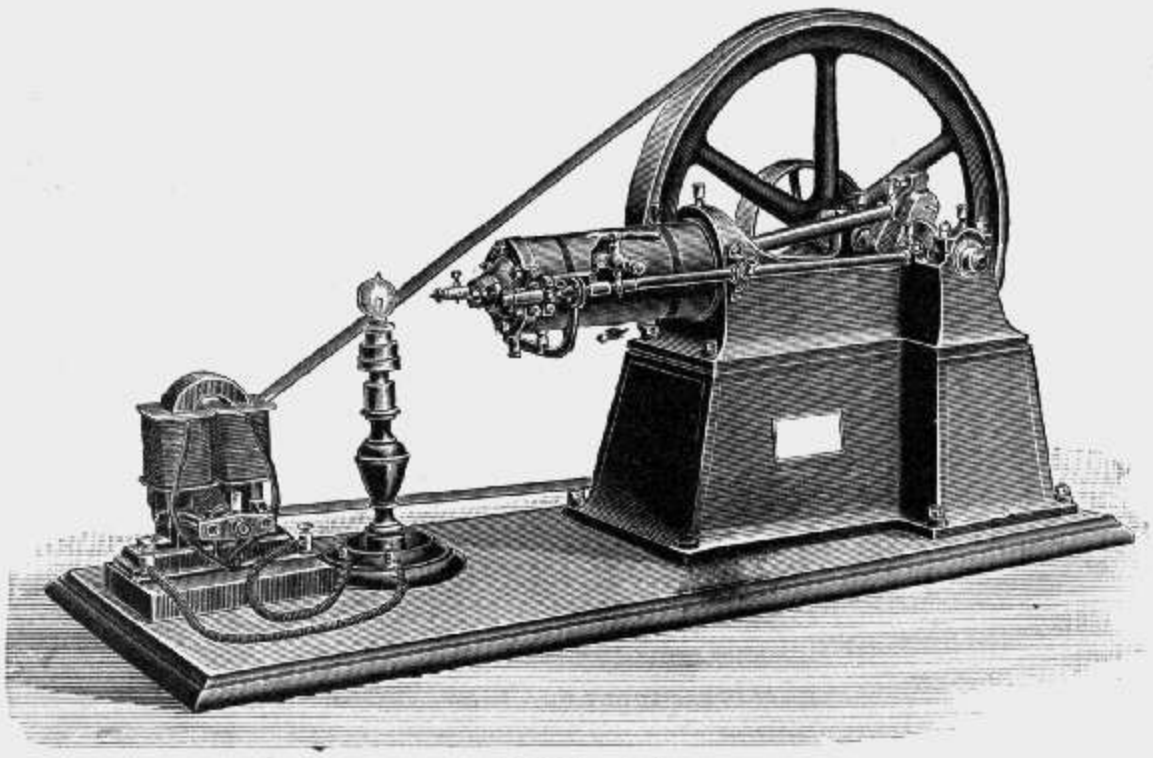
The model explains the mode of action of a 4-cycle gas engine. The four cycles of the motion of the piston, also Ignition and gearing can easily be explained. It is possible to set the model in motion (it cannot be worked) by a handle fixed to the flywheel.

55,242. **Model of a Horizontal Gas Engine,** Otto system, $^1/_{10}$ HP; see Fig. 55,243, p. 630, working as a 4-cycle motor with electric ignition, for house gas or petrol 18. 0.0

Dimensions: bore 50 mm, flywheel diam. 400 mm, speed 800 r.p.m., gas-consumption 300 litres per hour. The following pertain to the engine: 1 gas bag, 1 cooling vessel, 1 ignition coil, 1 double cell, 5 leads, 2 spanners.

[1] With motor working at other current or voltage at corresponding variation in price. When ordering, type of current and voltage should be mentioned, and in the case of 3-phase current, the frequency.

Max Kohl A. G. Chemnitz, Germany.



55 243. 1 : 8.



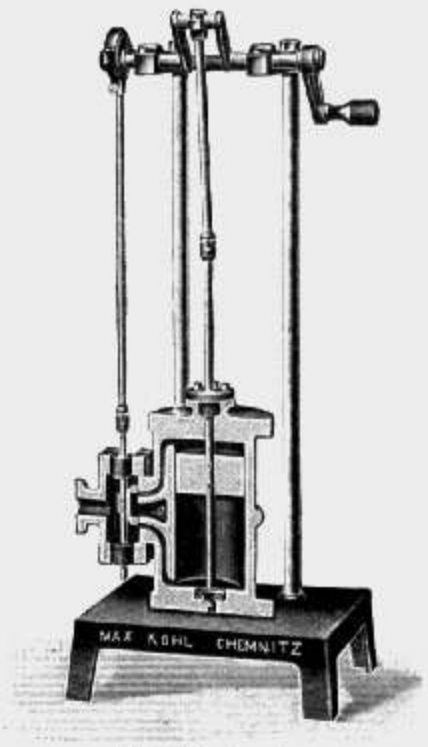
55 245. 1 : 10.



55 246. 1 : 7.



55 250. 1 : 6.



55 251. 1 : 7.



55 249. 1 : 5.

55,243. **Gas Engine No. 55,242 with Dynamo,** mounted on one baseplate, Figure, with glow lamp on stand . . . . . £ 21. 0. 0

The generator gives 2 amps. at 12 volts.

53,101. **Steam Reaction Wheel (Heron's Rotating Sphere),** of glass, in iron stand, Fig. 53,101, p. 407 . . . . . 0. 5. 0

53,102. **Steam Reaction Wheel,** entirely of metal, Fig. 53,102, p. 407 . . . . . 0. 14. 0

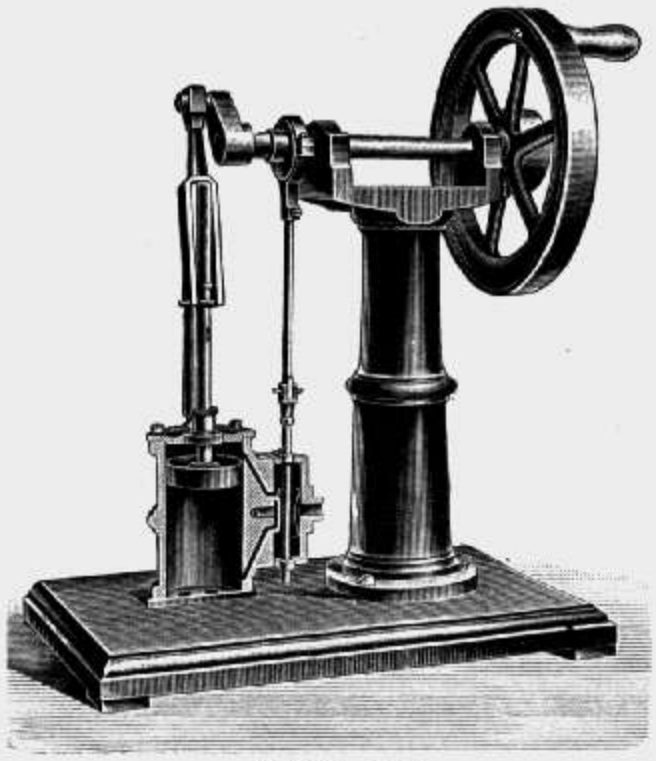
55,244. **Aeolipile,** with safety valve (Fr. phys. Techn., I, 2, Fig. 3668) 0. 18. 0

55,245. **Model Geyser after Wiedemann,** Figure. 2. 8. 0

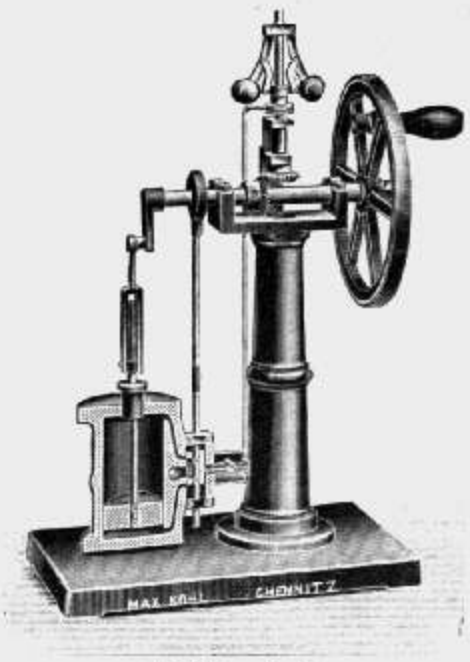
The apparatus shows the phenomena of the throwing up of hot water and steam.

Cl. 1883, 1883, 3810, 1882, 3421, 4202.

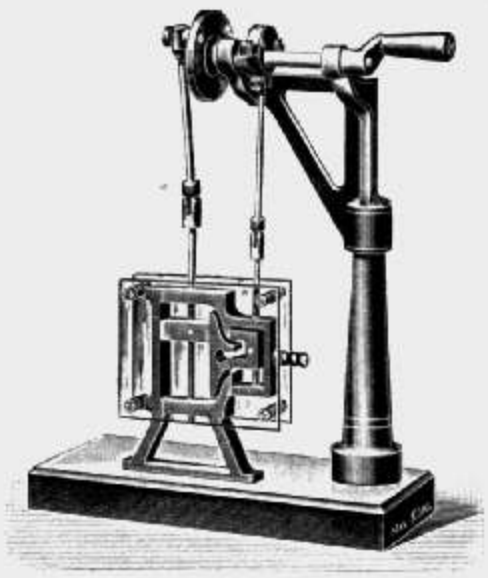
Max Kohl A. G. Chemnitz, Germany.



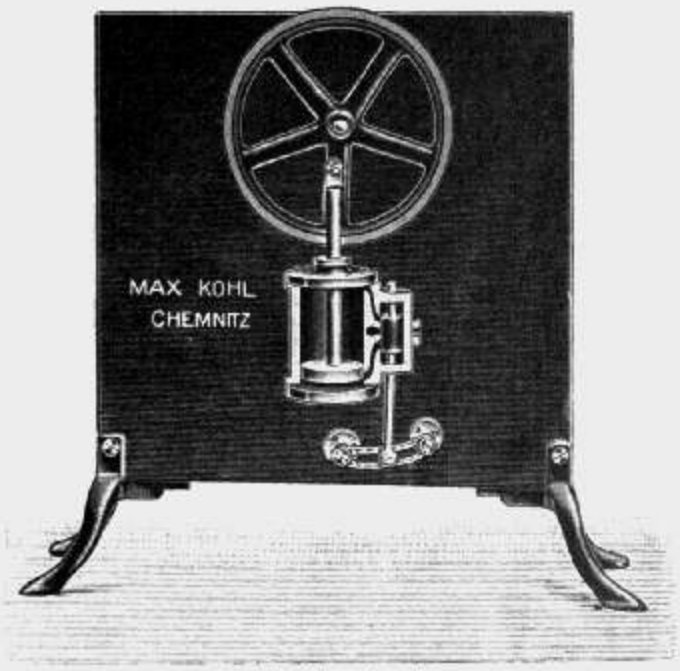
55 252. 1 : 5.



55 253. 1 : 7.



55 254. 1 : 4.

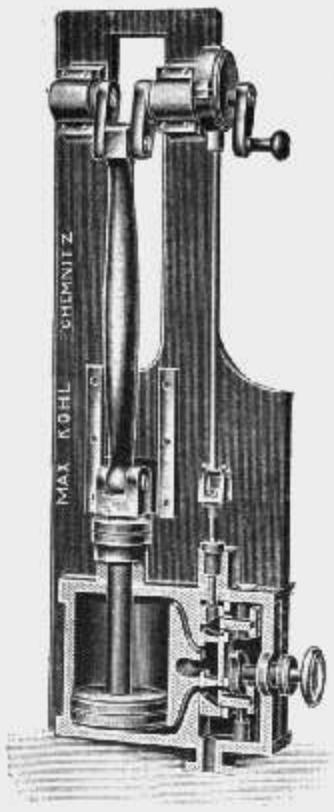


55 255. 1 : 6.

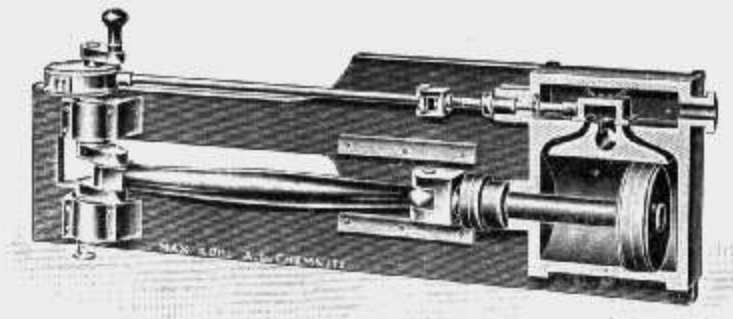
	£ s. d.
55,246. **Apparatus for demonstrating the Geyser,** after Tyndall, Figure (Tyndall, Die Wärme [Heat], 4th Edn., 1894, Fig. 54), for gas heating	2. 16. 0
The apparatus is heated by placing a Bunsen burner underneath and by the gas ring given with the apparatus, and shows an eruption about every minute.	
55,247. **Steam Piston, for showing the action of Water Vapour,** of glass, with holder . . .	0. 3. 0
55,249. — idem, Figure, **of Metal,** with handle	0. 8. 0
55,250. — idem, **larger,** Figure, of glass, with metal mounts and handle, on stand	1. 4. 0
55,251. **Sectional Model of a Steam Engine Cylinder,** Figure, with Slide Valve gearing, large type, **of Metal**	2. 4. 0
55,252. **Sectional Model of a Steam Engine Cylinder,** Figure, with flywheel, entirely of metal, cylinder bore 36 mm, length 80 mm	2. 2. 0
55,253. — idem, Figure, with governor and throttle valve	4. 4. 0
* 55,254. **Sectional Model of a Steam Cylinder,** Figure, transparent, for projection . . .	2. 6. 0
The path of the steam can be demonstrated by blowing in some cigar smoke.	
55,255. **Sectional Model of an Oscillating Steam Engine Cylinder,** Figure, movable, of wood and iron	4. 16. 0

* Can be used with the projection apparatus.

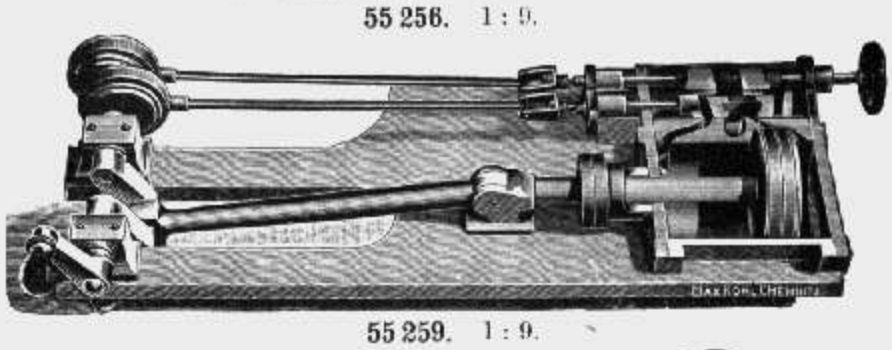
Cl. 1890, 4206, 365, 3957.



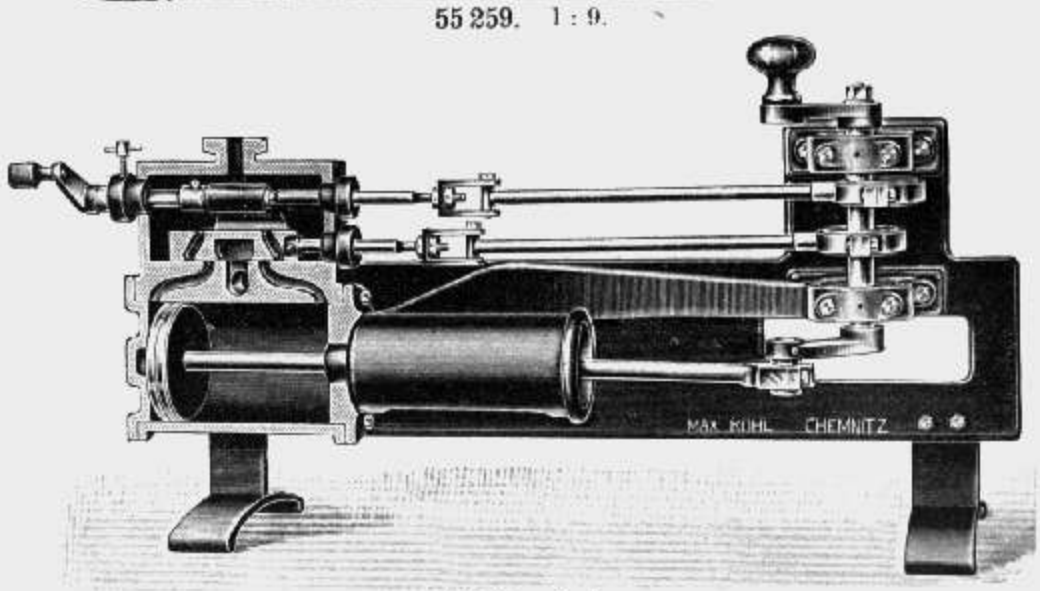
55 257. 1 : 10.



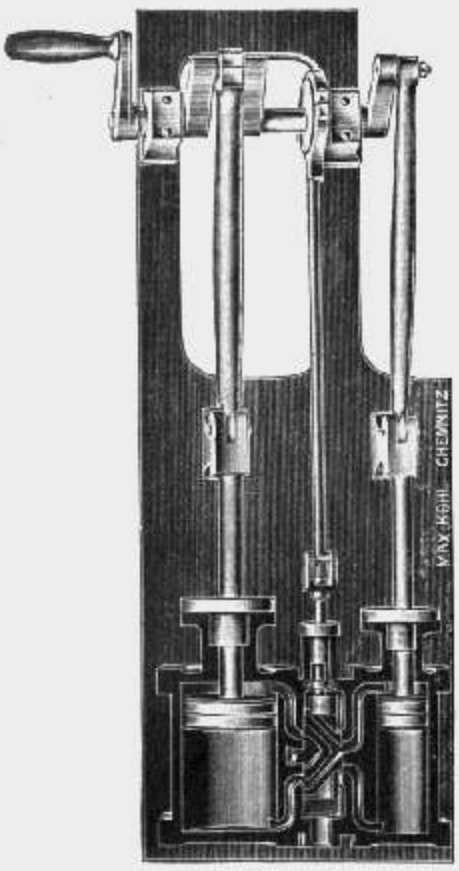
55 256. 1 : 9.



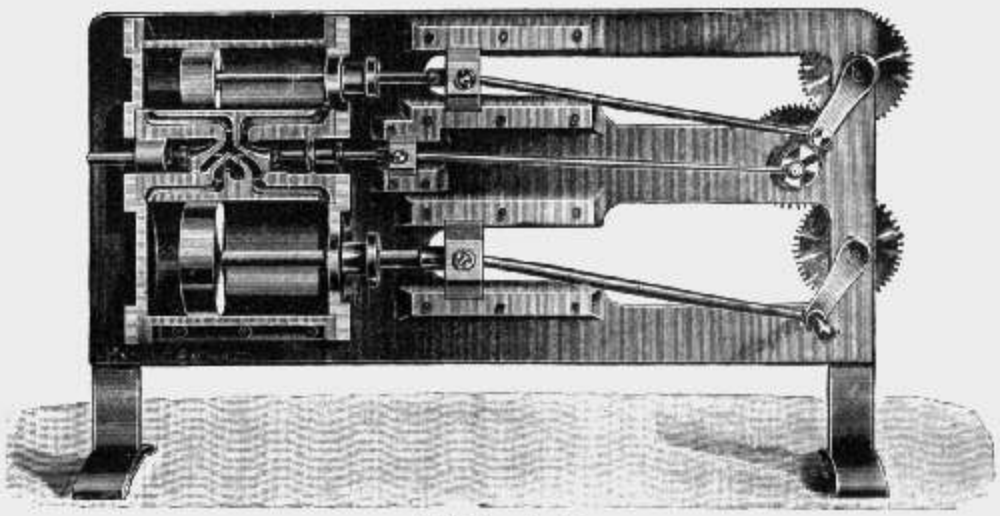
55 259. 1 : 9.



55 261. 1 : 7



55 262. 1 : 9.



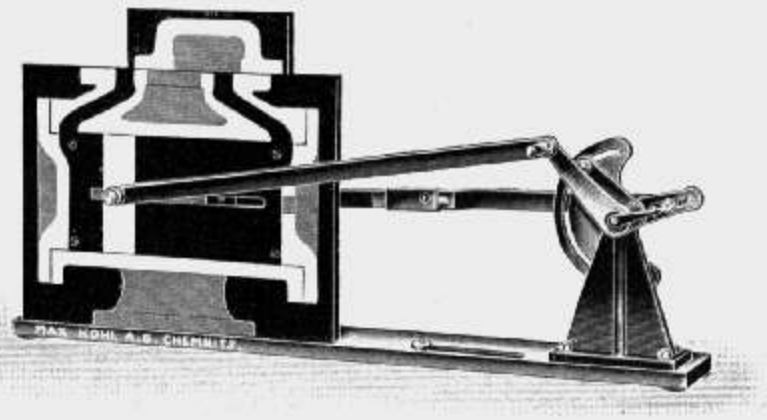
55 263. 1 : 7.

Max Kohl A G. Chemnitz, Germany.

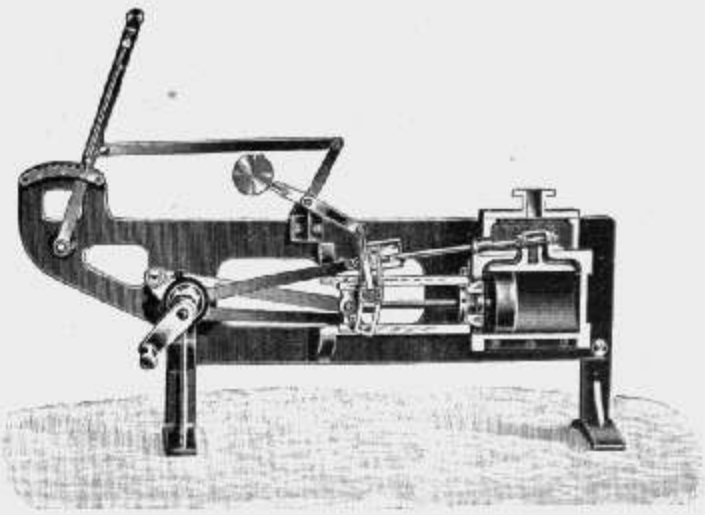
		£	s.	d.
55,256.	**Sectional Model of a Cylinder** with simple Slide Valve, Figure, of wood . . .	5.	0.	0
55,256 a.	— idem, of iron, smaller, about $^3/_5$ the size	8.	0.	0
55,257.	— idem, **with Farcot Slide Valve,** Figure, of wood	7.	0.	0
55,258.	— idem, **of iron, smaller,** about $^3/_5$ the size	12.	0.	0
55,259.	— idem, **with Meyer Compound Slide Valve,** Figure, of wood	7.	0.	0
55,260.	— idem, of iron, smaller, about $^3/_5$ the size	12.	0.	0
55,261.	— idem, **with Rider Slide Valve,** Figure, of iron	12.	0.	0
55,262.	— idem, **with Woolf Slide Valve,** Figure, of wood	6.	0.	0
55,262 a.	— idem, of iron, smaller, about $^3/_5$ the size	8.	0.	0
55,263.	— idem, different pattern, Figure, of iron	13.	0.	0

Cl. 6217, 4899, 1893, 3891, 3691, 1894

Max Kohl A. G. Chemnitz, Germany.



55 264 A. 1 : 16.



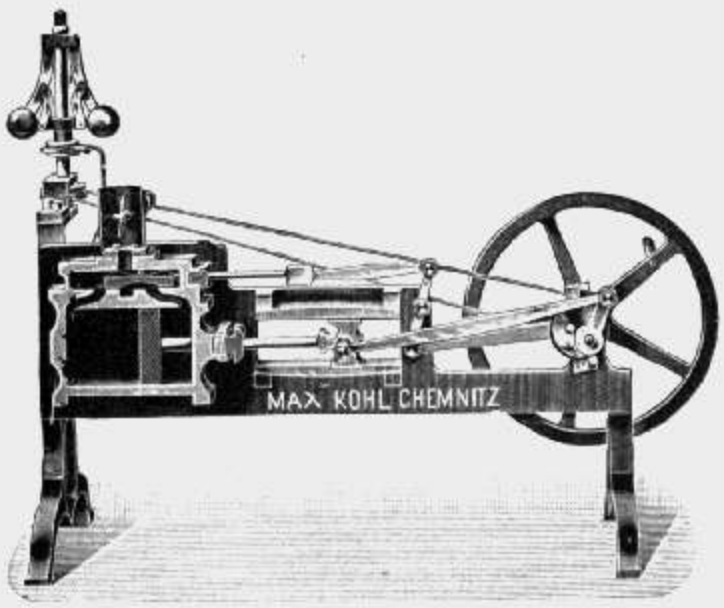
52 266. 1 : 7.



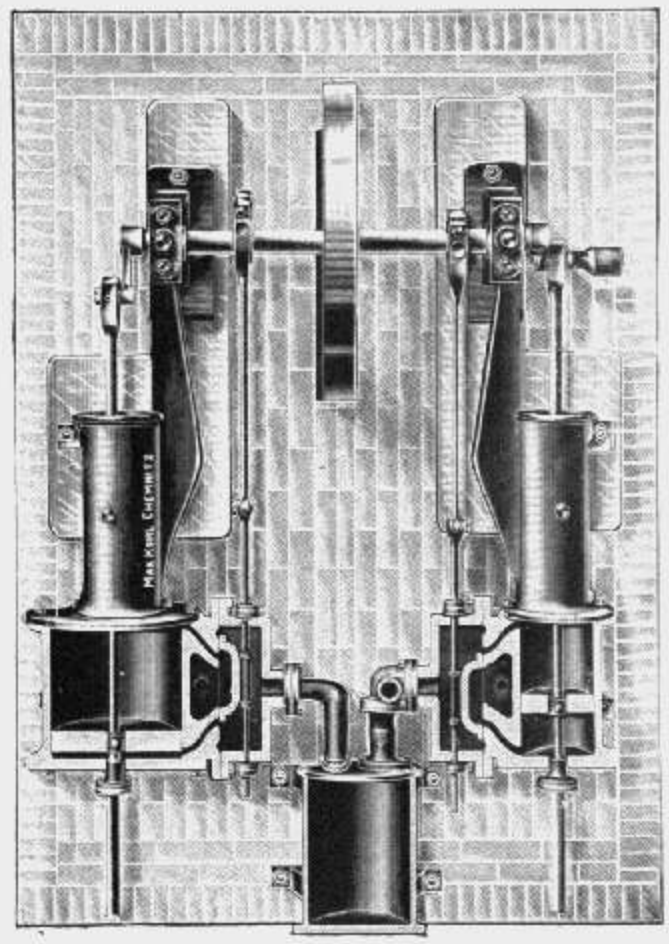
55 264 B. 1 : 16.



55 264 C. 1 : 16.



55 265. 1 : 5.



55 266. 1 : 4.

55,264. **Sectional Model of a Steam Engine Cylinder,** after Prof. Vater, Figs. A, B and C, large plainly understandable model, with adjustable advance and eccentricity, with interchangeable cylinder and valve parts for the ordinary three-port slide valve, Fig. A, the double-inlet channel slide-valve, Fig. B, and the Penn slide valve with double port for inlet and exhaust, Fig. C, painted in clear colours . . . . . £ 15. 0. 0

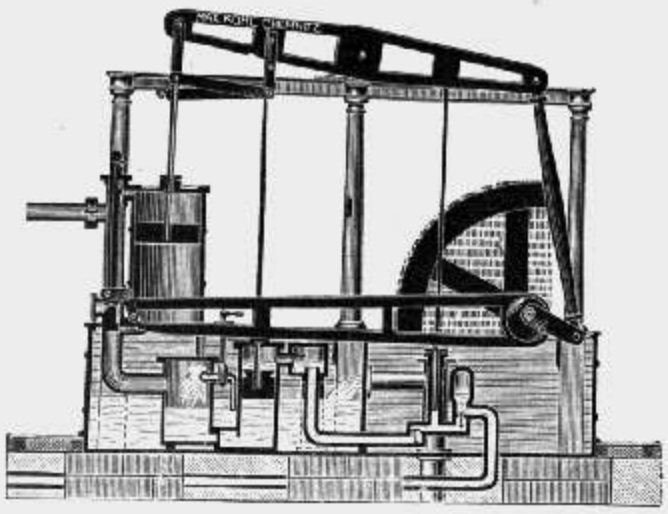
52,266. Sectional Model of a Steam Engine Cylinder with Slide Valve and Link (reverse gear for locomotives), after Stephenson, Figure, of iron (Gan.-Man., Fig. 569) 12. 0. 0

55,265. **Sectional Model of a Horizontal Steam Engine,** Figure, of metal, with valve gearing, governor and throttle vavle 3. 4. 0

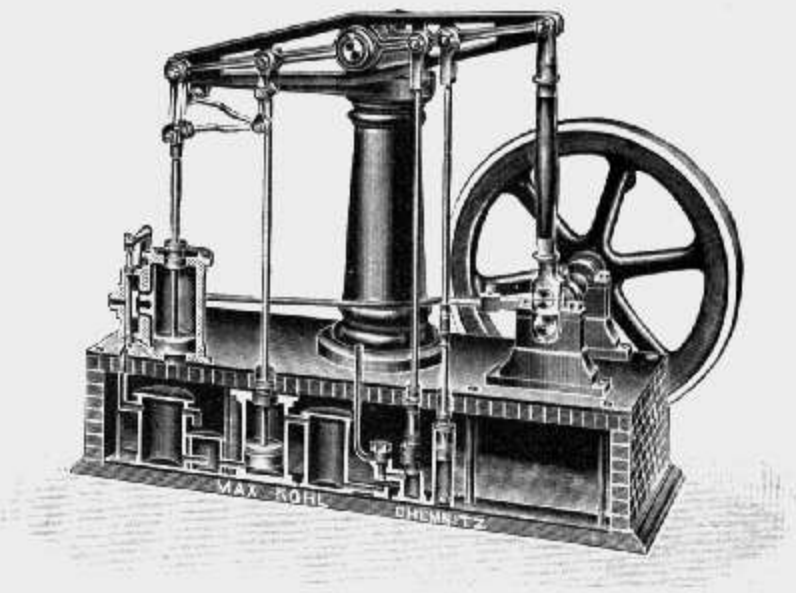
55,266. **Sectional Model of a Compound Steam Engine,** Figure 15. 0. 0

The high and low pressure cylinders, the simple slide valve motion and the receiver are represented in section.

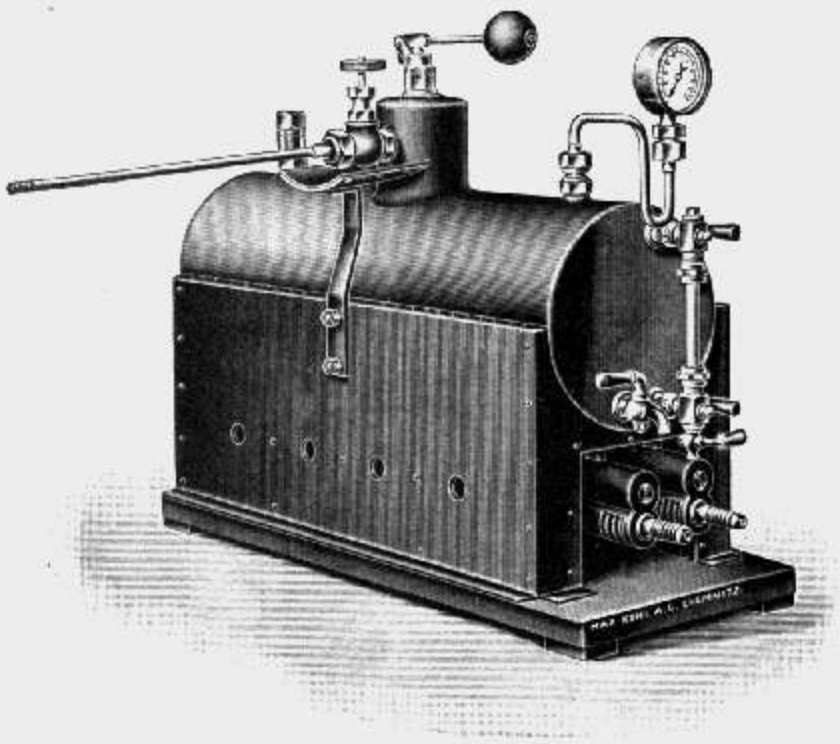
Cl. 6037, 532, 6035, 1895, 1896.



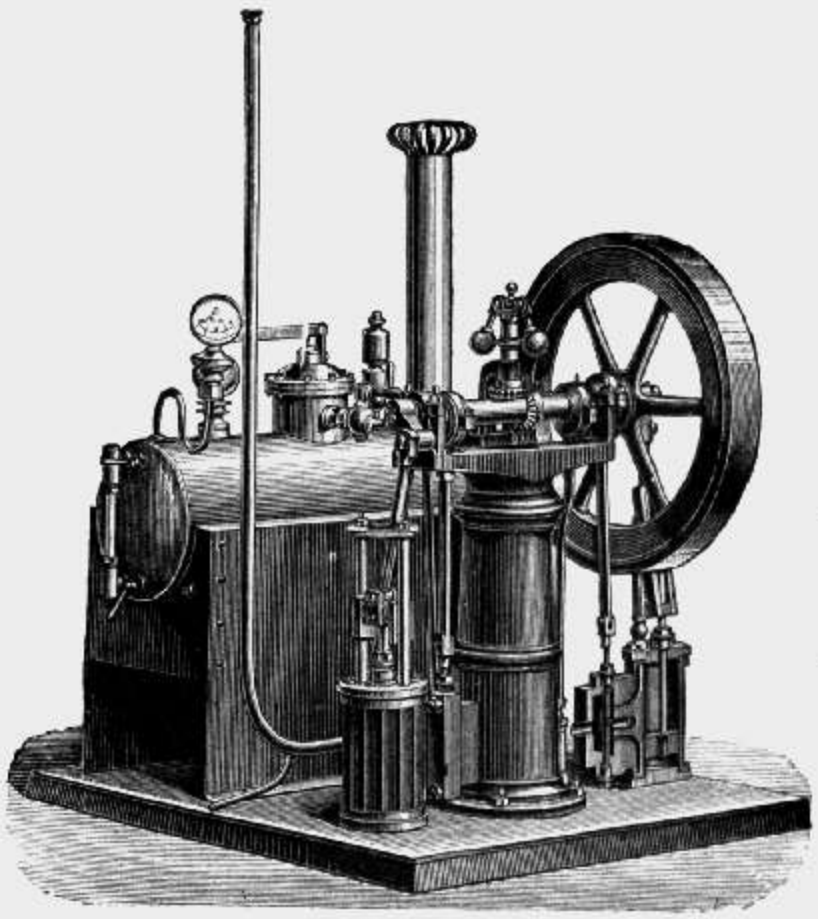
55 268. 1 : 7.



55 269. 1 : 7.



55 270. 1 : 12.



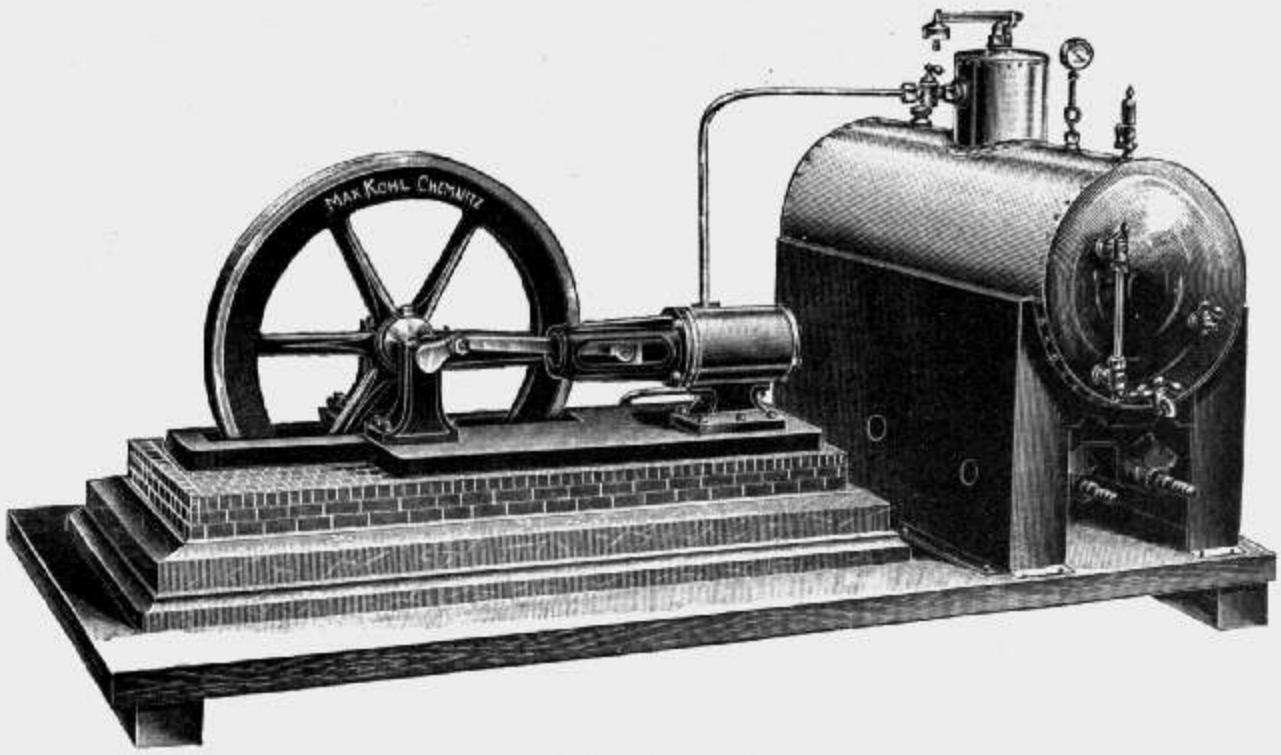
55 271. 1 : 5.

	£ s. d.
55,268. **Model of a Watt Low-pressure Engine,** of metal and cardboard, movable, Figure	1. 5. 0
55,269. **Sectional Model of a Watt Low-pressure Steam Engine,** Figure, of metal; showing in section the cylinder, valve-chest, condenser and pumps; cylinder bore 32 mm . .	11. 0. 0
55,270. **High Pressure Iron Boiler,** Figure, after Friedr. C. G. Müller, for 6 Atmospheres (M. T., p. 165), with Fletcher gas-burner, water gauge, discharge-cock, pressure-gauge, supports for the check manometer, safety valve, steam pipe cock and feed pump . .	18. 0. 0
55,271. **Model Steam Engine,** Figure, with brass boiler, safety valve, water discharge-cock, testing cock, steam pipe cock, water gauge, whistle, pressure-gauge and feed pump; also with a complete sectional model of a steam cylinder. With gas burner	11. 10. 0

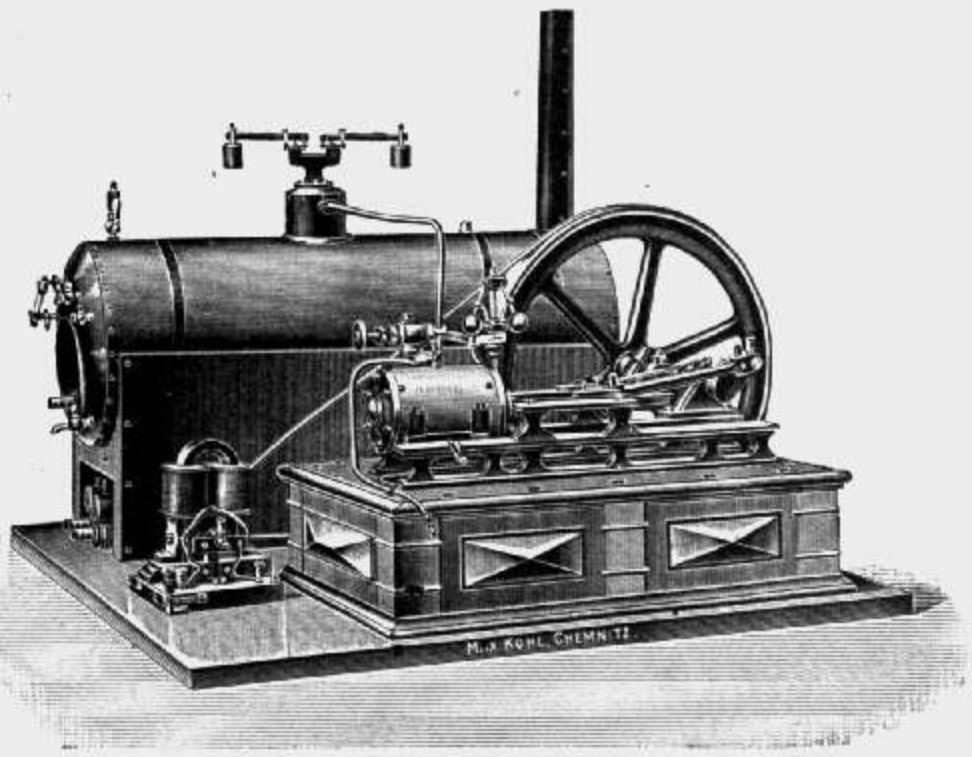
Fitted, if desired, with spirit burner in place of the gas burner.

Cl. 1897, 1896, 5886, 1899.

Max Kohl A. G. Chemnitz, Germany.

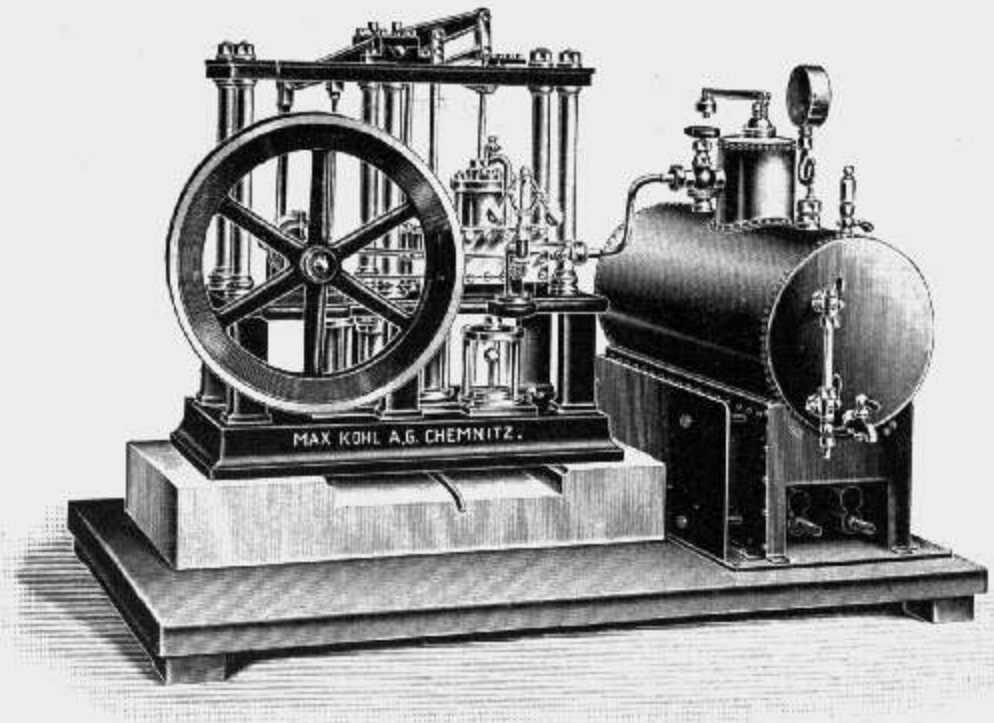


55 274 (55 272, 55 273). 1 : 8.

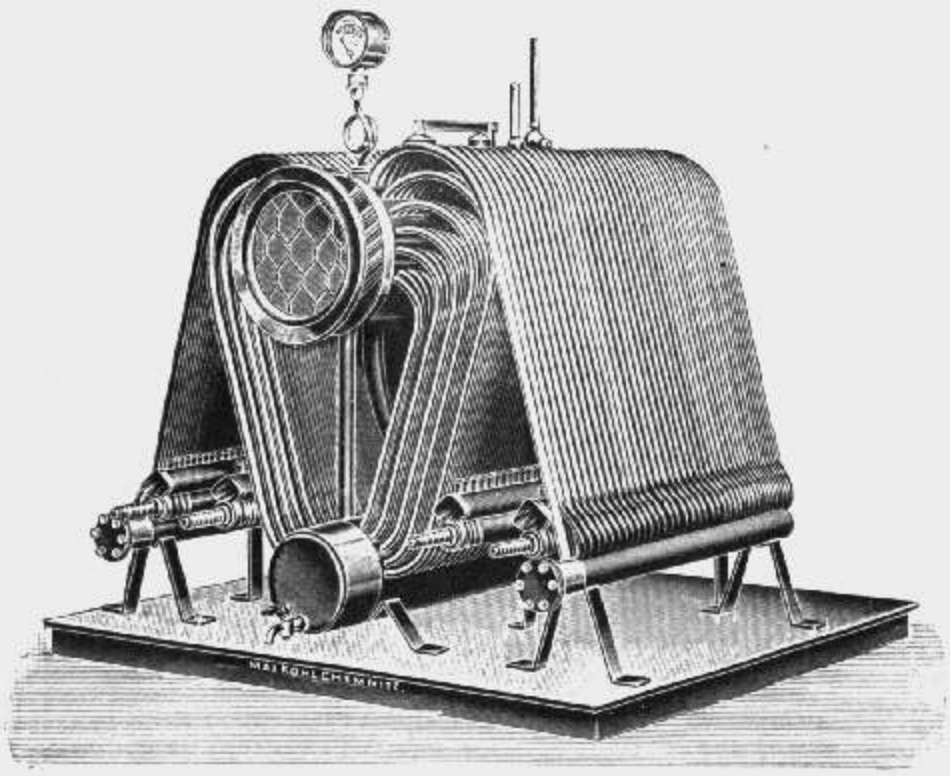


55 275. 1 : 10.

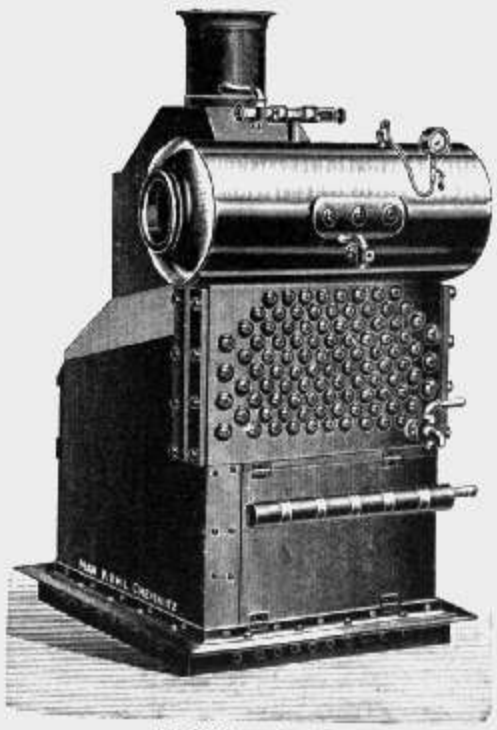
	£ s. d.
55 272. **Model of a Horizontal Steam Engine,** cf. Fig. 55 272, without boiler	9. 0. 0
Dimensions: piston diam. 40 mm; stroke 60 mm; flywheel diam. 330 mm; length, breadth and height of the entire engine 660 × 310 × 340 mm.	
55,273. **Boiler for above,** of **Copper, with Safety Valve,** pressure-gauge, water gauge, test cocks, check valve, whistle; can be heated with gas or spirit; length 500 mm, diam. 220 mm, cf. Fig. 55,272	10. 0. 0
55,274. **Steam Engine No. 55,272, with Boiler No. 55,273,** both built on to one baseboard, Figure	20. 0. 0
55,275. **Horizontal Steam Engine, $^1/_{10}$ HP, with Cylindrical Boiler and Dynamo,** Figure	30. 0. 0
The illustration shows a single tube boiler. Instead of this, however, a simple cylindrical boiler is supplied. Size of boiler: length 600 mm, diam. 220 mm. Dimensions of engine: piston diam. 55 mm, flywheel diam. 400 mm. Output of dynamo: 2 amps. at 10 volts.	



55 276. 1 : 9.



55 277. 1 : 6.



55 278. 1 : 10.

55,276. **Watt's Low-pressure Engine with Condenser,** Figure, **with Boiler** No. 55,273; piston diam. 40 mm; stroke 80 mm; flywheel diam. 315 mm . . . . . £ 59. 0. 0

Steam cylinder, condenser cylinder and pump bodies are of glass; the valve gearing is also arranged under glass so that all processes can be observed when the engine is working.

The engine has simple valve gearing, Watt's parallelogram, cold water pump for keeping the water in a reservoir at constant level, condenser, hot water pump for emptying the condenser, feed pump for the boiler, and flywheel.

55,277. **Model of a Thornycroft Boiler,** Figure, entirely of copper, with manometer for $^1/_2$ atm., safety valve, and pipe union 40. 0. 0

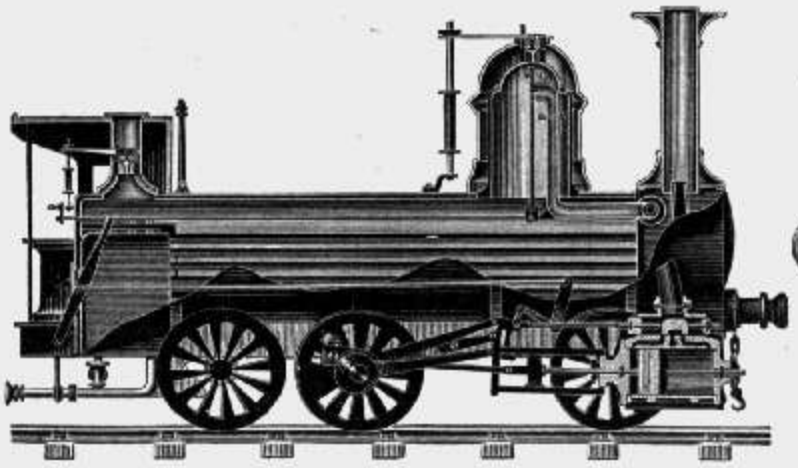
In order to observe the process of boiling, the steam space is closed in on both front sides by wired glass. Heating is effected by 4 Fletcher burners.

55,278. **Model of a Dürr Boiler,** Figure, entirely of copper, with manometer for $^1/_2$ atm., safety valve and pipe union 65. 0. 0

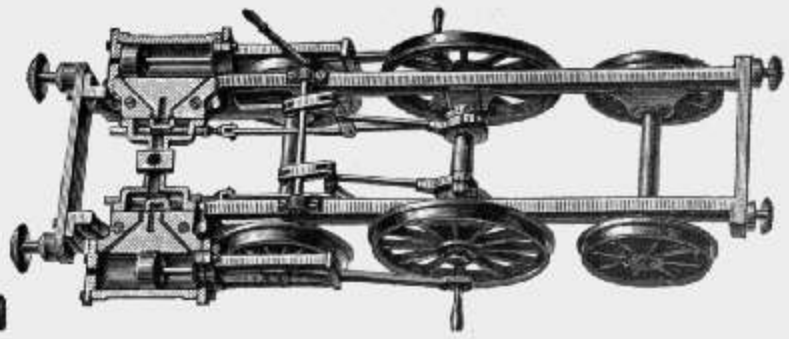
With front sides of the steam space closed by glass and Fletcher burner for heating.

Cl. 6124.
1909, 1911

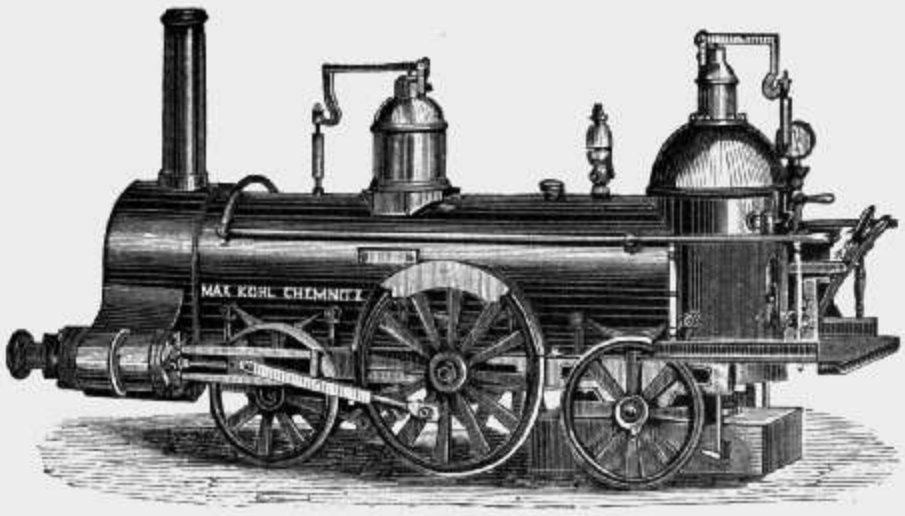
Max Kohl A. G. Chemnitz, Germany.



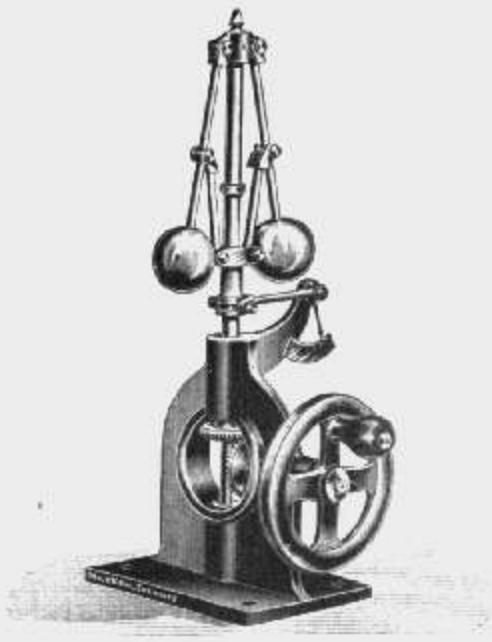
55 279. 1 : 6.



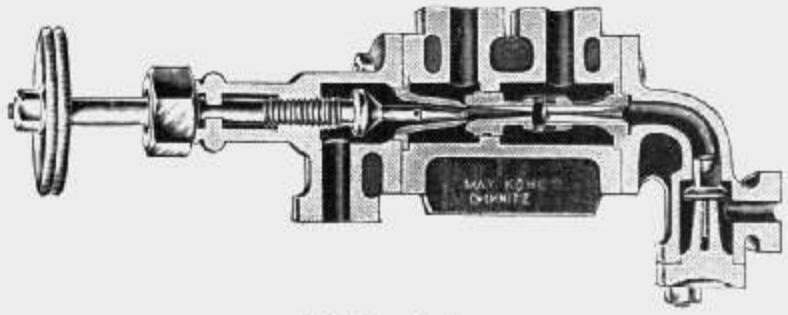
55 283. 1 : 6.



55 282. 1 : 6.



55 285. 1 : 7.



55 288. 1 : 3.

		£	s.	d.
55,279.	**Sectional Model of Locomotive,** Figure, movable, with reversing gear	1.	5.	0
55,281.	**Locomotive** with valve gear, brass boiler, running in one direction only. Length 370 mm, height 230 mm, construction similar to Fig. 55,282	7.	0.	0
55,282.	**Locomotive,** Figure, **with Reversing Gear,** running backwards and forwards, with brass boiler, 2 safety valves, water gauge, whistle and cocks; for spirit fuel	15.	0.	0
	Dimensions: diam. of driving wheel 100 mm. Size of entire engine 520 × 180 × 370 mm.			
55,283.	**Locomotive Chassis,** Figure, with cylinder and valve-chest in section, same size as loco. No. 55,282	12.	0.	0
55,284.	**Piston Rod in oscillating cylinder**	7.	10.	0
55,285.	**Watt's Governor,** Figure	6.	0.	0
	Watt's Pendulum, Flywheel Governor and Throttle Valve: see Nos. 51,982 and 51,983, p. 281, No. 55,253, p. 631 and 55,265, p. 633.			
55,286.	**Parabolic Governor after Farcot**	8.	15.	0
55,287.	**Ring Governor**	7.	15.	0
55,288.	**Section Model of an Injector** after Giffard, of bronze, Figure	5.	0.	0

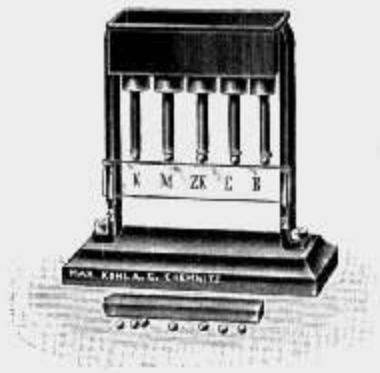
Cl. 1911, 1910, 1912, 1904, 3692.



55 289. 1 : 8.



55 292. 1 : 8.



55 291. 1 : 3.



55 294. 1 : 5.



55 290. 1 : 5.



55 293. 1 : 8.



55 295. 1 : 7.

Propagation of Heat.

£ s. d.

55,289. **Apparatus for demonstrating Thermal Conduction in Metal Rods,** after Ingenhouss, Figure (W. D., Fig. 379 [359]; Gan.-Rein., Fig. 390), with rods of copper, brass, zinc, tin, iron and lead, coated with silver mercury iodide 1. 0. 0

The paint, having a beautiful yellow colour in the cold state, becomes brown when heated, resuming, however, its yellow colour some time after cooling.

55,290. — idem, with vertical Rules, Figure 1. 2. 0

* 55,291. — idem, **smaller,** Figure, with 5 rods to which metal rings are stuck on with wax, for lantern projection (Fr. phys. Techn., **I**, 2, Fig. 3861) 0. 12. 0

55,292. **Apparatus** after Mühlenbein, **with Bunsen Burner,** Figure, with bars, arranged star-shape, of brass, zinc, tin, iron, German silver and wood, painted with silver mercury iodide; they are heated from the centre (Fr. phys. Techn., **I**, 2, Fig. 3864) 1. 10. 0

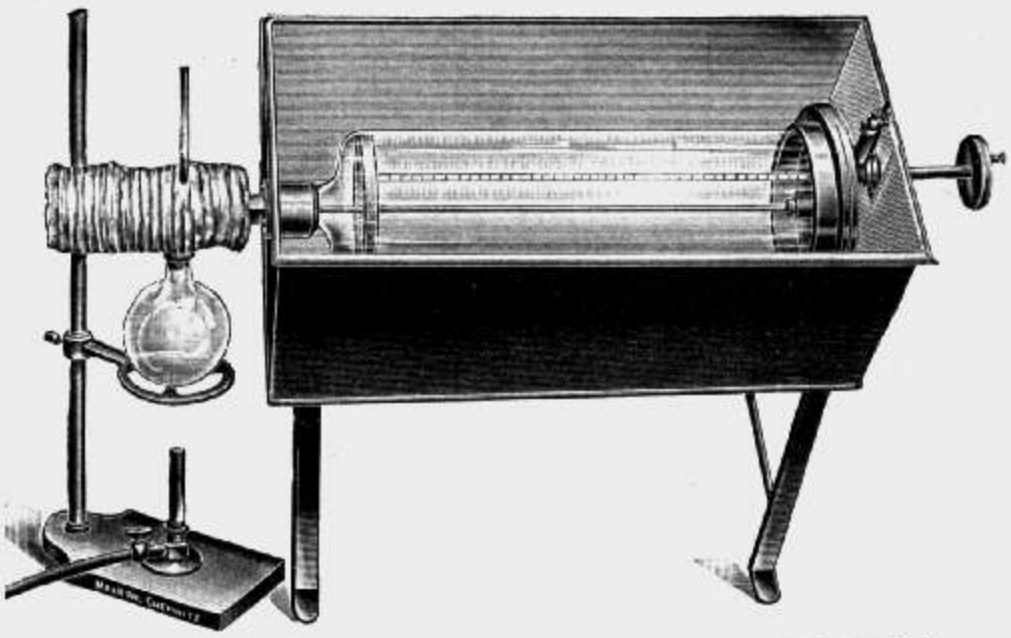
55,293. — idem, **with Spirit Burner,** cf. Fig. 55,293 (Fr. phys. Techn., **I**, 2, Fig. 3865) . 1. 10. 0

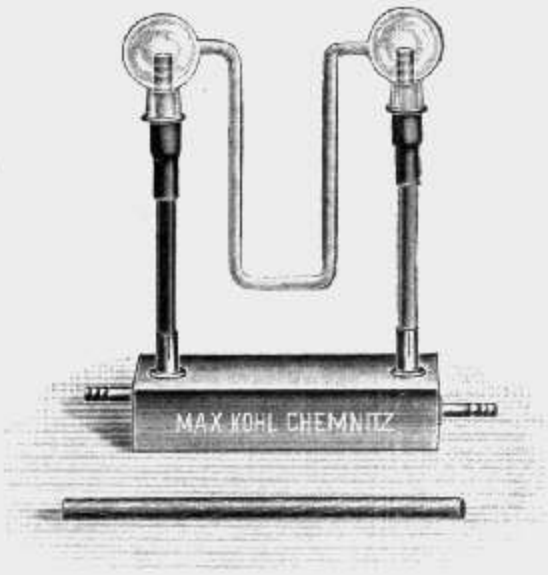
55,294. **Apparatus for showing the Conduction of Heat in Metal Rods,** Figure, after Rebenstorff, for steam heating (W. D., p. 568 [527]; Ztschr. f. d. phys. u. chem. U., **21**, 1908, p. 297), with rods of copper, brass, zinc, tin, iron and lead, coated on one side with mercury copper iodide (red) and on the other with mercury silver iodide (yellow) . . 1. 4. 0

55,295. **Apparatus for demonstrating the different Thermal Conductivity of Copper and Iron,** Figure, coated with thermoscopic paint 0. 12. 0

* Can be used with the projection apparatus.

Cl. 6206, 1919, 5887, 3693, 1916, 1918, 3694.

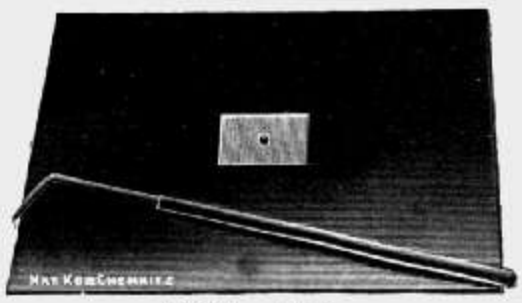




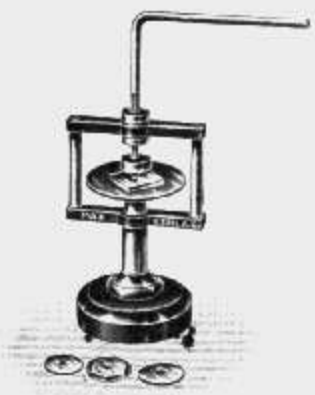
55 296. 1 : 4.



55 300. 1 : 8.



55 301. 1 : 3.



55 302. 1 : 5.



55 303. 1 : 8.

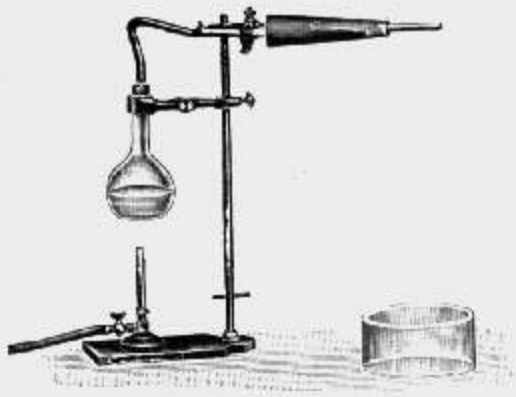
	£ s. d.
* 55,296. **Apparatus for demonstrating the different Thermal Conductivity** of copper, lead and wood, for steam heating, Figure, arranged for the projection lantern (Fr. phys. Techn., I, 2, Fig. 3859)	0. 14. 0
55,297. **Copper-Mercury Iodide,** for experiments on thermal conduction and thermal radiation 50 grams	0. 5. 6
55,298. **Rods of Copper, Brass, Iron, Glass, Wood and 12 small Lead Spheres,** after Friedr. C. G. Müller, for showing different thermal conductivities (M. T., p. 162) . . . . . The spheres are attached to the rods by wax, the ends of the rods being then exposed to heat singly or together, and the pendulum beats being observed.	0. 4. 0
55,299. **Thermal Conduction Apparatus** after Looser, with air thermoscopes (Looser, Versuche aus der Wärmelehre, 3rd Edn., p. 131 [2nd Edn., p. 113]; Fr. phys. Techn., **I**, 2, Fig. 3867), with 8 bars and octuple thermoscope	6. 0. 0
55,300. **Apparatus** after Wiedemann and Franz, Figure **for Thermal Conduction in Metal Rods, with 6 Rods** (M. P., III, p. 775 [II, 2, p. 607]; Pogg. Ann. d. Physik u. Chemie, 3rd Series, Vol. 89, 1853, p. 501, and 4th Series, Vol. 95, 1855, p. 337) . . . . . The 6 rods consist of iron, aluminium, zinc, tin, brass and German silver. The measurement is made in vacuo and in an air-filled space by means of a thermocouple.	15. 0. 0
* 55,301. **Gypsum Slab and Heating Rod,** for showing the elliptical Propagation of Heat in Crystals, Figure (W. D., Fig. 380 [360]) . . . . . The small gypsum slab coated with paraffin wax is provided with a hole into which is inserted a copper rod which can easily be heated by a flame. A pasteboard screen holds off any disturbing light. The apparatus is used with the horizontal projection apparatus.	0. 5. 0
55,302. **Apparatus for explaining unequal Thermal Conduction in Crystals,** after Sénarmont, Figure, with 4 pierced crystal plates, quartz ground parallel to axis, quartz perpendicular to axis, calc-spar perpendicular to axis, and gypsum (Fr. phys. Techn. **I**, 2, Fig. 3829)	2. 8. 0
55,303. **Wood Pyramid with Brass Tube carried through,** Figure, for showing the difference in thermal conduction in wood in a direction along the grain and across the grain (Ztschr. f. d. phys. u. chem. U., **21**, 1908, p. 298)	0. 5. 0

* Can be used with the projection apparatus.

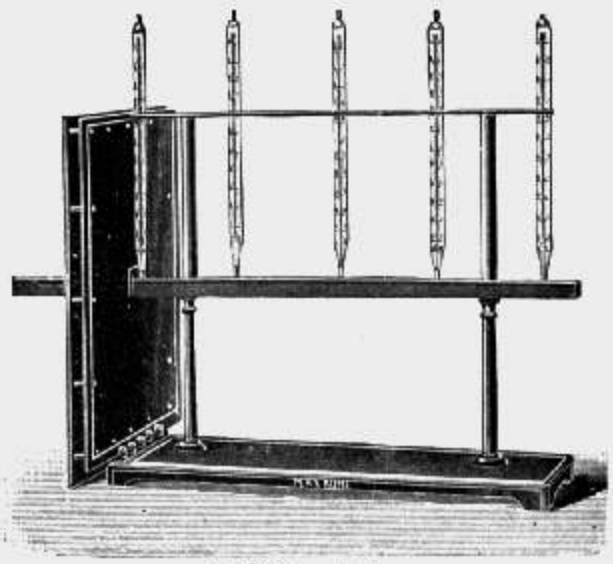
Cl. 1923, 3842, 368, 6131, 1769.



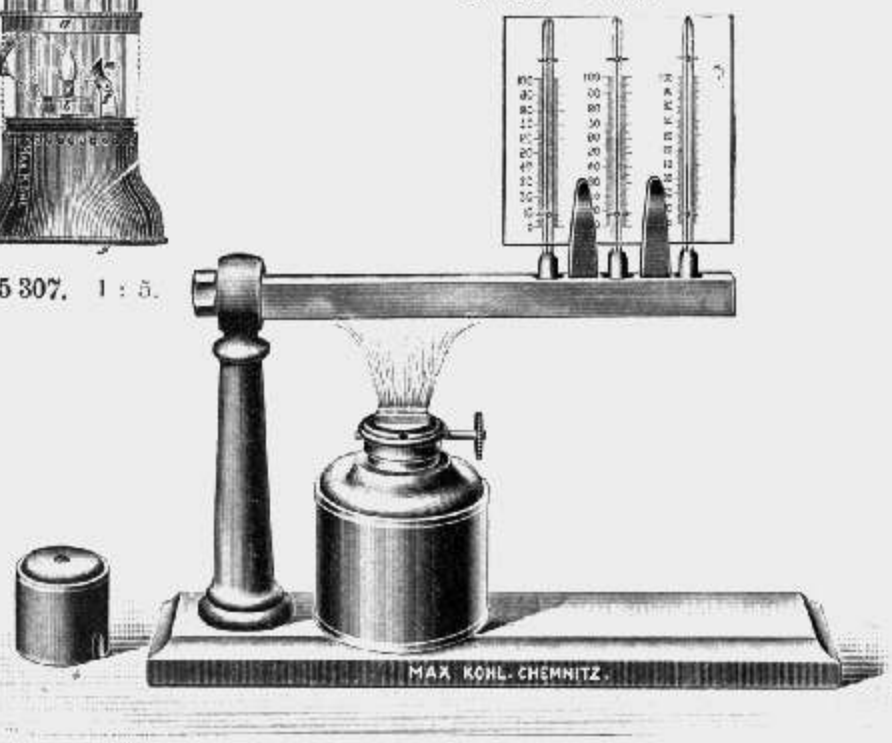
55 307. 1 : 5.



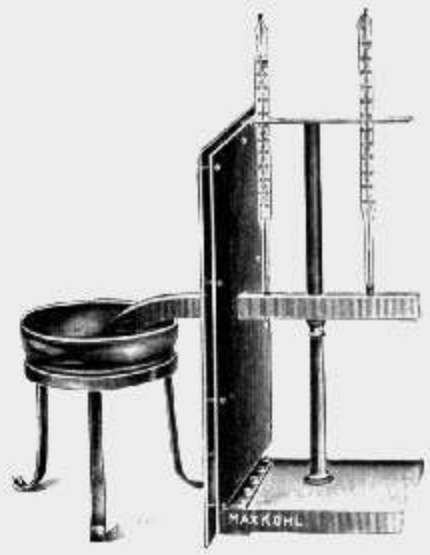
55 304. 1 : 15.



55 309. 1 : 9.



55 311. 1 : 3.



55 312. 1 : 8.

		£ s. d.
55,304.	**Wood Cone** for showing the **Influence of Direction of Grain,** after Rebenstorff Figure, with stand, boiling flask, rubber tubing and glass dish (Ztschr. f. d. phys. u. chem. U., **21**, 1908, p. 298)	0. 16. 0
55,305.	**Wire Gauze Cylinder,** for demonstrating the safety lamp (M. T., pp. 162/3)	0. 1. 0
55,306.	**Davy's Safety Lamp** (M. P., III, Fig. 457 [II, 2, Fig. 295])	0. 8. 0
55,307.	**Wolf's Safety Lamp,** Figure, ignited from outside In practical use in most German coal-mines.	0. 18. 0
55,308.	**Apparatus** after Despretz, **for showing Decrease of Temperature with distance from Thermal Source** (M. P., II, 2, Fig. 297), with 7 thermometers	3. 4. 0
55,309.	— idem, with 5 thermometers, Figure	2. 14. 0
* 55,310.	— idem, with 3 thermometers	2. 8. 0
55,311.	— idem, smaller, for objective demonstration, with 3 thermometers, Figure	0. 16. 0
55,312.	**Apparatus** after Despretz, **for showing Decrease of Temperature with distance from Thermal Source** (M. P., III, Fig. 459 [II, 2, Fig. 297]; Gan.-Man., Fig. 535; Gan.-Rein., Fig. 391), the rod being heated by oil or water bath, Figure, with 7 thermometers	3. 12. 0
55,313.	— idem, with 5 thermometers	3. 0. 0
55,314.	— idem, with 3 thermometers	2. 14. 0
55,315.	**Apparatus for investigating the Thermal Conduction of Liquids,** Figure, glass cylinder with differential thermoscope and vessel for placing above this to contain the heated liquid (Gan.-Rein., Fig. 393)	1. 0. 0

* Can be used with projection apparatus.

Cl. 1920, 5077, 1921, 367, 3422.

Max Kohl A. G. Chemnitz, Germany.

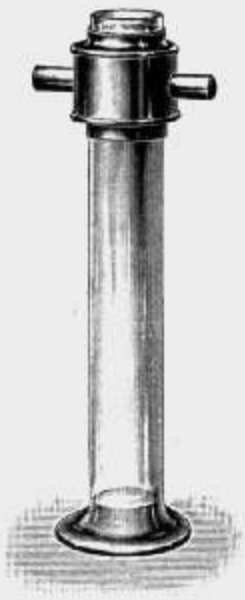
Max Kohl A. G. Chemnitz, Germany.



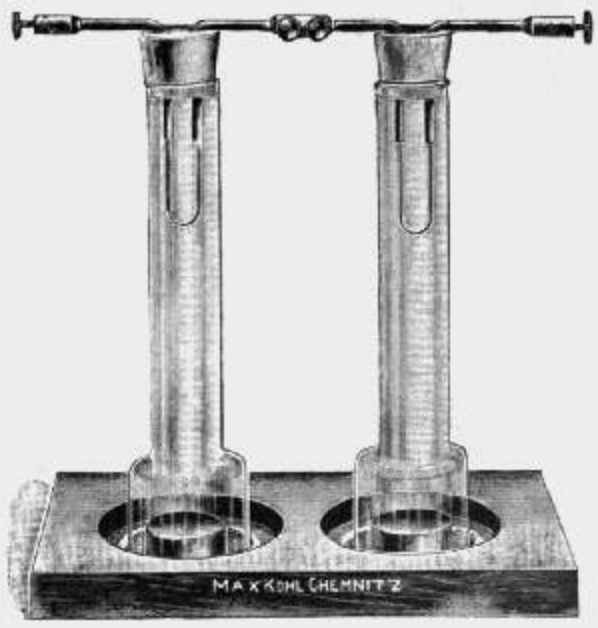
55 315. 1 : 6.



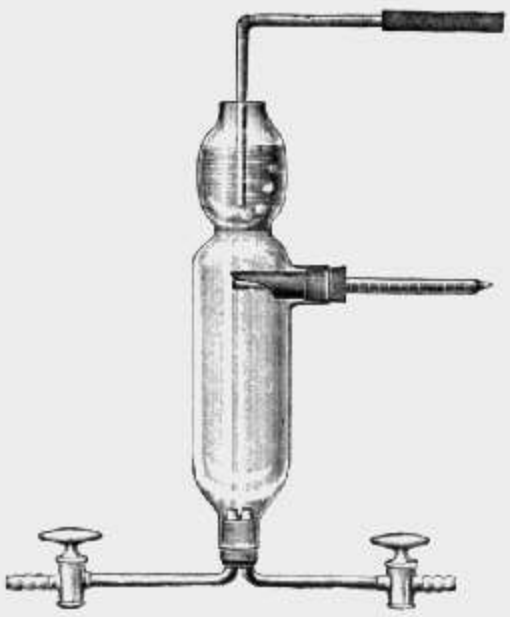
55 316. 1 : 5.



55 317. 1 : 7.



55 318. 1 : 5.



55 320. 1 : 5.



55 321. 1 : 8.

55,316. **Tube with Heating Bulb for Thermal Conduction and Convection** in liquids, after Rebenstorff, Figure, for steam heating (Ztschr. f. d. phys. u. chem. U., **21**, 1908, p. 298) . . . . . £ 0. 6. 0

Two bushes made of thermoscopic paper are slipped on the glass tube. In the vertical position the difference between conduction and convection of the liquid in the tube is shown.

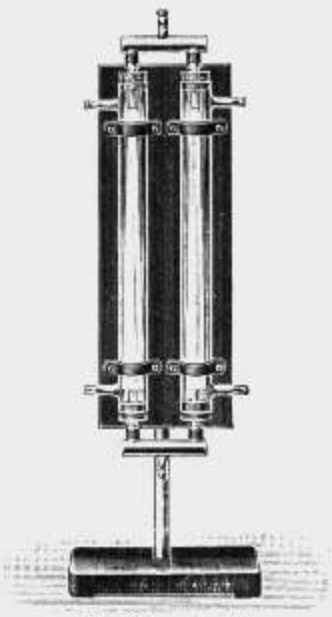
55,317. **Apparatus for investigating the Thermal Conduction of Liquids,** Figure, cylindrical glass vessel with steam capsule, on stand (W. D., Fig. 381 B [361 B]) 0. 14. 0

55,318. **Apparatus for thermal Conduction of Gases,** after Grove, Figure (M. P., III, Fig. 469 [II, 2, Fig. 306]) 0. 14. 0

55,319. **2 Glow Lamps** after Grimsehl, one evacuated, the other filled with hydrogen, also 2 Chromothermoscope Screens, one backed with black paper and the other with tinfoil, for showing variation in thermal conduction and convection (Grimsehl: Die elektrische Glühlampe im Dienste des physikalischen Unterrichts, pp. 13 and 50) 0. 15. 0

55,320. **Apparatus for thermal Conduction of Gases,** after Magnus, Figure (M. P., III, Fig. 470 [II, 2, Fig. 307]) 1. 8. 0

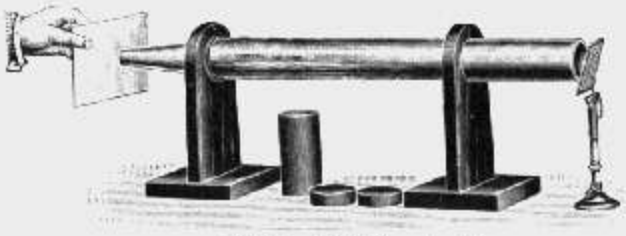
55,321. — idem, Figure, fitted up more completely 3. 0. 0



55 323. 1 : 8.



55 322. 1 : 3.



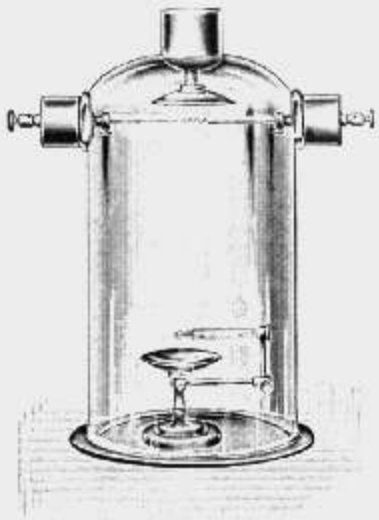
55 325, 55 326. 1 : 12.



55 326. 1 : 7.



53 078. 1 : 9.



53 077. 1 : 7.



55 330. 1 : 10.

55,322. **Apparatus for Thermal Conduction of Gases,** after Weinhold, Figure (W. D., Fig. 383 [363]) . . . . . £ s. d. 0. 8. 0

55,323. **Apparatus for Thermal Conduction and Convection in Gases,** Figure, after Rebenstorff, on stand, tilting back on hinges, for steam heating (Ztschr. f. d. phys. u. chem. U., **21**, 1908, p. 300) 1. 10. 0

The two comparison glass tubes are filled with, say, hydrogen and air. They are fitted with conical jackets of thermoscopic paper, wound round the heating tubes. The apparatus is used successively in a vertical and horizontal position.

53,078. **Apparatus for demonstrating the Cooling Effect of Gases,** Figure, after Tyndall (Tyndall, Wärme [Heat], Fig. 83), with lateral flexible tube stopcock for introducing gases, and a cock for connecting up to the air pump, for placing on the air pump plate 2. 0. 0

55,325. **Radiation Tube** after Rebenstorff, Figure, with 3 telescopic tube parts, a detachable radiation cone, a slide tube of pasteboard, blackened inside (Ztschr. f. d. phys. u. chem. U., **21**, 1908, p. 303), can also be used for experiments on the propagation of air-impulses (Fr. phys. Techn., I, 2, Fig. 3709), price exclusive of thermal source or coloured leaves 0. 18. 0

55,326. **Thermal Supply for Radiant Heat,** after Rebenstorff, Figure, consisting of a Bunsen burner with slotted head and gauze rectangle (Ztschr. f. d. phys. u. chem. U., **21**, 1908, p. 300) 0. 10. 0

55,011. **10 Thermoscopic coloured Leaves after** Rebenstorff 0. 4. 0

53,077. **Apparatus** after Davy, Figure, **for Thermal Reflection in vacuo,** receiver with two concave mirrors, thermometer and heating wire, for setting up on the air-pump (Gan.-Rein., Fig. 408) 3. 3. 0

53,750. **Parabolic and Cylindrical Mirrors** after Rebenstorff, see Fig. 53,750, p. 476, for reflection experiments (Ztschr. f. d. phys. u. chem. U., **21**, 1908, p. 302) 0. 16. 0

Cl. 1929.
4150, 5070, 4160,
4117, 3884, 6056.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



55 331, 55 337. 1 : 12.



55 338. 1 : 6.



55 341. 2 : 3.

Spherical Concave Mirrors, of German Silver, cf. Fig. 55,330/1, special construction, arranged to rotate on firm iron stand, with adjustable Sponge or Bulb Holder, with protecting cover, without Table: £. s. d.

List No.	55,328	55,329	55,330	55,331	55,332
Diameter mm	200	250	300	400	500
Focal Length mm	95	75	120	125	160
Each £	**1. 12. 0**	**2. 0. 0**	**2. 8. 0**	**3. 0. 0**	**4. 4. 0**

The sponge and bulb holders are now fixed to the mirror mount instead of to the base, in the case of all mirrors from No. 55,328 to 55,332 (see Fig. 55,331). If the position of the mirror is changed the relative position of holder to mirror remains unaltered.

The mirrors to 300 mm diam. are supplied with a hinged tripod stand, as Fig. 55,330, and the two larger ones with two trunnions on base frame as Fig. 55,331.

Where a single mirror is ordered, a Sponge Holder will be supplied with same; if a pair of the same mirrors are ordered, a Sponge Holder and a Bulb Holder are supplied.

Parabolic Concave Mirrors, of German Silver, cf. Figs. 55,330 and 55,331, of special construction, adjustable on firm Iron Stand, with adjustable Sponge Holder or Bulb Holder, with protecting cover, without Table:

List No.	55,333	55,334	55,335	55,336
Diameter mm	250	300	390	500
Focal Length mm	40	50	70	70
Each £	**2. 4. 0**	**2. 12. 0**	**3. 10. 0**	**5. 10. 0**

Get-up: as Nos. 55,328—55,332.

55,337. **Table for setting up Concave Mirrors,** see Fig. 55,331, without mirror 1. 10. 0

Glass Concave and Convex Mirrors: see Nos. 53,754—53,794, p. 477 and 478.

55,338. **Thermometer on Stand,** Figure, for setting up at the focus of the concave mirror, from 0°—150° C. 0. 10. 0

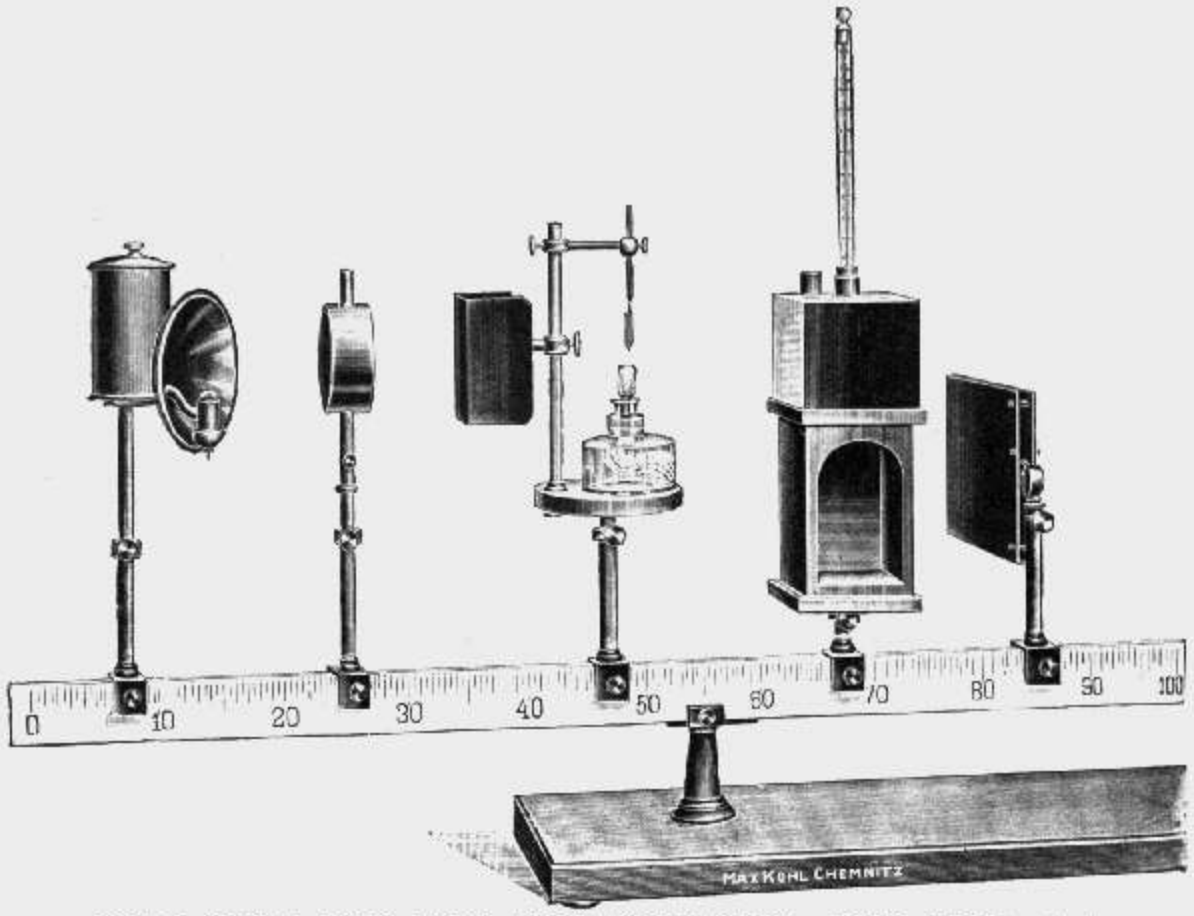
55,339. **Iron Wire Mantle** for glowing charcoal, with shank and stand (M. T., p. 163) . . 0. 10. 0

55,340. **Platinum Cap (Gauze),** with Bunsen Burner, cf. Fig. 55,341, for radiation experiments with the thermoscope. Price according to cost of platinum . . . . . £ **1. 2. 0** to variable 1. 8. 0

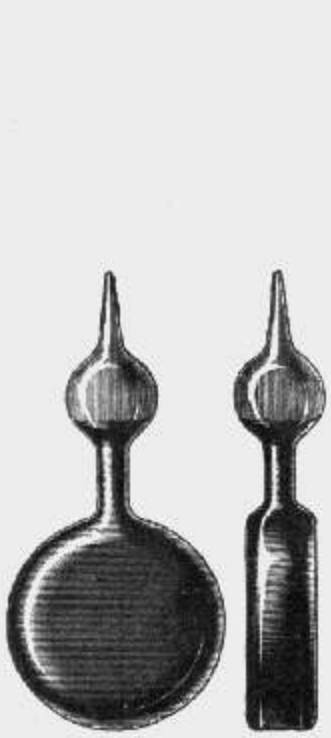
55,341. **Platinum Cap alone,** Figure (W. D., Fig. 367 [347]), price according to cost of platinum . . . . . £ **1. 0. 0** to variable 1. 6. 0

54,950. **Thermoscope** after Weinhold, Fig. 54,950, p. 588 (W. D., Fig. 368 [348]). 0. 3

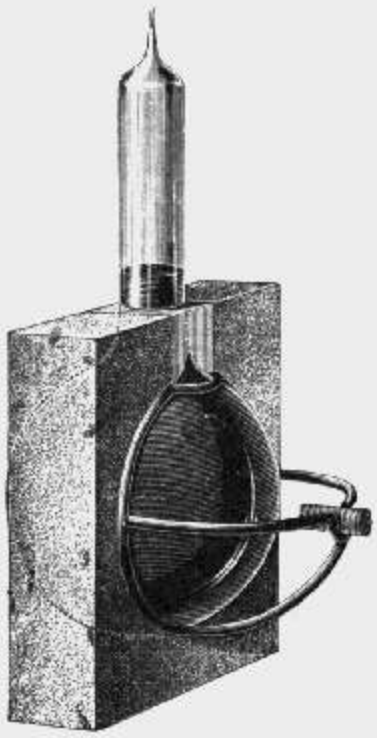
Cl. 5056, 3424, 1932.



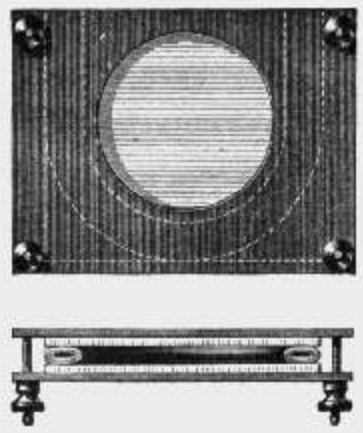
55 350 A (55 351, 55 352, 55 353, 55 354, 55 355, 55 356 a, 55 358, 55 361). 1 : 8.



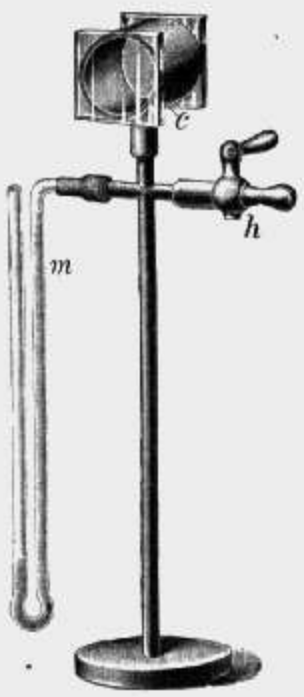
55 342. 1 : 2.



55 343. 1 : 2.



55 345. 3 : 10.



55 349. 1 : 4.

*.55,342. **Small Flat Flask** for filling with Carbon Bisulphide and Iodine, Figure, for showing the Dark Rays (W. D., Fig. 370 [350]), without charging material, in sheet metal flask £ 0. s. 1. d. 9

The small flask is supplied with a larger sheet iron flask in which it is kept, after filling, protected from light or fire. The flask cannot be delivered filled and is therefore provided with stopper. Filling must not be done near an open flame; even a glowing cigar should be avoided.

* 55,343. **Spherical Flask,** Figure, working as Burning Glass for Dark Rays (W. D., Fig. 371 [351]), in mount, for filling with iodine and carbon bisulphide, with Tinder Holder, uncharged, in sheet iron bottle 0. 8. 0

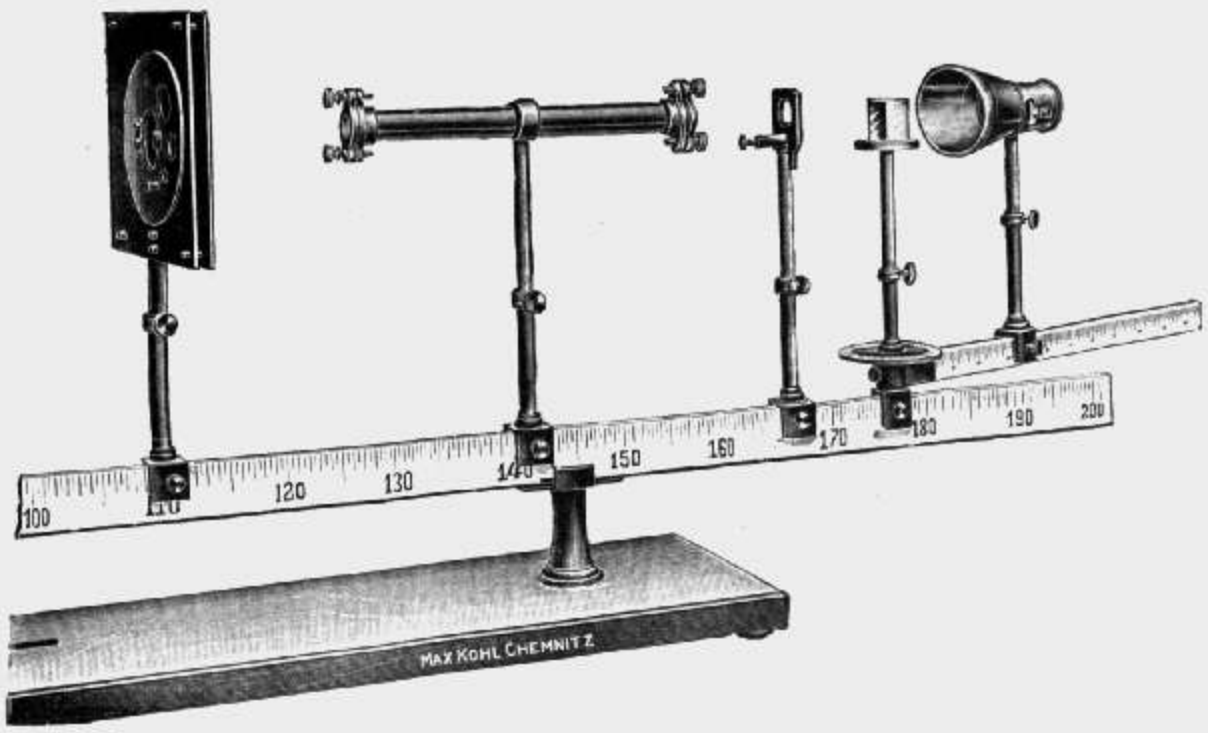
With sunlight or an arc lamp the flask acts as a burning glass and ignites the tinder. Kindly observe the remarks to preceding item.

55,343 a. **1 Silvered and 1 blackened Glass Flask,** for showing the dependence of absorption and emission of heat on the nature of the surface (M. T., p. 164) 0. 6. 0

* Can be used with the projection apparatus.

Cl. 1937.
1933, 1934, 370, 1936.

Max Kohl A. G. Chemnitz, Germany.

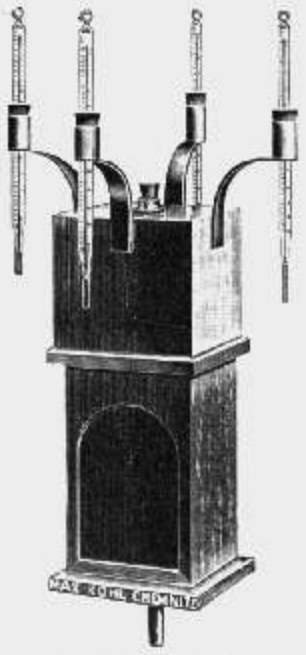


55 350 B (55 362, 55 348, 55 365, 55 366), 55 369, 55 388. 1 : 8.

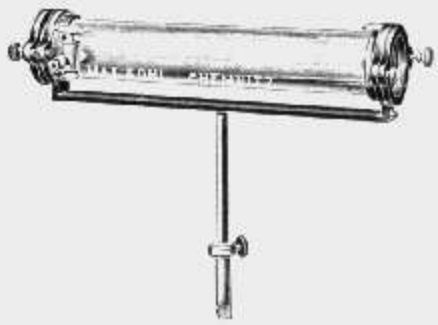
	£ s. d.
55,344. **Thermometer in vacuo,** after Rumford, for showing the rapid propagation of Radiant Heat through a vacuum (Gan.-Man., Fig. 537; Gan.-Rein., Fig. 400)	1. 4. 0
* 55,345. **Plane Parallel Vessel** for alum solution, F i g u r e, collapsible (W. D., Fig. 307 [290]) The vessel consists of two plane parallel glass slabs with a piece of rubber laid between	0. 12. 0
* 55,346. — i d e m, composed entirely of glass, 100×100×10 mm	0. 5. 0
* 55,347. **Device for Absorption of Heat Rays by Coloured Glasses** . . . . . The apparatus consists of a radiometer, a flat flask with concentrated alum solution and a number of coloured glasses in wood frames.	0. 16. 0
55,348. **Apparatus for the Absorption of Heat Rays in Gases and Vapours** (W. D., Fig. 372 [352]), a brass tube, closed at the ends with rock salt plates, on stand	1. 12. 0
55,349. **Apparatus for showing that air is not heated by Thermal Rays,** F i g u r e (W. D., Fig. 373 [353]) . . . . . A hollow brass cylinder is closed by two rock salt slabs 45 × 45 mm and 6 mm thick.	2. 4. 0
55,350. **Melloni's Apparatus for Experiments on Radiation, Refraction, Absorption and Reflection of Heat,** F i g s. A and B (M. P., 9th Edn., II, 1, Fig. 523; Gan.-Rein., Fig. 406, 411—414, 419), without thermopile or rock salt prism . . . . . The apparatus comprises parts Nos. 55,351—55,355, 55,356 a, 55,357, 55,358, 55,348, 55,361—55,366 and 55,367. For preparations see Nos. 55,368—55,385.	14. 4. 0
55,351. **The Stand,** with a 2 m long rule, divided in cm, of maple and fixed to a baseboard by two pillars This stand as well as the following ones can be used simultaneously as an optical bench; also all apparatus fit the stands of optical benches 53,929—53,930, so that one frame only is necessary for the optical bench and Melloni Apparatus.	2. 0. 0
55,352. **8 Brass Stands,** arranged for clamping to the rule . . . . . Each £ **0. 5. 6**	2. 4. 0
55,353. **Locatelli Lamp,** with square wick and reflector	0. 16. 0
55,354. **Weinhold Steam Capsule,** polished on one side and blackened on the other, 95 mm diameter . . .	0. 10. 0
55,355. **Stage with Stand, Platinum Spiral and Spirit Lamp**	0. 18. 0
55,356. **Copper Screen, blackened,** for use as constant thermal source (a) without stage or spirit lamp . . . . . (b) with stage and spirit lamp	0. 8. 0 0. 18. 0
55,357. **Platinum Cap No. 55,341** with Bunsen Burner and with shank for inserting in a stand No. 55,352	1. 6. 0

* Can be used with the projection apparatus.

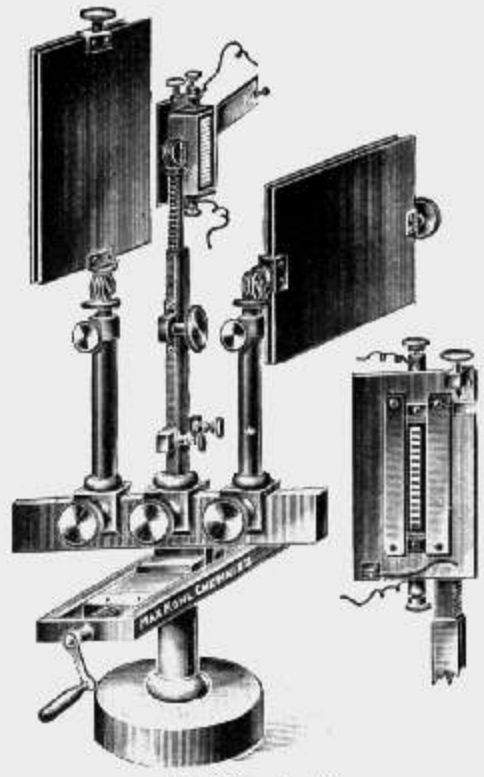
Max Kohl A. G. Chemnitz, Germany.



55 359. 1 : 7.



55 364. 1 : 7.



55 386. 1 : 6

			£	s.	d.
55 358.	**Cube after Leslie,** 10 cm side, with 4 different surfaces, polished metal, dull white, dull black and shiny black, with Thermometer and Heating Box		0.	18.	0
55,359.	— idem, with 4 thermometers, divided in $^1/_5{}^0$, Figure		2.	4.	0
55,360.	**Cube after Leslie,** with 4 polished surfaces of different metals: brass, steel, zinc and iron		1.	4.	0
55,361.	**Double Screen,** of sheet zinc, on hinge		0.	16.	0
55,362.	**Screen with rotary disk,** with holes of different diameter		0.	18.	0
55,348 a.	**Brass Tube with Rock Salt Slabs,** closed, without stand, Fig. 55,350 B, **or**		1.	8.	0
55,364.	**Glass Tube,** with brass mount, Figure, closed by rock salt slabs		3.	4.	0
55,365.	**Holder for carrying Crystal and Gypsum Plates**		0.	8.	0
55,366.	**Rotary Bar** with divided circle and adjustable stage		1.	10.	0
55,388.	**Thermopile of 36 elements,** arranged square, in mount with polished funnel		2.	14.	0
55,367.	**Stages for setting up Rock Salt Prisms** and the like		0.	4.	0

Galvanometer (Multiplier): see under "**Electricity**".

Rock Salt Prisms.	List No.	**55,368**	**55,369**	**55,370**
	Side × Height mm	30 × 40	35 × 45	40 × 50
	£	**1. 0. 0**	**1. 4. 0**	**1. 8. 0**

Rock Salt Slabs.	List No.	**55,371**	**55,372**	**55,373**	**55,374**
	Size mm	25 × 25	30 × 30	40 × 40	50 × 50
	£	**0. 8. 0**	**0. 10. 0**	**0. 18. 0**	**1. 6. 0**

55,375.	**Plates of Alum, Borax, Sugar, Calc-spar, Agate, Crown and Flint Glass, Sal-ammoniac**	**Each**	0.	4.	0
55,376.	**Plates of Black Glass, Citric Acid and Mica**	**Each**	0.	3.	0
55,377.	**Quartz Plates,** ground perpendicular or parallel to axis, of **Heavy Spar, Fluorspar**	**Each**	0.	8.	0

Rock Salt Cylindrical Lenses, radius of curvature 300 mm.

	List No.	**55,378**	**55,379**	**55,380**	**55,381**
	Diameter mm	30	40	50	60
	£	**0. 18. 0**	**1. 4. 0**	**1. 12. 0**	**2. 0. 0**

Rock Salt Lenses, bi-convex, 300 mm radius of curvature.

	List No.	**55,382**	**55,383**	**55,384**	**55,385**
	Diameter mm	30	40	50	60
	£	**0. 14. 0**	**1. 0. 0**	**1. 8. 0**	**1. 18. 0**

55,386.	**Melloni Pile, linear,** Figure, on stand with slider and graduation and with thermopile No. 55,392		12.	0.	0

Thermopiles, Figure, arranged square, in mount with polished reflector.

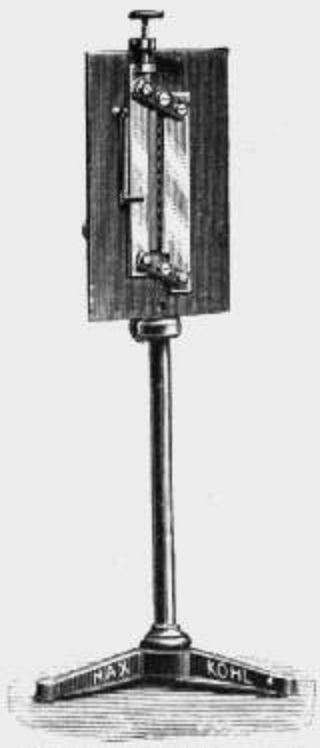
	List No.	**55,387**	**55,388**	**55,389**	**55,390**
	Number of elements	25	36	49	64
	£	**2. 2. 0**	**2. 14. 0**	**3. 6. 0**	**4. 8. 0**

Cl. 3425, 5123, 1939.

Max Kohl A. G. Chemnitz, Germany.



55 387—55 390. 1 : 4.



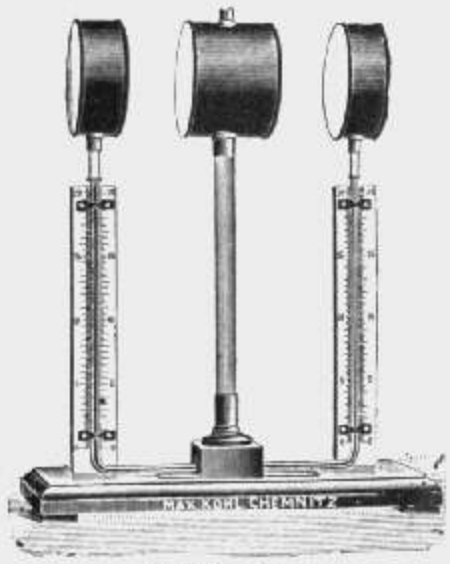
55 391—55 394. 1 : 6.



55 395. 1 : 4.



55 397. 1 : 5.



55 398. 1 : 7.

Thermopiles, Figure, arranged oblong, with mount, and gap opening symmetrically. £ s. d.

List No.	55,391	55,392	55,393	55,394
Number of Elements	24	36	48	60
£	**2. 14. 0**	**3. 6. 0**	**4. 4. 0**	**5. 0. 0**

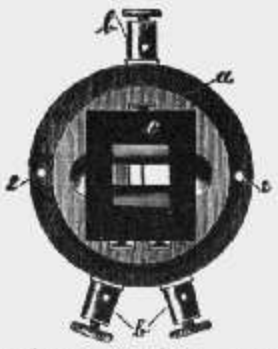
55,395. **Linear Thermopile** after Rubens, Figure, consisting of 20 elements of iron and constantan, in mount, with German silver reflector polished inside, on adjustable stand (Ztschr. für Instrumentenkunde, **18**, 1898, p. 64; Ztschr. f. d. phys. u. chem. U., **11**, 1898, p. 126) 3. 14. 0

55,396. **Tinfoil Screen,** on Base, Fig. 55,010 A, p. 600 (W. D., Fig. 374 [354]), with silver-mercury iodide paint and black ring, for explaining Power of Absorption and Reflection 0. 8. 0

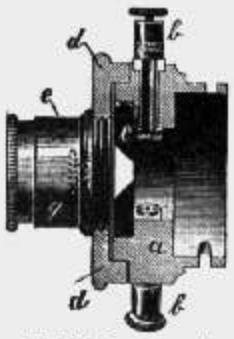
55,397. **Steam Capsule** after Weinhold, **for Radiation Experiments,** Figure (W. D., Fig. 369 [349]), on stand 0. 12. 0

55,398. **Apparatus** after Ritchie, Figure, **for showing the relation between Emissive and Absorptive Power** (Gan.-Rein., Fig. 410) 2. 2. 0

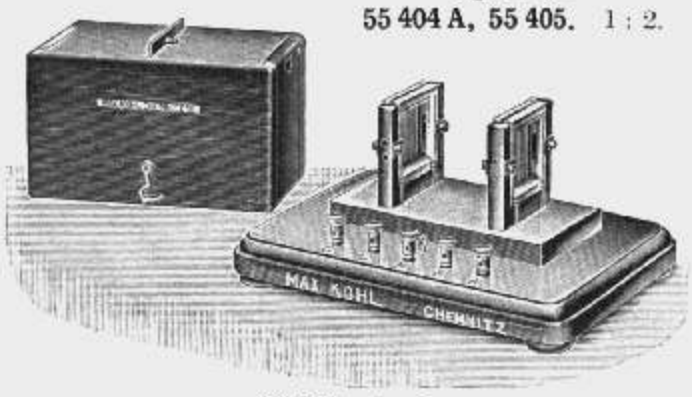
The apparatus, having the form of a differential thermometer, possesses two similar metallic air capsules and one of medium size intended to be filled with warm water. All capsules are white on one side and black on the other.



55 404 A, 55 405. 1 : 2.



55 404 B. 1 : 2.



55 402. 1 : 5.

55 403. 1 : 6.



55 407.
1 : 5.

55,399. **Thermal Radiation Apparatus** after Rumford, consisting of 2 cylindrical vessels, one with smooth and the other with rough surface, for comparing surface radiation, with 2 thermometers divided in $^1/_2$ degrees . . . . . £ 2. 0. 0

Both vessels are filled with boiling water and the time is measured which is required for cooling down to a definite temperature.

55,400. **Thermal Radiation Apparatus** after Dulong and Petit, consisting of a mercurial thermometer with large thermometer vessel and with holder and screens 2. 8. 0

The thermometer is heated to a definite temperature and the time measured for the thermometer to cool down to the surrounding temperature. The experiment is repeated after covering the thermometer chamber with lamp black, leaf gold, leaf silver or with different dyes.

54,531. **Gap with Micrometer Screw and Divided Drum,** Fig. 54,531, p. 545 . . . . . 1. 13. 0

54,530. — i d e m, without Micrometer Screw or Divided Drum, Fig. 54,530, p. 545 . . . 1. 3. 0

55,401. **Surface Bolometer** for measuring Radiant Heat, cf. Fig. 55,402, after Lummer and Kurlbaum, with two Branches and protecting box with slider (Ztschr. f. Instrumentenkunde, **12**, p. 81; Wied. Ann. 1892, Vol. 46, pp. 204 et seq.) 3. 0. 0

The bolometer is based on the change in electrical conducting resistance produced by the heating, on radiation, of a lamp-blacked platinum grating of extreme fineness (0.001 mm thick) fixed to a small slate frame. The change in resistance is measured by means of the Wheatstone bridge combination.

55,402. — i d e m, **with 4 Branches,** F i g u r e, with protecting box, sliders and central diaphragm 4. 10. 0

55,403. — i d e m, F i g u r e, **with 4 branches,** two of which can be illuminated alternatively by lateral displacement of the apparatus (Physikalisch-Technische Reichsanstalt pattern) 5. 0. 0

The detachable protecting box is provided with a pipe for the introduction of a thermometer.

55,404. **Linear Bolometer** after Lummer and Kurlbaum, Figs. A and B, **with 2 branches,** with mount 3. 0. 0

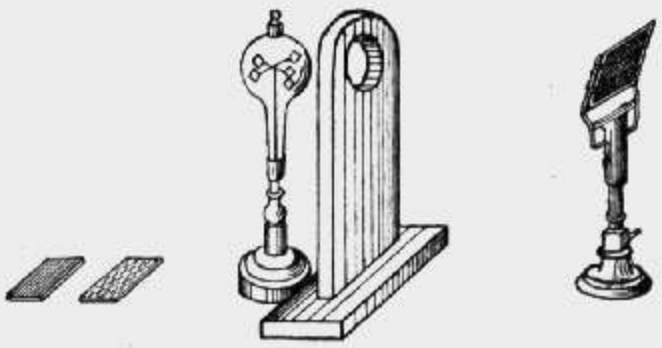
In this apparatus the slate frame is provided with two fine platinum strips which are connected up as adjacent branches of the Wheatstone bridge and one of which is screened off from the rays. The apparatus is employed in conjunction with a spectrometer, this method of using being explained by F i g. 55,404 B.

55,405. **Capsule with Slate Frame,** Fig. 55,404 A, for forming a 4-branch Bolometer from the preceding apparatus 1. 6. 0

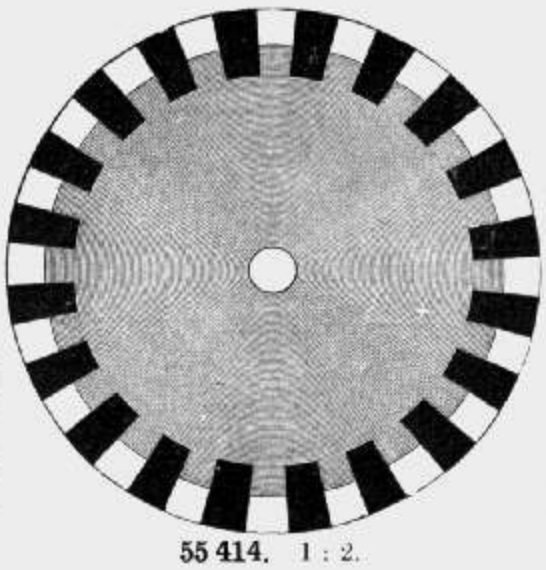
Very sensitive galvanometers should be used for connecting with the bolometers (10^{-8} to 10^{-9} amp. sensitivity), see section "Electricity".

Max Kohl A. G. Chemnitz, Germany.

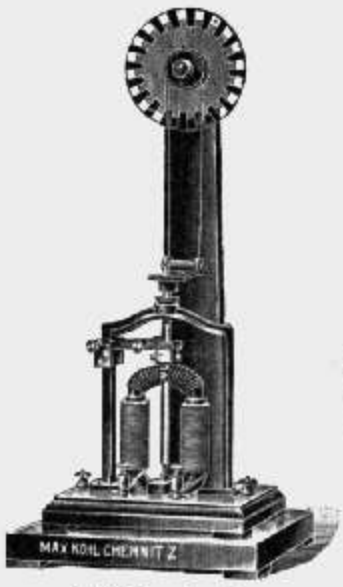
Max Kohl A. G. Chemnitz, Germany.



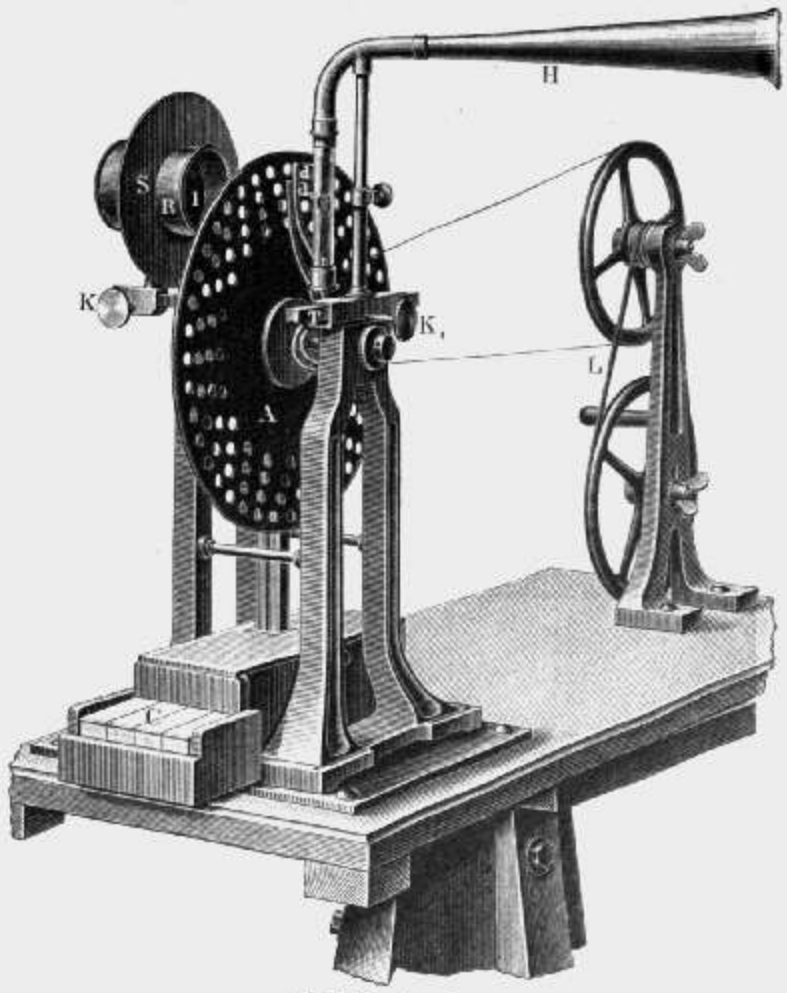
55 411, 55 326. 1 : 8.



55 414. 1 : 2.



55 416. 1 : 8.

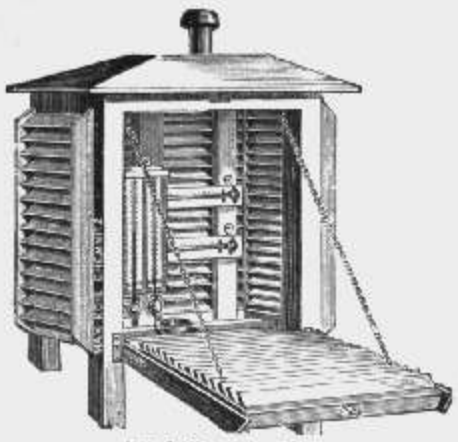


55 418. 1 : 6.

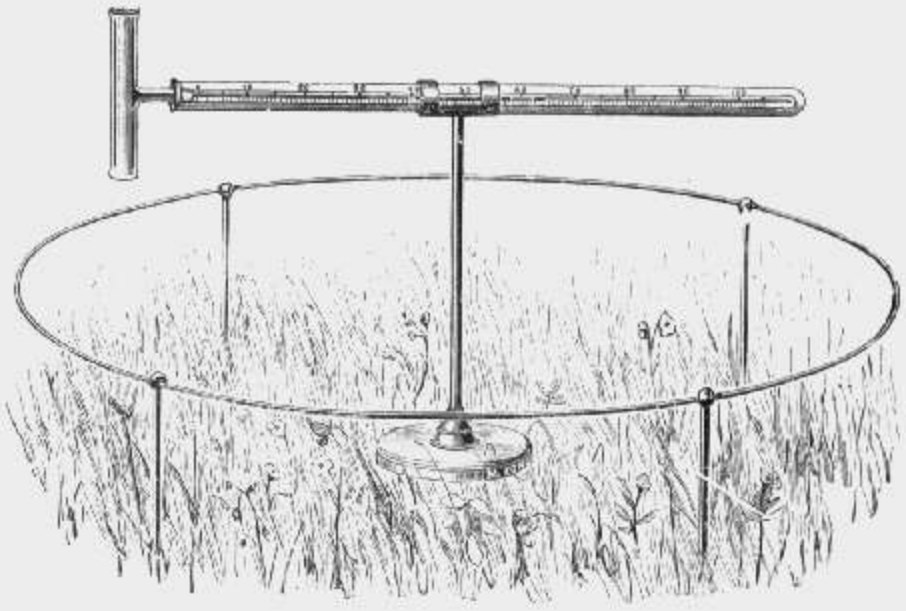
Radiometers and Radiophonic Apparatus.

	£ s. d.
55,406. **Radiometer** after Crookes, ordinary pattern	0. 5. 0
55,407. — i d e m, with two vanes rotating in opposite directions, F i g u r e	0. 10. 0
55,408. — with aluminium vanes, covered with mica one side	0. 6. 0
55,409. — with semi-cylindrical vanes (aluminium)	0. 6. 0
55,410. — with hemispherical aluminium vanes	0. 6. 0
55,411. **Radiometer** after Rebenstorff, F i g u r e, with one vane having lengthened surface in order to enable the revolutions to be counted, with wood screen and two wire nets of nickel; also adapted for experiments on Absorption and Reflection of radiant heat after Freuchen (Ztschr. f. d. phys. u. chem. U., **20**, 1907, p. 28)	0. 10. 0
55,326. **Heat Supply for Radiant Heat,** for above, F i g. 55,326, p. 642	0 10. 0
55,412. **Radiometer** with fixed metal disc (aluminium, copper) and rotary cross above same of transparent mica	0. 8. 0
55,413. — i d e m, with fixed cross and rotating disc above	0. 8. 0
* 55,414. **Radiophone** after Weinhold, F i g u r e (W. D., Figs. 375 and 377 [355 and 357]), apparatus for producing a tone by rapidly repeated radiation, consisting of a plate glass sector disc for the whirling table, and the receiver	0. 18. 0
* 55,415. — i d e m, with a zinc sector disc (W. D., Fig. 376 [356]), fitting the whirling table	0. 14. 0
55,416. **Electric Motor with Stand** for driving the sector disc, F i g u r e, without disc	2. 14. 0
55,417. **2 Lenses, bi-convex,** 80 mm diam., 500 mm focal length, in mount, on stands for the preceding radiophones (W. D., Fig. 378 [358]) . . . . . Price, together	1. 6. 0
55,418. **Radiophone** after Mercadier, F i g u r e (M. P., 9th Edn., II, 2, Fig. 338), with 4 rows of holes giving a chord, keyboard, receiver and sound horn; without whirling table	18. 0. 0

* Can be used with the projection apparatus.



55 420. 1 : 10.



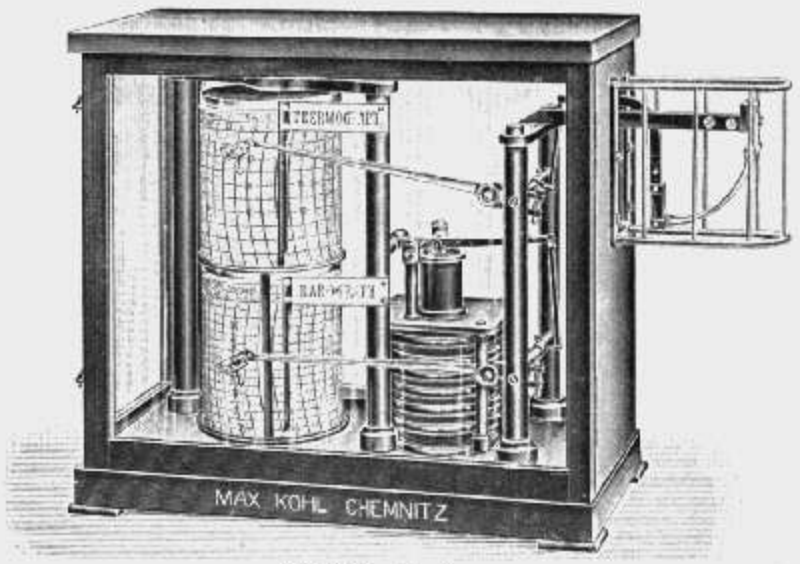
55 425. 1 : 5.



55 423. 1 : 11.



55 426. 1 : 4.



55 427. 1 : 6.

Meteorological Apparatus.

£ s. d.

Chamber and Siphon Barometers, Station and Travelling Barometers, Altitudinal Barometers and **Aneroid Barometers:** see pp. 372—377, Nos. 52,771—52,806.
Recording Aneroid and Mercurial Barometers: see p. 377, Nos. 52,808—52,810.
Cathetometers: see pp. 224, Nos. 51,463—51,466.
Reading Microscopes: see pp. 226 and 227, Nos. 51,473—51,477.
Thermometers: see pp. 576—579, 54,845—54,877.
Thermographs: see p. 579, Nos. 54,878—54,885.
Boiling and Freezing Point Determination Apparatus: see p. 580, Nos. 54,887—54,889.
Thermometer Comparators and Calibrating Apparatus: see p. 225, Nos. 51,467—51,468.
Distance Thermometers: see pp. 584—587, Nos. 54,912—54,944.
Thermometer Testing and Comparing Apparatus: see p. 581.

55,420. **Thermometer Screen** after Stephenson, Figure, for 4 or more thermometers, with double blinds 2. 10. 0

55,421. **Earth Thermometer** after Lamont, divided in $^1/_5{}^0$, from — 10° to + 50° C., for 0.25 m depth, in brass mount with steel point 0. 18. 0

55,422. — idem, for 0,5 m depth 1. 2. 0

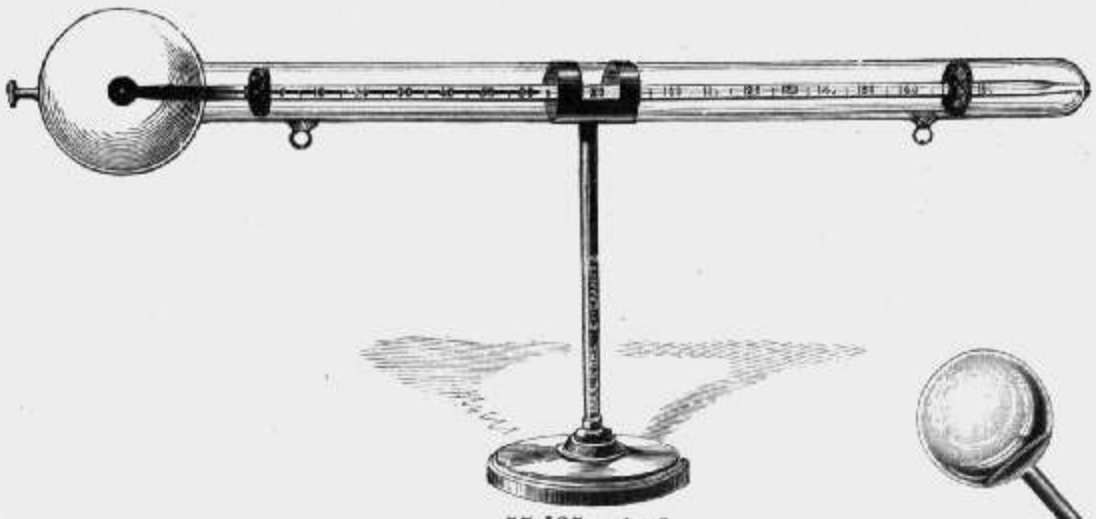
55,423. — idem, for 0,75 m depth, Figure 1. 4. 0

55,424. — idem, for 1 m depth 1. 10. 0

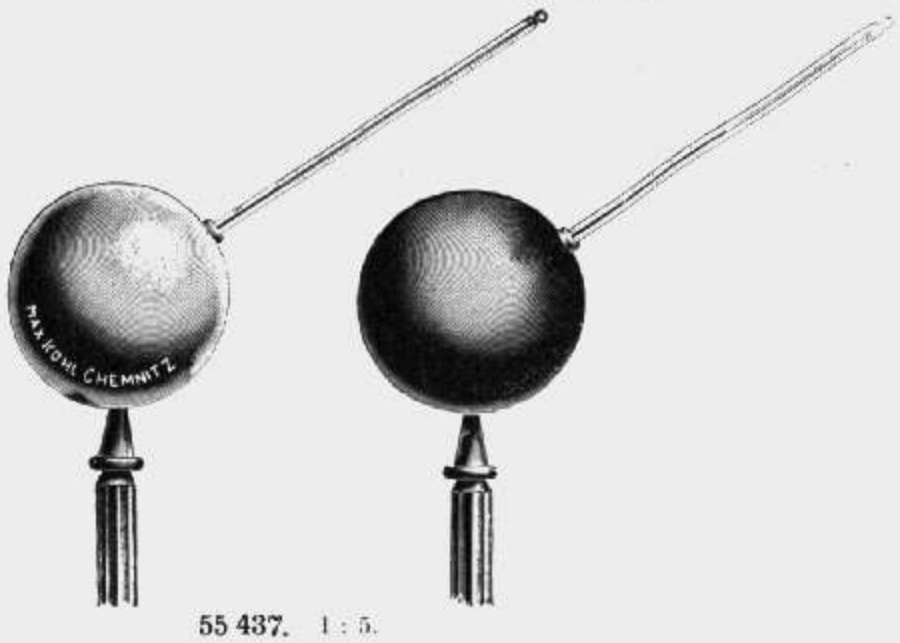
55,425. **Earth Minimum Thermometer,** Figure, very sensitive, spirit filled and with thermometer vessel in form of hollow cylinder 1. 0. 0

Cl. 1968, 1971, 4106, 1972, 3829.

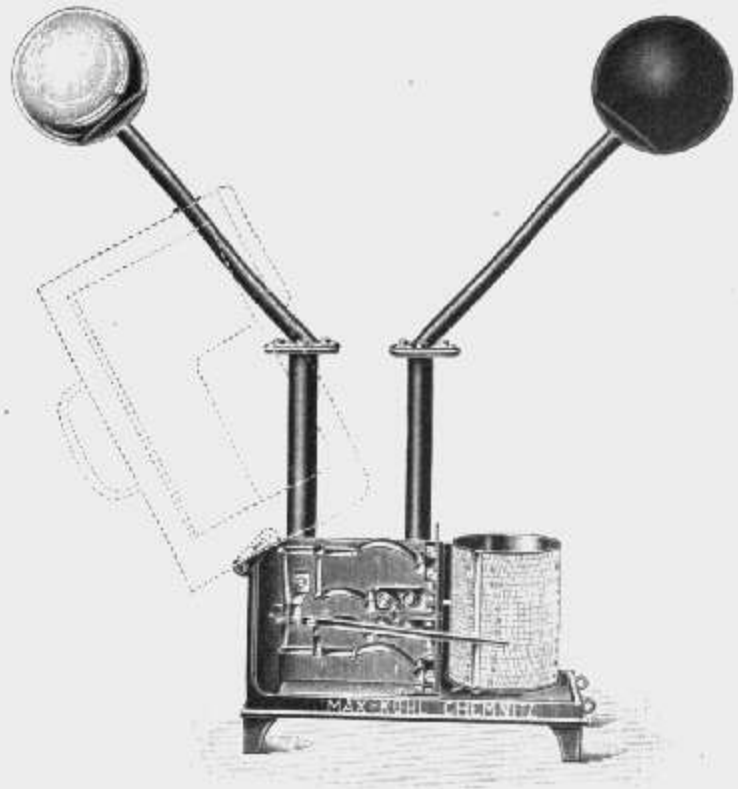
Max Kohl A. G. Chemnitz, Germany.



55 435. 1 : 3.

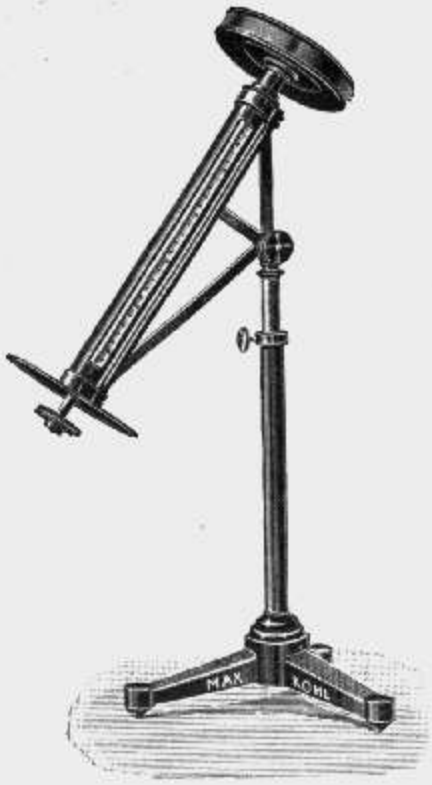


55 437. 1 : 5.



55 438. 1 : 10.

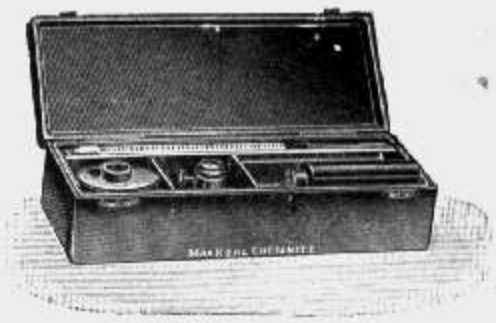
	£ s. d.
55,426. **Spring Thermometer,** Figure	0. 10. 0
The maximum system thermometer is divided in $^1/_5{}^0$ from -10^0 to $+100^0$ C. and has a protecting ring for the mercury bulb, the latter being provided with a tuft of hair for holding the spring water.	
55,427. **Baro-Thermograph,** Figure, combined recording instrument for air-pressure and temperature, in walnut case	12. 10. 0
55,428. — idem, in aluminium casing	15. 0. 0
55,429. **Baro-Hygrograph,** in walnut case	13. 0. 0
55,430. **Baro-Psychograph**	15. 0. 0
55,431. **Thermo-Hygrograph**	12. 10. 0
55,432. **Baro-Hygro-Thermograph**	18. 0. 0
All recording instruments are also supplied in a metal casing at the same price.	
55,433. **Statoscope** for observing the ascent and descent of a balloon, model of the Royal Aeronautical Batallion	4. 10. 0
55,434. **Anercid Barograph,** one rotation of drum in 12 hours, with leather case, straps and rifle hook	7. 10. 0
55,435. **Solar Radiation Thermometer,** Figure, on stand	1. 4. 0
The mercury vessel is surrounded by an evacuated bulb; the thermometer is provided with maximum device, being graduated from -10^0 to $+70^0$ C. in $^1/_2{}^0$.	
55,436. — **Two of the preceding,** without stand, in case	1. 16. 0
The bulb of one thermometer is blackened, the other plain.	
55,437. **Pair of Bulbs** after Violle, Figure, for measuring solar radiation	4. 0. 0
Of the two bulbs, consisting of thin sheet copper, one is dull black on the outside, the other polished and gilded; both bulbs are jet black internally. Each carries a thermometer divided in $^1/_5{}^0$.	
55,438. **Actinometer** after Violle, Figure, recording, with two scribing levers writing on drums	31. 10. 0
Two thermometers are, together with their sensitive vessels, enclosed in metal spheres, one of the latter being polished and the other jet black.	



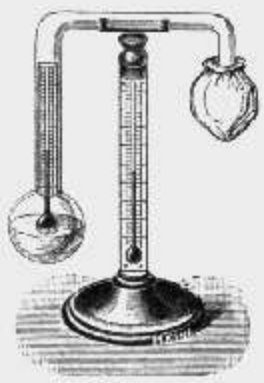
55 439. 1 : 5.



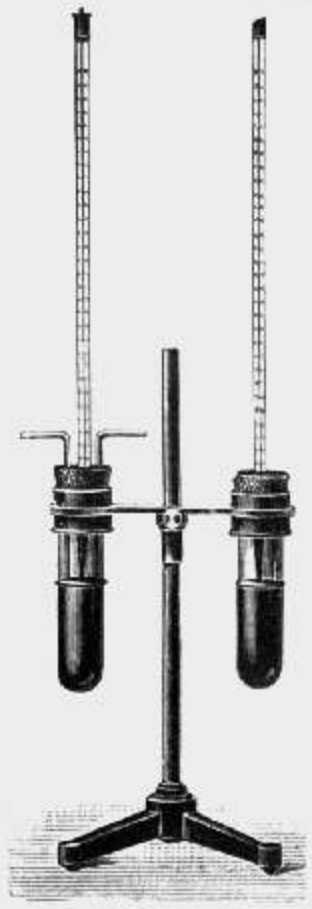
55 441 A. 1 : 7.



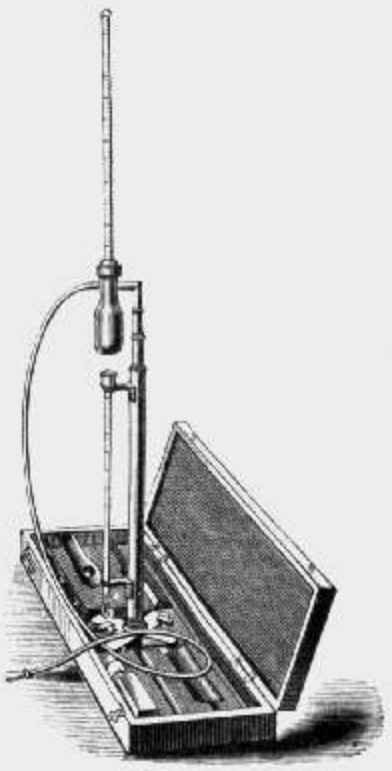
55 441 B. 1 : 8.



55 443. 1 : 6.



55 444. 1 : 8.



55 446. 1 : 10.

	£ s. d.
55,439. **Pyrheliometer** after Pouillet, Figure, for showing the total amount of solar heat absorbed by the earth (M. P., III, Fig. 473 [II, 2, Fig. 340]; Gan.-Rein., Fig. 453) .	4. 10. 0
55,440. **Sunshine Recorder** after Campbell-Stokes, for automatically recording the duration of sunshine, with adjustable polar altitude, centering device and sensitive sheets for one year's records	9. 0. 0
54,888. **Hypsometer** after Wollaston, see Fig. 54,888, p. 580, with one thermometer No. 54,874a	4. 3. 0
55,441. **Hypsometer** after Geissler, Figs. A and B, for altitudinal determinations from the boiling point of water by means of thermometers, with lamp and boiler, in box . . The thermometer is divided in $^1/_{10}{}^0$ from + 95 to + 102° C.	3. 5. 0
55,442. — idem, with large thermometer divided in $^1/_{50}{}^0$ C.	5. 0. 0
55,443. **Hygrometer** after Daniell, Figure (M. P., 9th Edn., II, 2, Fig. 352; W. u. E. phys. Prakt., Fig. 102; Gan.-Man., Fig. 522; Gan.-Rein., Fig. 386)	0. 15. 0
55,444. **Hygrometer** after Döbereiner-Régnault, Figure (W. u. E. phys. Prakt., Fig. 103; Gan.-Rein.. Fig. 387), with two polished silver vessels and two thermometers divided in $^1/_{10}{}^0$, on brass stand, without aspirator	2. 10. 0
55,445. — idem, with simple aspirator of 5 litres capacity (M. P., III, Fig. 480 [II, 2, Fig. 353])	3. 10. 0
55,446. **Hygrometer** after Régnault, Figure, with polished silver vessel for the ether, with extra-sensitive thermometer, in box	4. 0. 0
55,447. **Hygrometer** after Alluard, Figure, with accessories (Gan.-Man., Fig. 523) . . .	4. 16. 0

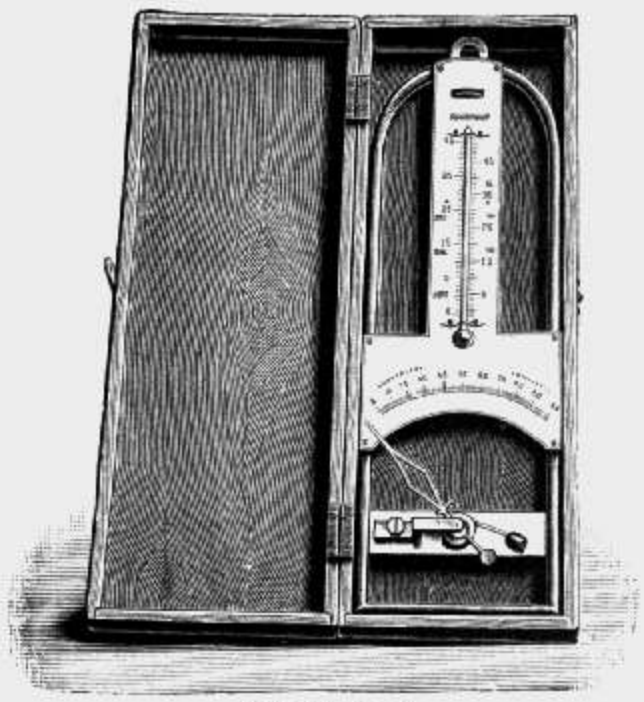
Cl. 1976, 1977, 1978, 1979, 1980, 1982.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.

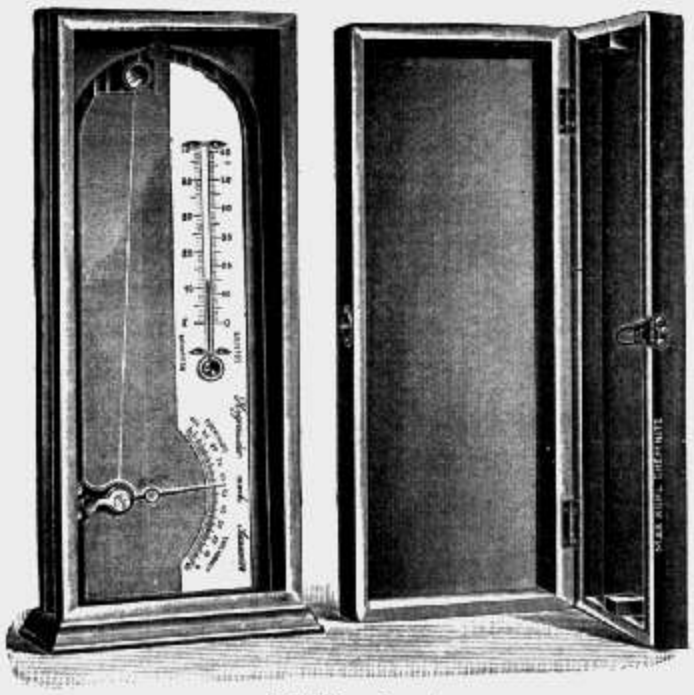


55 447. 1 : 4.

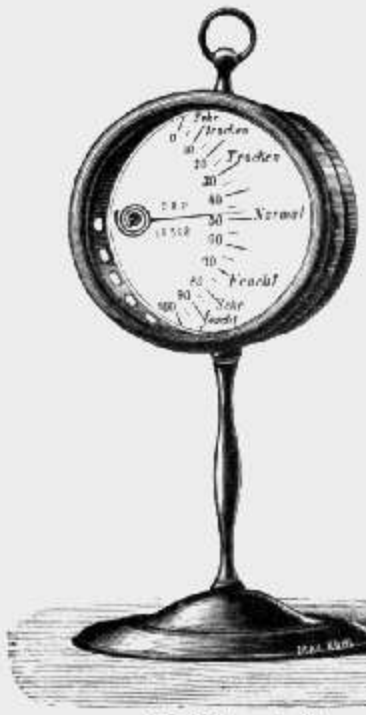


55 448. 1 : 4.





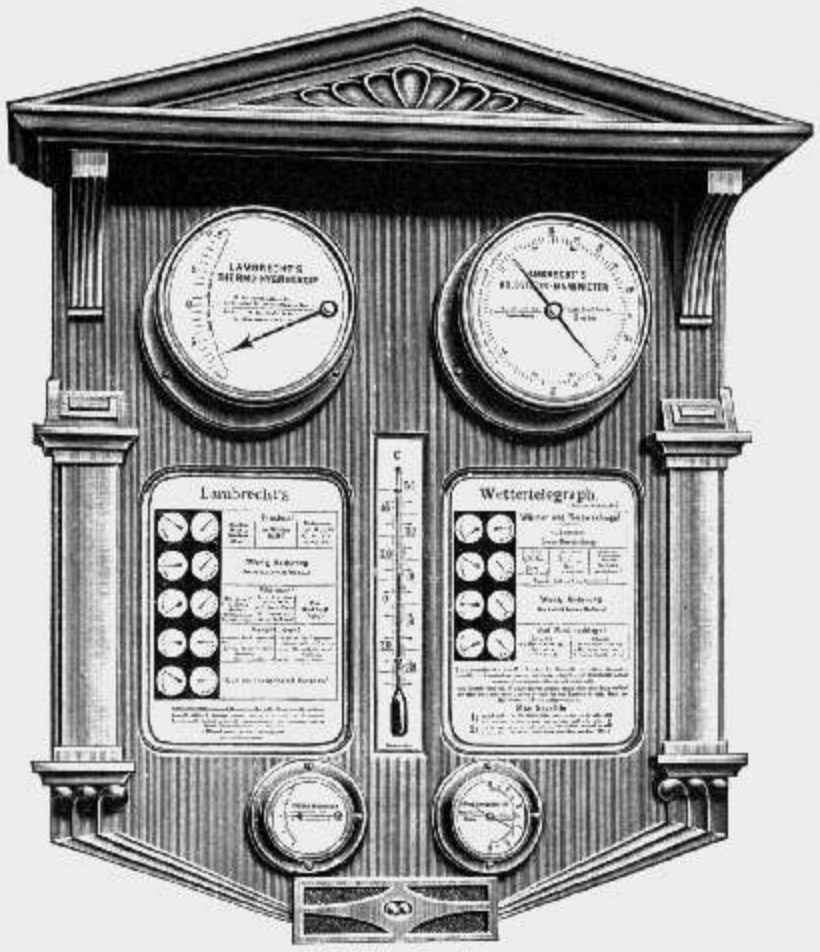
55 449. 1 : 4.



55 451. 1 : 3.

55 453. 1 : 2.

	£ s. d.
55,448. **Capillary Hygrometer** after Saussure. Figure (M. P., III, Fig 481 [II, 2, Fig. 357]; Gan.-Man., Fig. 520; Gan.-Rein., Fig. 389), with thermometer	1. 5. 0
55,449. **Capillary Hygrometer** after Koppe, Figure, with adjusting device and with thermometer	1. 16. 0
55,450. **Hygrometer** after Mithof, scale diam. 80 mm, in black polished wood mount . . .	0. 4. 0
55,451. — idem, on base, Figure	0. 8. 0
55,452. — idem, with rain shade and arm for fixing to window	1. 5. 0
55,453. **Polymeter** after Lambrecht, Figure, in brass case (M. T., p. 161 and 162) . .	1. 0. 0
55,454. — idem, in phosphor-bronze case (non-oxidisable)	1. 5. 0



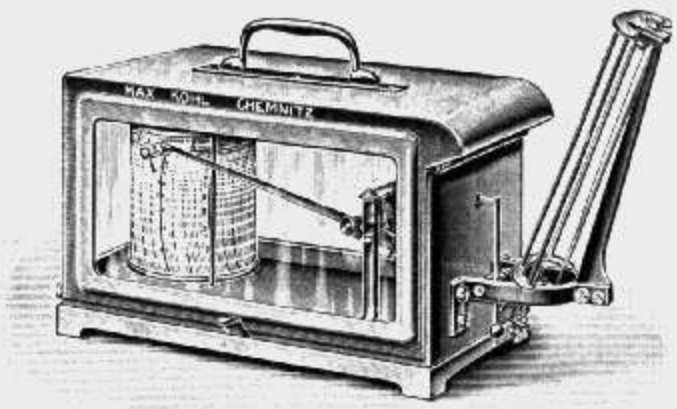
55 455. 1 : 5



55 458. 1 : 7.



55 456. 1 : 18



55 457. 1 : 6.

55,455. **Weather Telegraph** after Lambrecht, Figure, with barometer, thermometer and hygrometer . . . . . £ 5. 0, 0

The place at which the observations are to be conducted should be mentioned when ordering, as also height above sea-level.

55,456. **Compression Hygrometer** after Kolosy, Figure, with millimetre scale, for exact measurements of the humidity-content of the atmosphere, with thermometer in $^1/_5{}^0$ C., for — 20° to + 40° C. 3. 0. 0

This new hygrometer is based on the measurement of the tensive force of the moisture contained in the air at the time of the observation. The quantity of moisture is given in accordance with Dalton's law of partial pressures, being read off direct in whole percents and $^1/_{10}$ of a per cent. A fresh filling is required for each measurement. Directions for use and a Table for facilitating measurements are supplied with the apparatus.

The relative humidity is determined by direct measurement, and the instrument can be used for calibrating and determining the constants of other hygrometers.

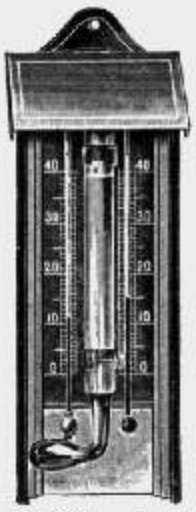
55,457. **Recording Hygrometer,** Figure, with clockwork cylinder, making one turn every week; very accurate movement 7. 0. 0

55,458. **Psychrometer** after August, Figure, with two accurate thermometers in $^1/_{10}{}^0$ from — 15° to + 50° C., with wood stand (M. T., p. 161) 1. 8. 0

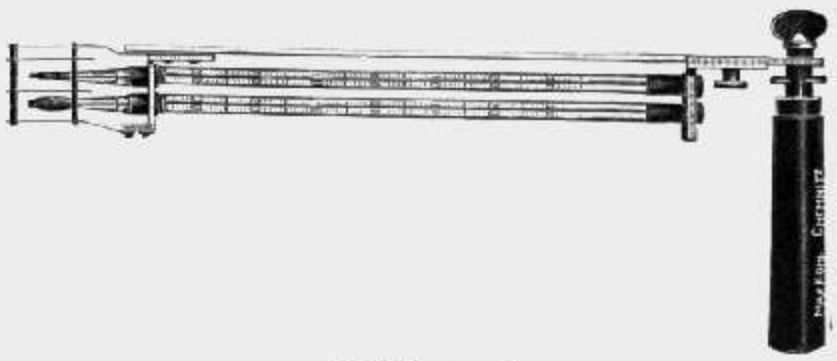
55,459. — idem, with metal stand 1. 16. 0

Cl. 6558, 6215, 4706, 5208.

Max Kohl A. G. Chemnitz, Germany.



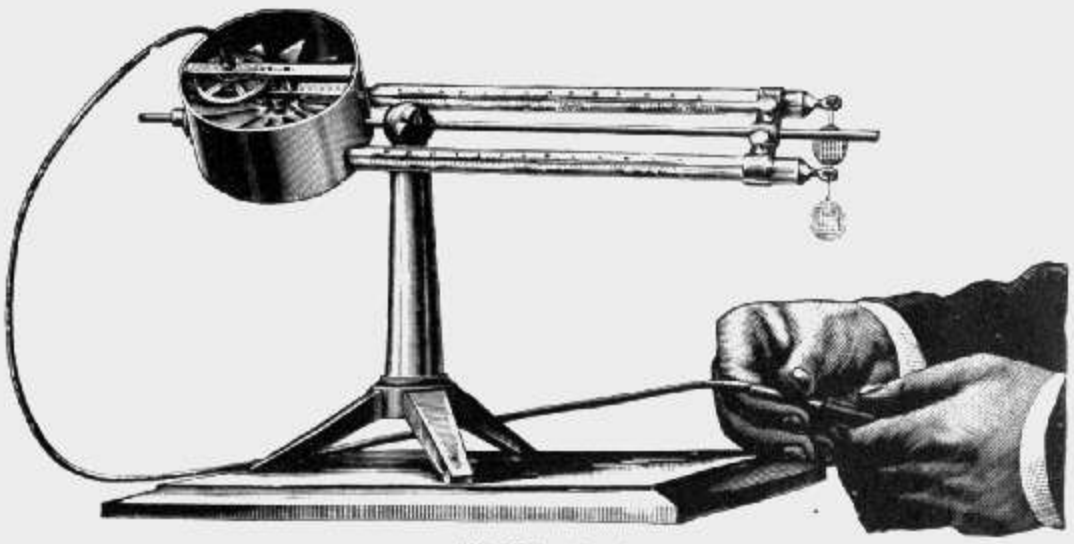
55 461. 1 : 6.



55 462. 1 : 5.



55 463. 1 : 4.



55 464. 1 : 4.

55,460. **Psychrometer,** simple, with large water vessel and two thermometers divided in $^1/_2{}^0$, with Table . . . . . £ s. d. 0. 10. 0

55,461. — i d e m, F i g u r e, with lacquered zinc case for protection from weather . . . 0. 15. 0

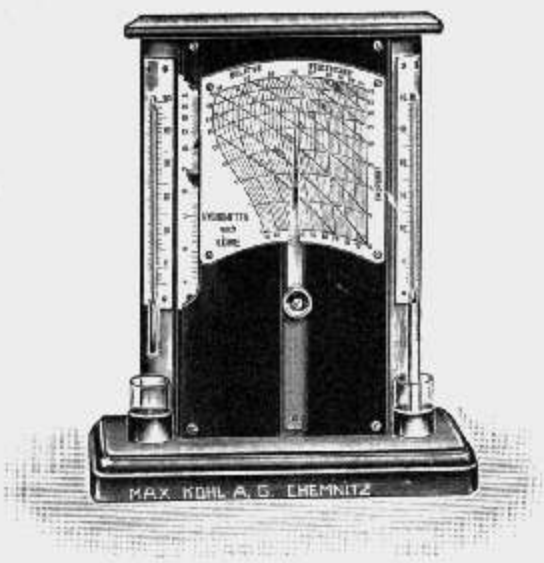
55,462. **Centrifugal Psychrometer** after Schubert (Ztschr. f. Instrumentenkunde, **16.** 1896, p. 329), F i g u r e, with wood handle arranged for swinging, giving very rapid and accurate results, with two thermometers divided in $^1/_{10}{}^0$ C. 2. 8. 0

In order to calculate the results, it is desirable to employ the Psychrometer Tables by J e l i n e k, H a n n and P e r n t e r, to be obtained from any bookseller.

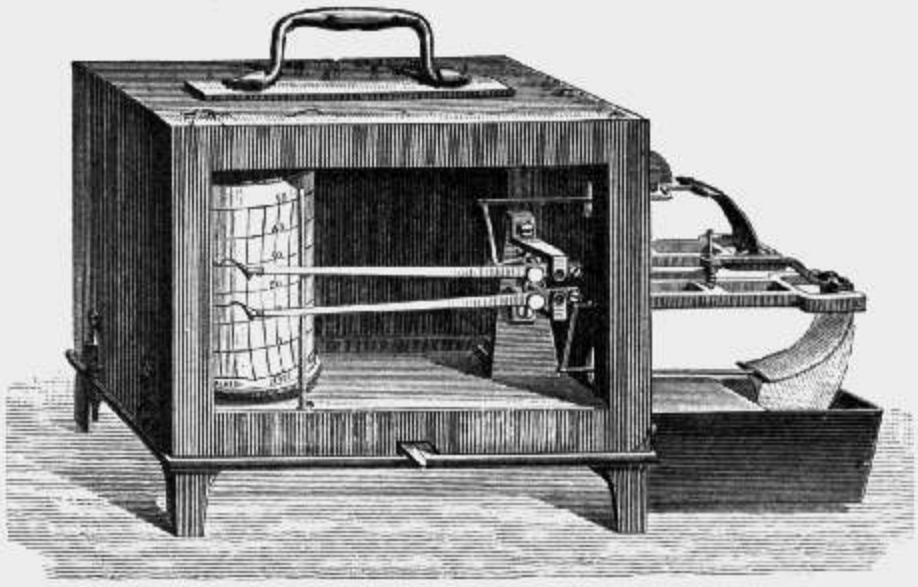
55,463. **Aspiration Psychrometer** after Lambrecht, F i g u r e, with two sensitive, tested thermometers, with hand motor 5. 0. 0

55,464. **Aspiration Psychrograph** after Lambrecht, F i g u r e, with two sensitive, tested thermometers, with hand motor 5. 10. 0

The apparatus differs from the preceding in that the thermometers are provided with marks, which follow the temperature variations during aspiration and fix the difference in the two thermometers after aspiration has ceased, so as to enable it to be read closely and carefully, with a magnifier if necessary.



55 465. 1 : 6.



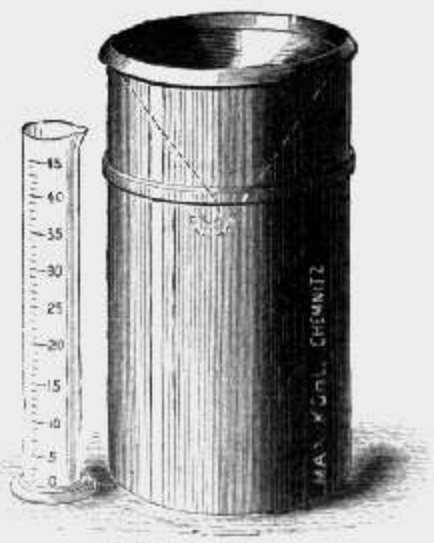
55 466. 1 : 5.



55 467. 1 : 3.



55 468. 1 : 7.



55 469. 1 : 7.

55,465. **Direct Reading Psychrometer** after Lowe, giving relative humidity, dew-point and water vapour tension. Can be used without Table . . . . . £ 2. 10. 0

In order to make a reading, the index knob is moved up or down until the upper index gives the same value on the temperature scale to the left as the dry-bulb thermometer to the right. The index knob is then turned, without being moved, until the lower index gives the temperature-value of the wet-bulb thermometer. The point at which the tip of the indicator is situated gives simultaneously the relative humidity, dew-point, and the tension of water-vapour.

55,466. **Recording Psychrometer,** Figure, with 7-day clockwork movement making one rotation in this time, with two thermometers and two levers, writing on a drum . . £ 9. 0. 0

55,467. **Air Tester** after Wolpert, Figure, for determining the amount of carbonic acid in the air in rooms; specially recommended for schools. Accurate determinations in a short time. With the necessary reagents in bottles . . . . . £ 0. 12. 0

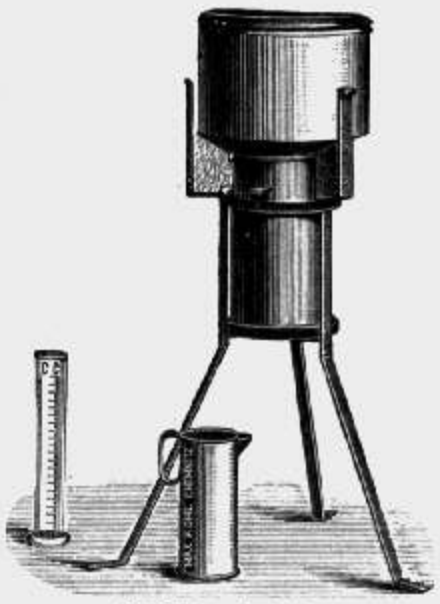
55,468. **Rain Gauge,** Figure, 125 sq. cm surface, with cylindrical measure . . . . . £ 1. 10. 0

55,469. — idem, Figure, **larger,** 250 sq. cm surface . . . . . £ 2. 10. 0

55,470. **Rain Gauge** after Bruhns, Figure, 500 sq. cm surface, with cylindrical measure and 2 rods with branded marks (Ztschr. f. Instrk., **8**, 1888, p. 208) . . . . . £ 2. 14. 0

55,471. **Rain Gauge,** cf. Fig. 55,472, consisting of graduated glass jar, brass cock, white enamelled lead funnel and arbor screw, indicating to 10 mm rainfall . . . . . £ 0. 5. 0

55,472. — idem, **larger,** Figure, indicating up to 15 mm rainfall . . . . . £ 0. 6. 0



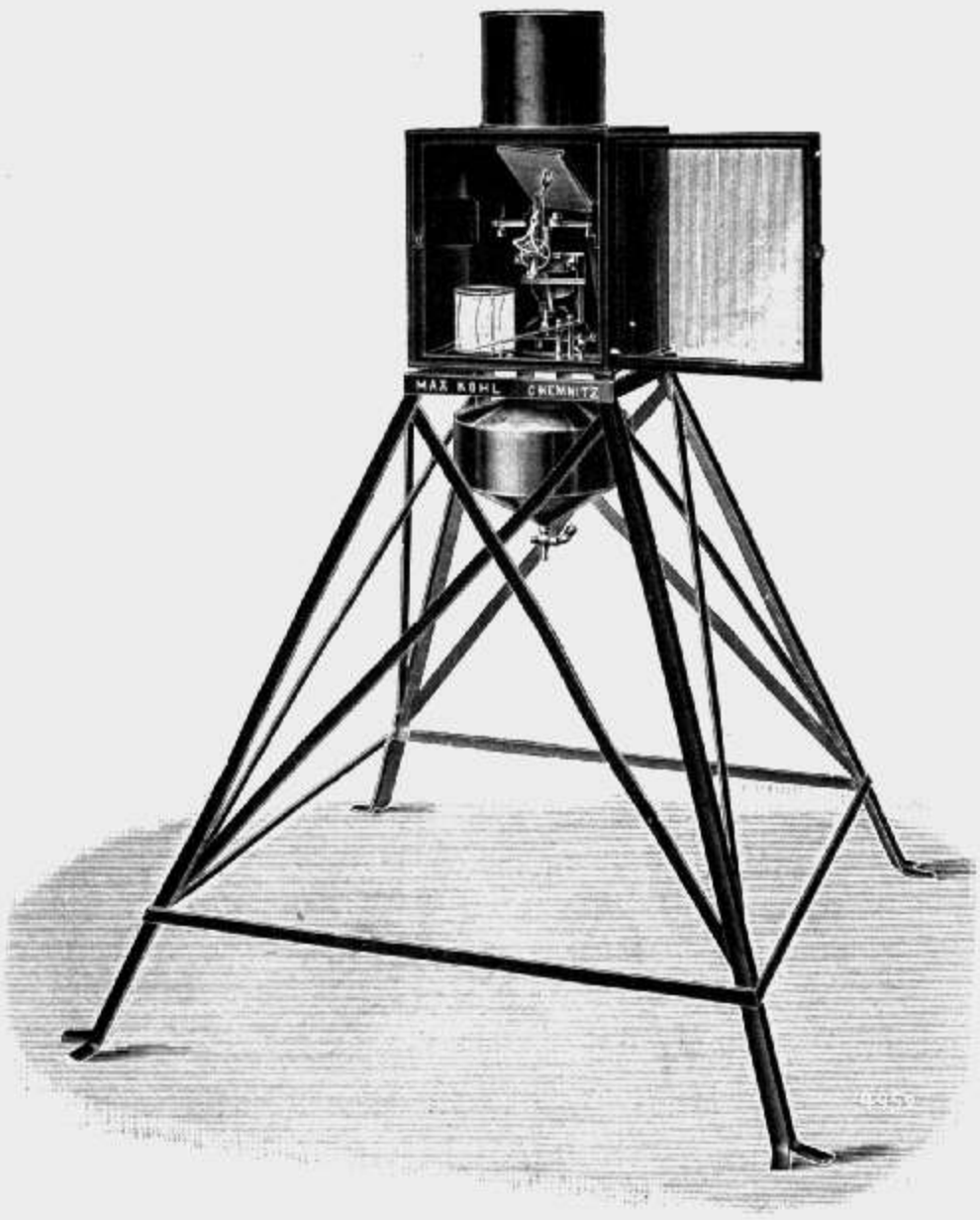
55 470. 1 : 16.



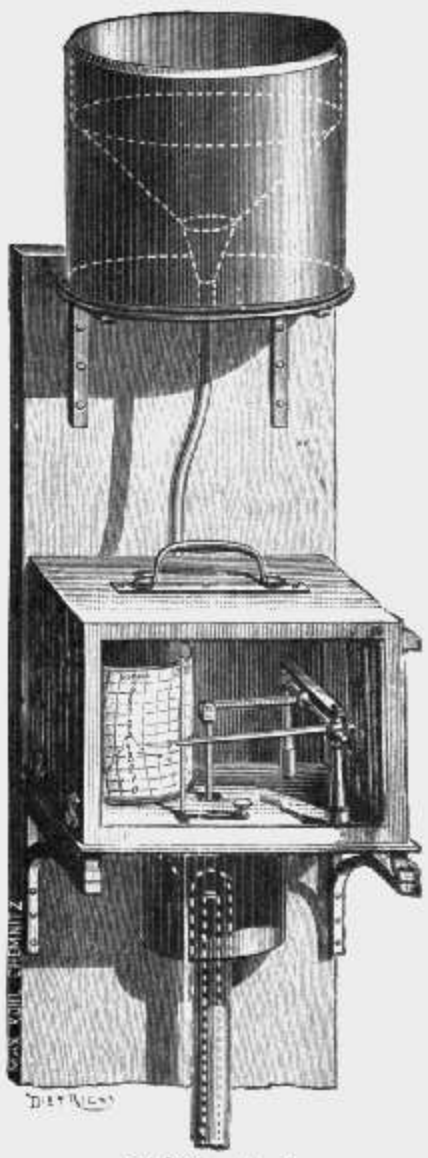
55 472. 1 : 6.



55 473. 1 : 8.



55 474. 1 : 20.



55 475. 1 : 7.

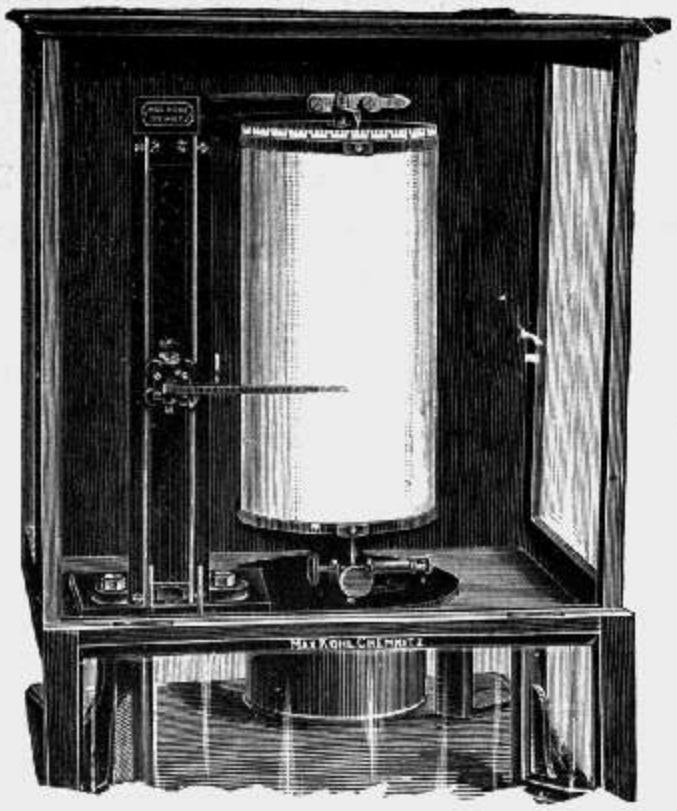
55,473. **Rain Gauge** after Prof. Hellmann, for catchment area of 100 sq. cm; the measuring glass gives the rainfall in millimetres . . . . . £ 0. 9. 0

55,474. **Recording Rain Gauge,** Figure, working very reliably, 8-day mechanism, on iron base, with reservoir and test vessel 27. 10. 0

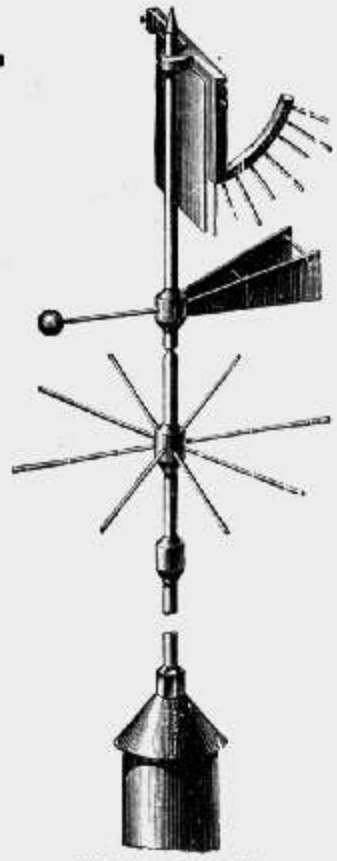
55,475. **Recording Rain Gauge,** Figure 12. 10. 0

The catchment vessel is separate from the recording mechanism, in order to be able to set up the latter in the observing room and the former in the open air.

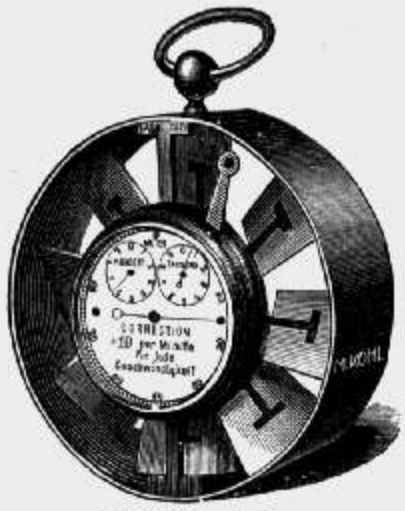
Max Kohl A. G. Chemnitz, Germany.



55476. 1 : 7.



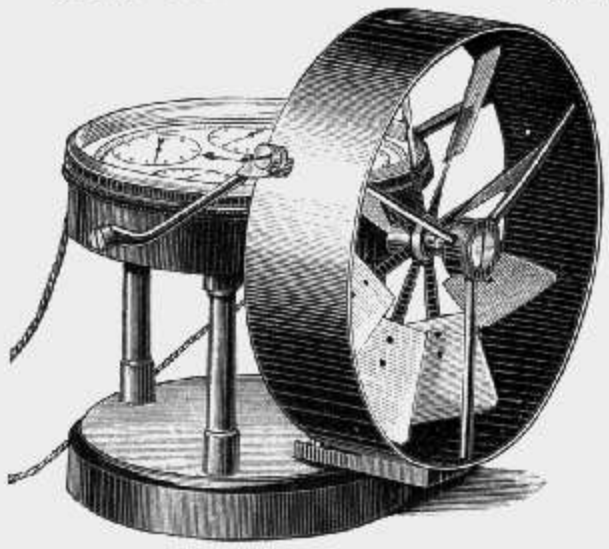
55477. 1 : 15.



55479. 1 : 2.



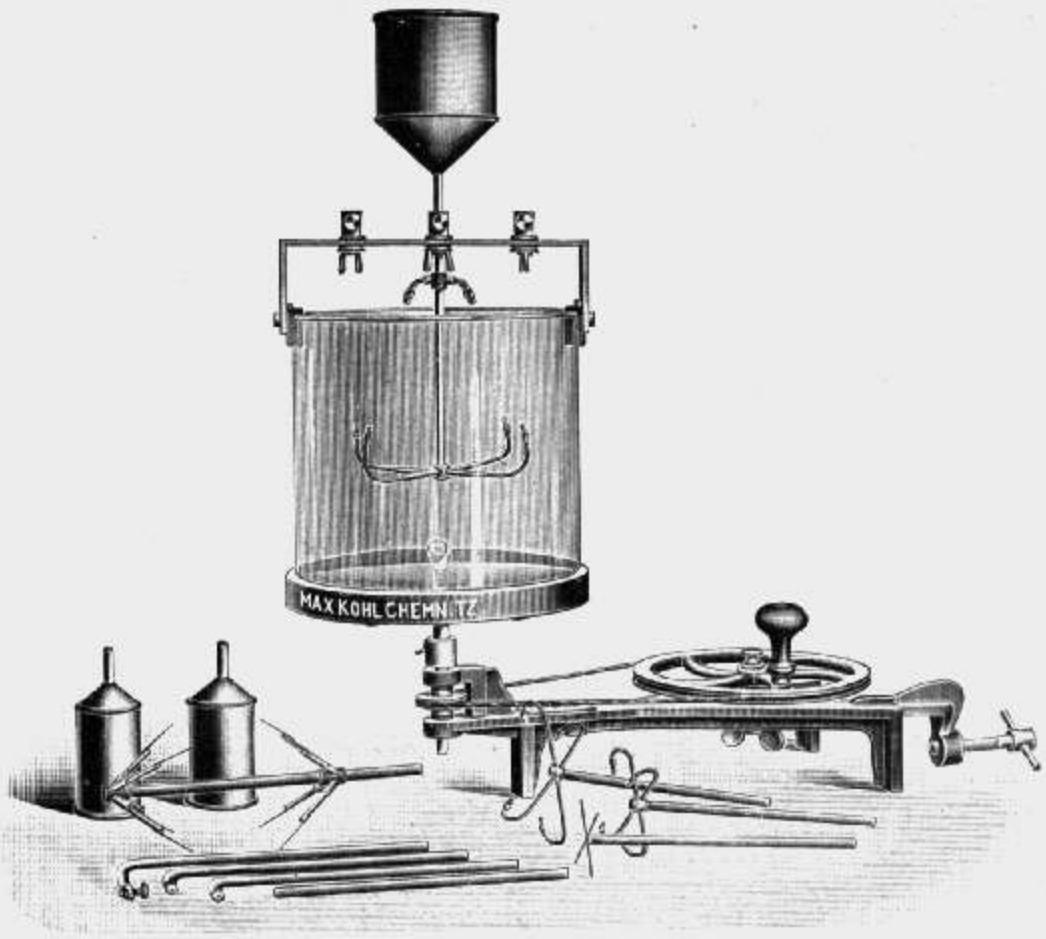
55482. 1 : 5.



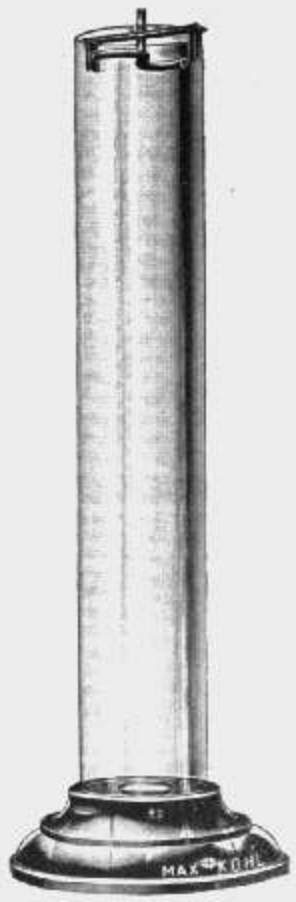
55478. 2 : 3.

	£ s. d
55,476. **Recording Water Gauge,** Figure, in glazed iron house, lower and front plate moving in hinges, with copper float on 2 m long rods and the necessary leads for same . .	23. 0. 0
55,477. **Wind Vane** after Wild, Figure, with scale of forces	3. 0. 0
55,478. **Anemometer** after Robinson, Figure, counting to 10 000 000 metres, in case .	5. 0. 0
55,479. — idem, counting up to 10 000 metres, Figure	3. 10. 0
55,480. — idem, counting to 100 metres	2. 10. 0
55,481. — idem, counting to 10 000 metres, large pattern, working from 7 metres per minute; diameter of protecting ring about 150 mm	6. 10. 0
55,482. **Anemometer** after Beckley, Figure, with counting mechanism and Robinson crossed cups	4. 10. 0
52,056. **Apparatus** after Rosenberg, Figure, for Explaining the **Theory of Cyclones, Anti-cyclones, Trade Winds and Counter Trade Winds** (Ztschr. f. d. phys. u. chem. U., **12**, pp. 335—338)	4. 10. 0
The apparatus is used in conjunction with a Whirling Table (see No. 51,949 et seq.); the above price is exclusive of the latter. Accurate description and instructions for use of the apparatus sent on application.	
55,484. **Apparatus for producing Smoke Eddies,** Figure, after Rosenberg, for Explaining the Existence of Cyclones and Anti-cyclones (Ztschr. f. d. phys. u. chem. U., **12**, 1899, p. 338)	1. 4. 0
The glass cylinder, open at both ends, can be detached from the wood base. The latter carries	

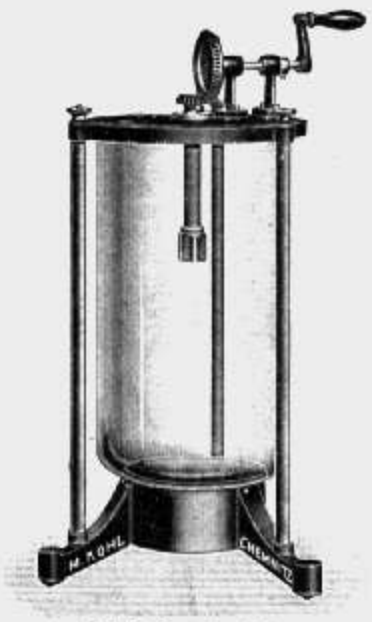
Max Kohl A. G. Chemnitz, Germany.



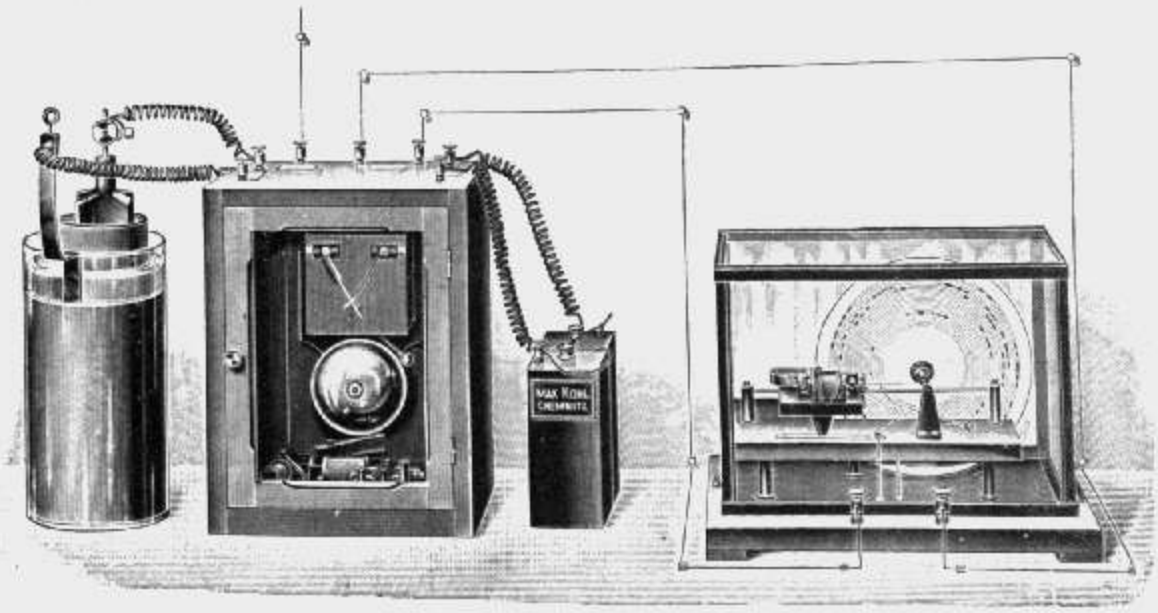
52 056, 51 949. 1 : 9.



55 484. 1 : 8.



55 485. 1 : 10.



55 486. 1 : 10.

a small metal plate on which German tinder or the like is allowed to burn in order to fill the cylinder with smoke. Air is then blown by means of a bellow through the upper pipe, cyclonic smoke eddies thereupon ensuing. £ s. d.

55,485. **Eddy Apparatus** after Colladon, Figure, for producing eddies in a mass of water similar to atmospheric eddy winds (Comptes Rendus, April, 1887) 6. 0. 0

55,486. **Storm Recorder** after P. J. Schreiber, Figure 9. 0. 0

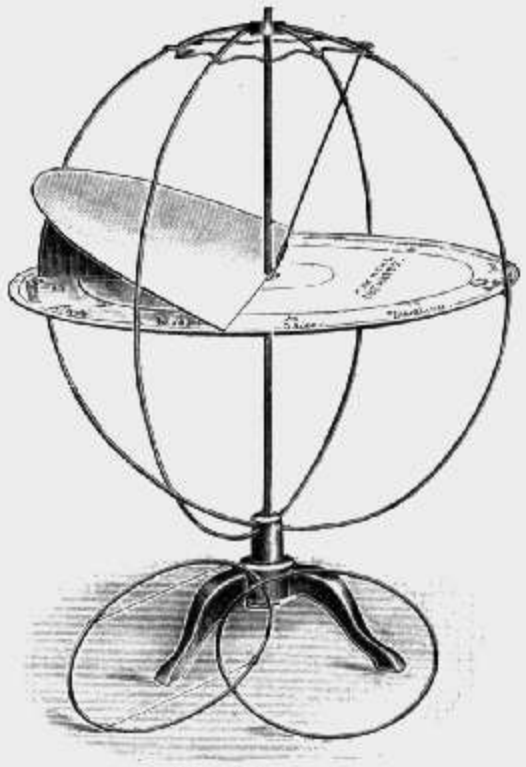
This apparatus automatically shows storms within a radius of 20 km and records them on a paper disc connected to a 24-hour clockwork arrangement. To the apparatus pertain the coherer, together with shaking device, built into a well-closing chamber (the coherer, etc. serving simultaneously as an acoustic indicator); a sensitive relay and shunt resistance for a cell, together with ink writer in a separate glass case, and three dry cells.

In spite of its simplicity, the apparatus is very sensitive. The determination of the time of the individual electrical discharges can be carried out with accuracy, as the pen describes a distance of 10 to 12 metres in 24 hours.

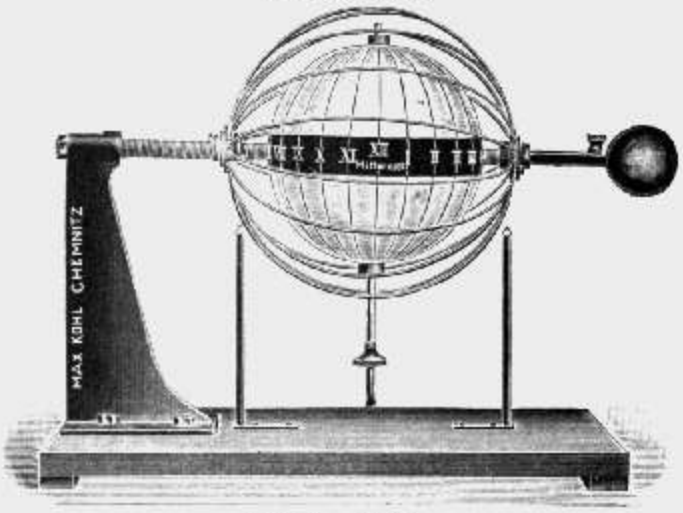
Complete description is appended to the apparatus.



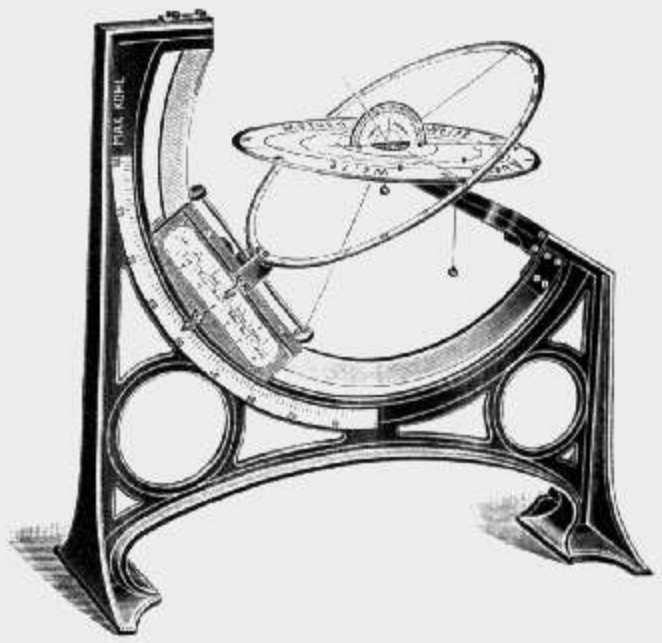
55 488. 1 : 5.



55 491. 1 : 7.



55 493. 1 : 8.



55 492. 1 : 10.

55,487. **6 Meteorological Charts,** mounted on linen, with rods for rolling up: (1) Isotherms for the mean annual temperature of the earth; (2) Isotherms for the mean July temperature of the earth; (3) Isobars and Winds predominant in January; (4) idem in July; (5) Isanormals of temperature for January; (6) idem for July . . . . . £ 1. 8. 0

Cosmology.

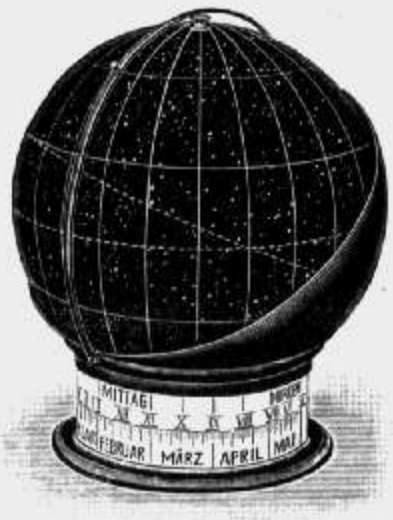
55,488. **Terrestrial Globe,** F i g u r e, on wood base, with nickelled meridian circle, oblique, 33 cm diameter . . . . . £ 1. 4. 0

55,489. — i d e m, on tripod, with compass, 40 cm diameter . . . . . £ 2. 4. 0

55,490. — i d e m, on tripod with compass, 48 cm diameter . . . . . £ 3. 10. 0

We quote on application for every kind of Globe for the teaching of Political and Physical Geography, Geology and Cosmology, such as Terrestrial Globes in relief, Geological Earth Globes, Lunar Globes in relief, Terrestrial Globes, etc.

Cl. 3690, 2015, 3435, 2016.



55 495. 1 : 9.



55 496. 1 : 8.



55 497. 1 : 6.

Max Kohl A. G. Chemnitz, Germany.

£ s. d.

55,491. **Apparatus for Demonstrating Equinoctial Precession** 1.16.0

55,492. **Horizon** after Buth, Figure 4.16.0

This apparatus permits of explaining the terms: "Plane, Horizon, Dead Level, East, West, North and South Points, East-West Line, North-South Line, Diurnal Circle, Diurnal and Nocturnal Arc, Point of Sunrise and Sunset, Eastern and Western Amplitude, Point of Culmination, Equator, Tropics, Sun's Altitude on the meridian and Altitude of the Pole", and answers the questions: When and how far does the sun set or rise from the Eastern and Western points? How large is the diurnal or nocturnal arc? At what altitude is the Sun (angle of the horizontal surface)? What is the inclination of the horizontal surface to the earth's axis (polar altitude)?

These questions can be put for any part of the Northern Hemisphere and for any day of the year.

55,493. **Apparatus for Explaining Ebb and Flow,** after Archenhold, Figure 4. 4.0

A large white sphere represents the solid interior of the earth which is supposed to be completely surrounded by water. The aqueous masses are represented by a white wire frame and a small sphere, representing the moon, is connected with springs to the earth's core. If the lunar sphere is taken away from the earth the aqueous masses (as in the case of ebb and flow) are changed from the spherical shape, and the tidal wave is shewn on the side turned towards and away from the moon: this tidal wave being smaller on the side turned away from the moon, corresponding to the greater distance from the latter. The earth can be rotated thus rendering the change from ebb and flow every six hours plainly visible. The action of the solar flow, amounting to about $^2/_5$ths of the lunar flow, can be represented for the case of new and full moon by drawing away the lunar sphere to a greater extent, and for the case of the first and last quarters by drawing it away to a lesser extent.

55,495. **Celestial Globe** after Haller, Figure, with movable socket, adjusted for **one** degree of latitude 4. 0.0

When ordering it should be stated for which degree of latitude the apparatus is intended.

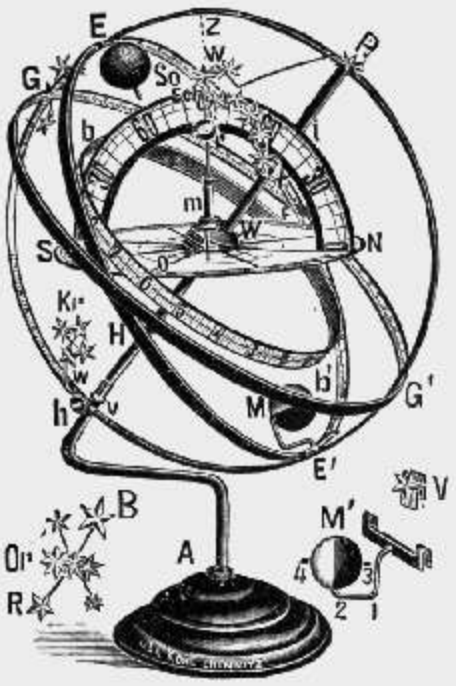
The globe can be set for any month, day or hour. The invisible part of the heavens is concealed by the socket. The apparatus is applicable for shewing the stars of the firmament visible at any time and also for solving a few astronomical problems, e. g., determining the rising and setting and the highest position of the stars.

55,496. — idem, Figure, with fixed socket and movable globe; can be set for any degree of latitude 7.10.0

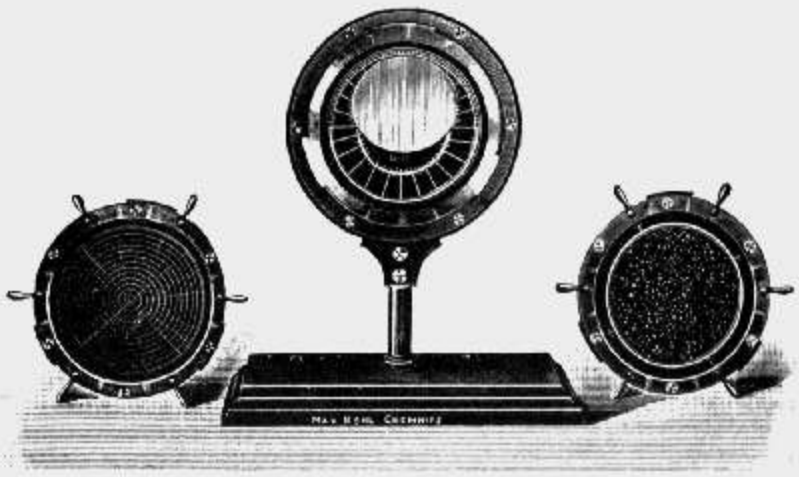
By arranging the globe to be movable the apparatus, in addition to being used for the purposes mentioned, can also be employed for demonstrating the apparent rotation of the heavens during twenty-four hours by observing the same from any position on the earth.

55,497. **Uranotrope** after Dr. Wislicenus, Figure 2. 4.0

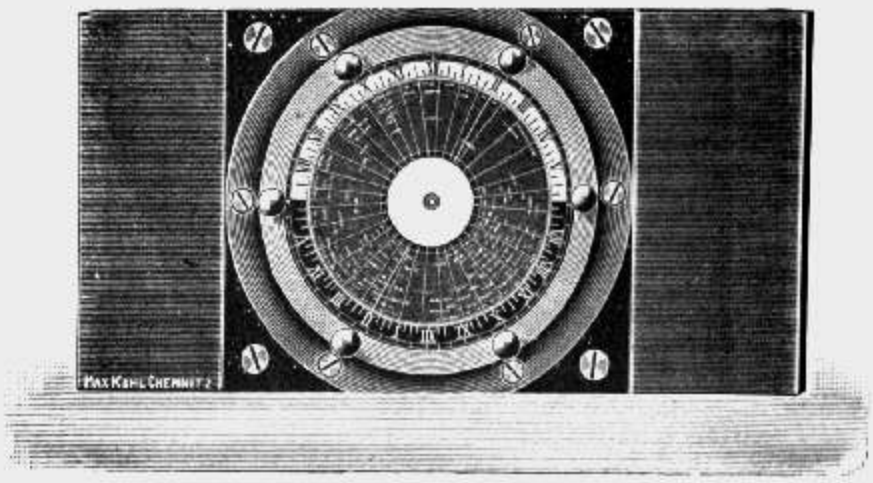
The Uranotrope serves for demonstrating the apparent rotation of the heavens and the apparent motions of the stars. It is formed essentially of a hollow brass sphere of about 20 cm diameter capable of rotation about an axis passing through it, in the centre of which axis placed a small terrestrial globe. This glass sphere represents the apparent terrestrial sphere, the terrestrial equator, the ecliptic, the tropic and polar circle, also the coloures of the equinoxes and solstices being etched on and painted in different colours Other entries should be made by the students during instruction by means of a coloured pencil supplied, with ink, or by pasting small paper pieces on the globe; the paper can be removed by washing off. — Complete description and instructions for use are appended to the apparatus.



55 499.



55 503. 1 : 5.



55 504. 1 : 2.

55,498. **Mang's collapsible Horizontarium;** can be used at same time for demonstrating the apparent motion of the stars for any point of the earth. With directions and box . £ 2. 10. 0 s. d.

55,499. **Mang's collapsible Armillary Sphere,** Figure, consisting of the preceding Horizontarium with a simple terrestrial sphere; with directions and box 4. 0. 0

55,500. **Mang's collapsible Telurion-Lunarion,** shewing the actual motions, proof of sphericity, oblate ring, existence of day and night, time, the degree in perpendicular axial position; with a powerful lamp, sliding concave mirror, directions and box 2. 10. 0

55,501. **Extra Globe** with water and land 0. 8. 0

55,502. **Mang's collapsible Universal Apparatus for Astronomical Geography,** containing a Horizontarium, an Armillary Sphere, Tellurion with Lunarion, a Planetarium; comprises all motions of the celestical bodies, enables demonstration of the lunar epicycloid, demonstration of the precession, migration of the apparent lunar orbit, parallax of the fixed stars, etc.; on stand with instructions 16. 10. 0

* 55,503. **Rotary Star Chart** of the Northern altitudes, Figure, for the latitude of Leipzig, with a disc having network of degrees and a disc without network; arranged for the Projection Lantern 2. 0. 0

For demonstrating the motion of the circumpolar stars. The firmament can be set for any hour of the day. It is possible with the chart to solve the problems of the rising and setting of the stars and their culminations.

* 55,504. **Universal Clock,** Figure, for explaining the times in different parts of the world, with the times of the most important towns noted, for objective projection; with rotary disc 1. 8. 0

* Can be used with the Projection apparatus.

Max Kohl A. G. Chemnitz, Germany.

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VOL. III.

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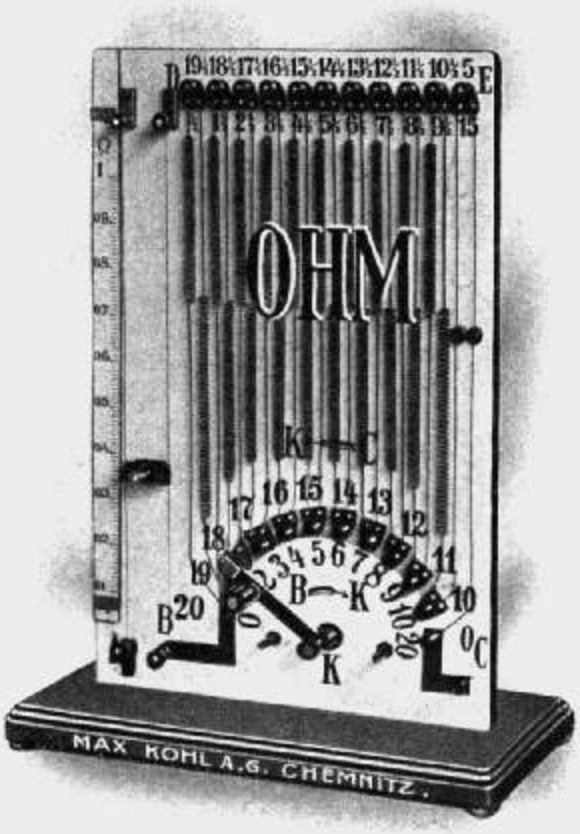

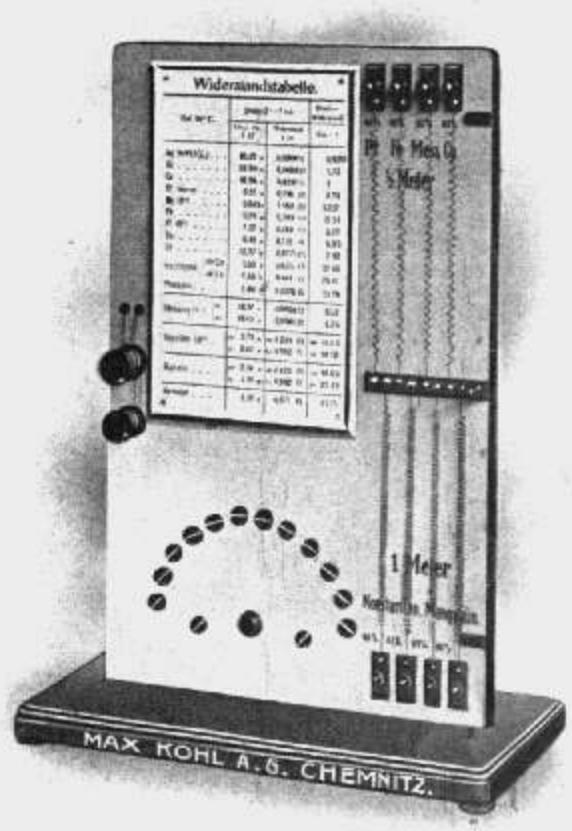

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60 001 — 60 004. 1 : 2.



60 005. 1 : 6.



60 016. 1 : 5.

Max Kohl A. G. Chemnitz, Germany.

Magnetism.

Lodestone, stone in iron mount, Figure. £ s. d.

List No.	60,001	60,002	60,003	60,004
According to size and beauty £	0. 12. 0	0. 15. 0	0. 18. 0	1. 4. 0

60,005. **2 Bar Magnets and 2 Horse Shoe Magnets,** Figure, with soft iron keeper, inserted in wood block 0. 12. 0

Bar Magnets, of tungsten steel, round section, thoroughly magnetic, as per German designation. North pole lacquered red, South pole blue.

List No.	60,006	60,007	60,008	60,009
Length mm	100	150	200	250
Diameter mm	8	10	10	14
£	0. 1. 6	0. 2. 0	0. 2. 6	0. 3. 0

Bar Magnets, tungsten steel, of rectangular section and thoroughly magnetic. North pole lacquered red, South pole blue.

List No.	60,010	60,011	60,012	60,013	60,014
Length mm	100	150	200	250	300
£	0. 1. 10	0. 2. 0	0. 2. 6	0. 3. 0	0. 4. 0

2 Bar Magnets, Figure, best construction, rectangular section, with keepers and hanging lug, in case.

List No.	60,015	60,016	60,017
Length mm	150	200	300
£	0. 10. 0	0. 12. 0	0. 15. 0

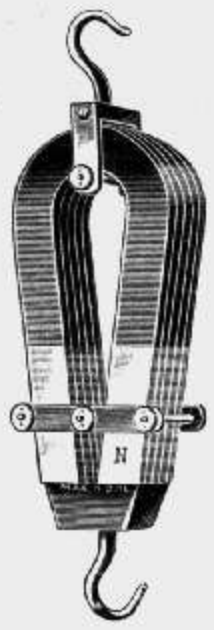
60,018. **2 Bar Magnets,** 100 × 10 × 6 mm, one of them being provided with a cap and with divided brass rail, for use with the Müller Dynmeter, in case, with keepers (M. T., pp. 212 and 220), and with tapered stand 0. 12. 0

Horse Shoe Magnet, excellently magnetic, with keeper.

List No.	60,019	60,020	60,021	60,022
Length of limb mm	100	150	200	250
£	0. 2. 6	0. 3. 6	0. 4. 6	0. 6. 0

Horse Shoe Magnet, with 3 segments.

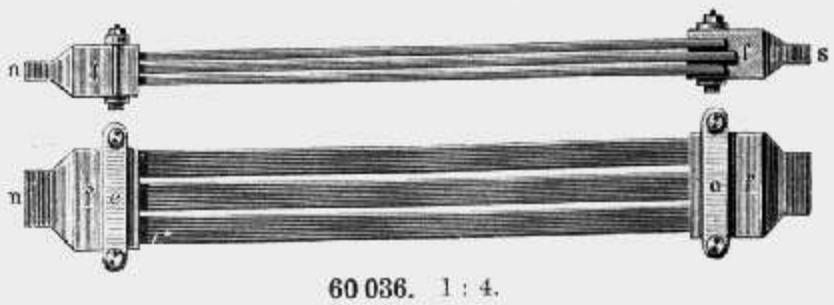
List No.	60,023	60,024	60,025
Length of limb mm	150	200	250
£	0. 18. 0	1. 2. 0	1. 6. 0



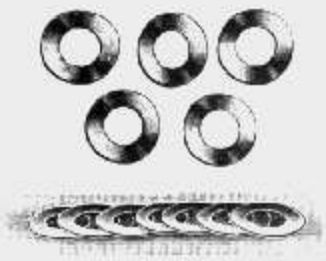
60 027. 1 : 5.



60 034. 1 : 7.



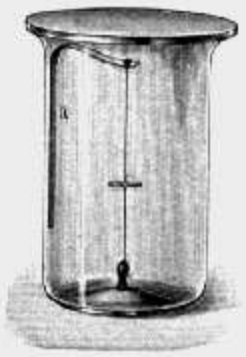
60 036. 1 : 4.



60 039. 1 : 3.



60 043, 60 058. 1 : 5.



60 059.

Horse Shoe Magnets, with 5 segments, Figure.

				£ s. d.
List No.	**60,026**	60,027	60,028	
Length of limb mm	150	200	250	
£	**1. 4. 0**	**1. 10. 0**	**1. 16. 0**	

Horse Shoe Magnet, with 7 segments.

List No.	**60,029**	60,030	60,031	
Length of limb mm	150	200	250	
£	**1. 10. 0**	**1. 16. 0**	**2. 5. 0**	

Laminated Magnet (Jamin's), Figure (Gan.-Man., Fig. 599).

	Length of limb, mm	No. of laminae	Barrying capacity, kg		£ s. d.
60,032.	170	20	12	. . . . .	1. 15. 0
60,033.	210	20	17	. . . . .	2. 5. 0
60,034.	300	20	20	. . . . .	3. 0. 0
60,035.	400	35	70	. . . . .	6. 0. 0

Magnetic Magazine, Coulomb's, Figure (M. P. 10th edn., IV, 1, Fig. 9; 9th edn., III, Fig. 21; Gan.-Man., Fig. 596; Gan.-Rein., Fig. 684).

List No.	**60,036**	**60,037**	**60,038**
With	3	6	9 rods
£	**1. 4. 0**	**1. 10. 0**	**2. 5. 0**

60,039. **12 Steel Rings** for magnetizing, Figure, only appearing magnetic after being cut, as suggested by Friedr. C. G. Müller (M. T., p. 214) 0. 1. 6

60,040. **1 Piece Thin Sheet Steel,** for cutting up for magnetic tests (M. T., p. 213). . . . 0. 0. 6

Magnetic Needle, Rhombic form, with agate cap, Figure, without the stand illustrated.

List No.	**60,041**	**60,042**	**60,043**	**60,044**	**60,045**	**60,046**	**60,047**	**60,048**	**60,049**	**60,050**
Length mm	30	50	60	70	80	100	120	150	200	250
£	**0. 1. 3**	**0. 1. 6**	**0. 1. 10**	**0. 2. 1**	**0. 2. 5**	**0. 3. 0**	**0. 3. 10**	**0. 4. 6**	**0. 5. 6**	**0. 6. 6**

Compass Needle, with agate cap, best construction.

List No.	**60,051**	60,052	60,053	60,054	60,055	60,056	60,057
Length mm	80	100	120	150	200	250	300
£	**0. 3. 0**	**0. 4. 0**	**0. 5. 0**	**0. 6. 6**	**0. 8. 0**	**0. 10. 0**	**0. 13. 0**

60,058. **Stand for Magnetic Needles,** serpentine base, brass column and point, Figure (Gan.-Man., Fig. 577), without magnetic needle illustrated 0. 2. 6

60,059. **Test Needle** in glass cylinder, Figure (M. P. 10th edn., IV, 1, Fig. 10) 0. 10. 0

Astatic Magnetic Needle, with stand (Gan.-Man., Fig. 612).

List No.	**60,060**	**60,061**
Length mm	60	100
£	**0. 9. 0**	**0. 10. 0**

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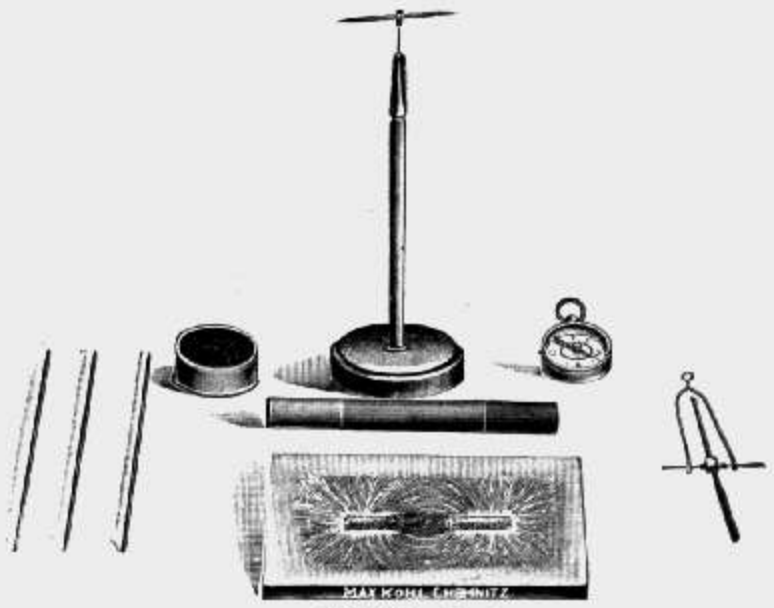
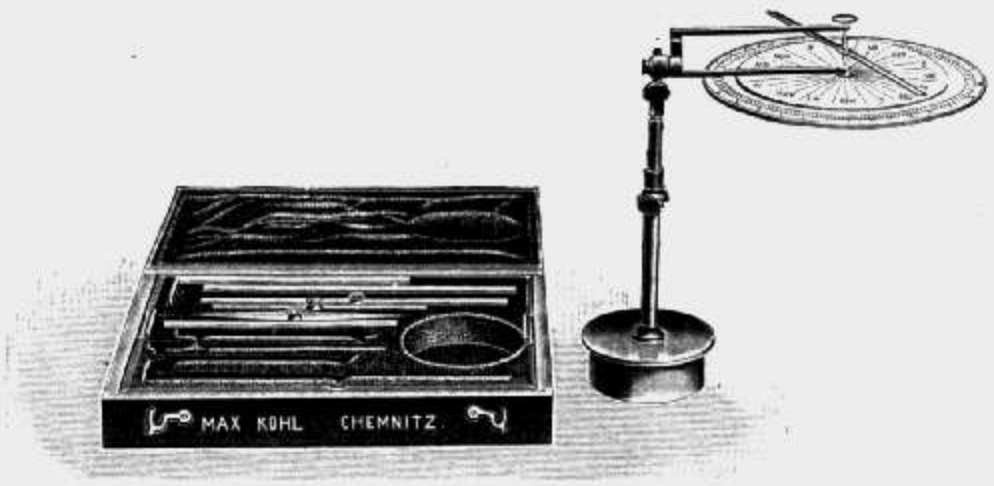
Cl. 2023, 2021, 2022, 4143, 5567, 5622.



60 063. 1 : 5.



60 065. 1 : 6.

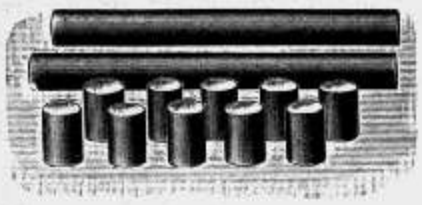


60 064. 1 : 6.

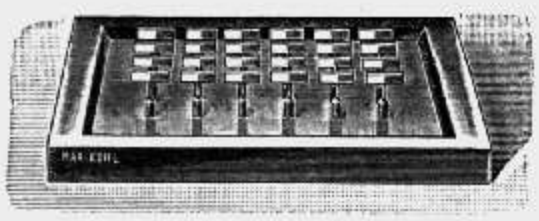


60 067. 1 : 6.

	£ s. d.
60,062. **Astatic Magnetic Needle,** Tremery's, with stand	0. 10. 0
This needle consists of two magnets, whose similar poles are turned outwards, the other poles being fastened to a piece of ebonite provided with a lug. The needle is thoroughly astatic.	
60,063. **Apparatus for explaining the Fundamental Laws of Magnetism,** Figure: magnetic needle on stand, compass, simple dipping needle, bar magnet, steel bars for breaking, iron filings in box, with sieve and slab for sprinkling the same	1. 2. 0
60,064. **Apparatus for Magnetic Experiments;** can also be used as a dip circle	5. 10. 0
1 stand with brass base, 1 rotary needle holder, 1 needle holder for needles with caps, 1 compass card, 1 graduated circle, 4 various magnetic needles, 1 magnetic and 1 non-magnetic iron rod, with case.	
60 065. **Collection of apparatus** for the fundamental experiments in magnetism, frictional contact and thermo-electricity, in wood box, Figure	2. 6. 0
The box contains: 2 magnet bars, 1 double hook for suspending these, 1 magnetic needle, 1 ebonite rod, 1 glass rod, 1 rubber, 1 insulating stand, 1 electric needle, pithballs with holder, 1 glass rod with brass cap, 1 ebonite rod with brass cap, 1 Voltaic cell with closing bow and one thermo-electric rectangle.	
60,066. **Cylindrical Nickel Piece,** for magnetic experiments	0. 2. 0
60,067. **Magnetic Double Pendulum,** Figure	0. 5. 0
Two pieces of soft iron are suspended vertically from two threads on a stand. On approaching one pole of a powerful magnet the iron pieces are attracted, at the same time repelling each other smartly.	
60,068. **Iron and Steel Bars,** for magnetic distribution, 6 of soft iron, 6 of hardened steel, 6 mm thick, 20 mm long	0. 3. 0



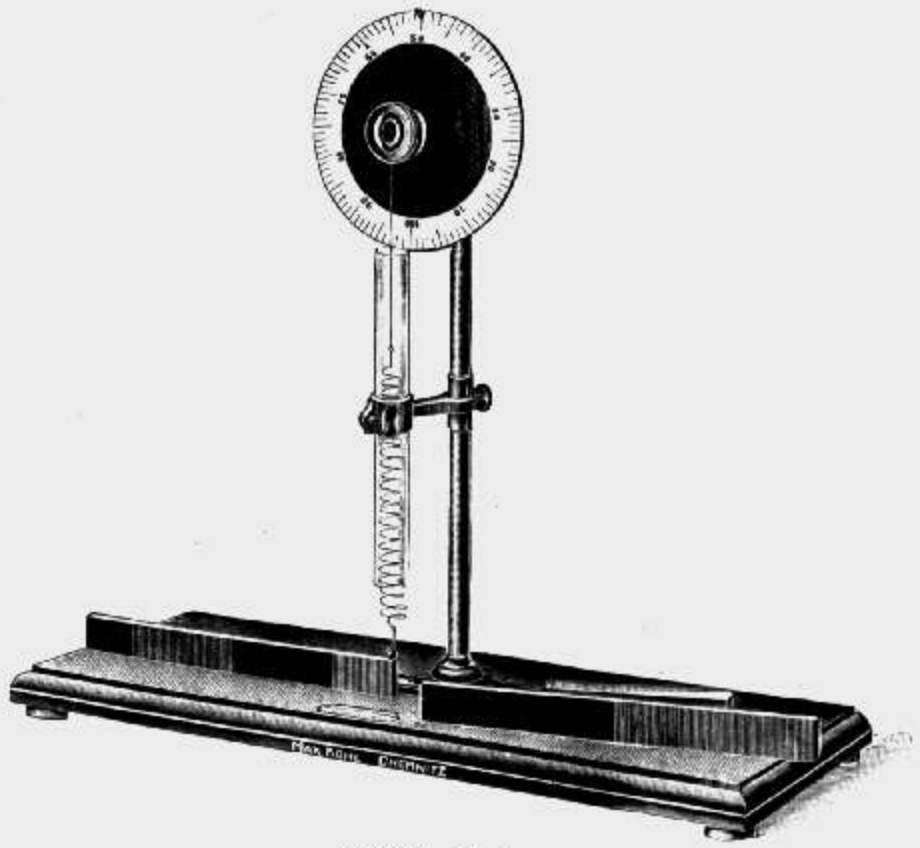
60 069. 1 : 4.



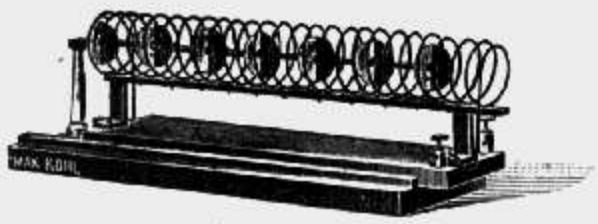
60 071. 1 : 5.



60 073. 1 : 6.



60 075. 1 : 8.



60 074. 1 : 4.

	£ s. d.
60,069. **12 Round Soft Iron Bars,** 15 mm thick, Figure, two 150 mm and ten 20 mm long (M. P. 10th edn., IV, 1, Figs. 4 and 5; 9th edn., III, Figs. 6 and 7; Gan.-Man., Fig. 585; Gan.-Rein., Fig. 677).	0. 2. 6
60,070. **12 Tempered Steel Wires,** for magnetising and breaking up	0. 2. 0
60,071. **Molecular Magnet Model,** Figure, consisting of 24 small magnets, 20 mm long, moving on points	1. 4. 0
60,072. — idem, **for objective projection** by means of the Horizontal Projection Apparatus The apparatus consists of a wood frame with a mica disc, the points carrying the magnets being fixed to this frame. The phenomenon is in this manner rendered plainly visible.	1. 16. 0
60,073. **Molecular Magnet Model,** Figure, consisting of 16 small magnets, 20 mm long, moving on points, each on separate base, on one baseboard	1. 0. 0
60,074. **Molecular Magnet Model,** von Beetz's, Figure, consisting of 8 magnetic needles turning about the horizontal axis with red and white discs visible at a distance, for experimentally proving Ampere's hypothesis	1. 14. 0
60,075. **Apparatus for determining the distribution of Magnetism in a bar magnet** by measuring its carrying power, Figure (W. and E. Phys. Prakt., Fig. 360), with **2 magnets,** 1 normal and 1 with consequent poles . . . . . The carrying capacity is determined at the individual points of the bar magnet by the spring tension (proportional to the extension of spring), which suffices to pull the small iron ball from the magnetic body.	2. 5. 0
60,076. **One Set Cardboard Sheets with magnetized sheet steel strips,** Figure, as suggested by Friedr. C. G. Müller (M. T., Fig. 148), for demonstrating the path of the lines of force in simple and compound fields	0. 18. 0
60,077: **Cardboard Sheet with magnetic bars placed perpendicularly to same,** Figure, for demonstrating the path of the lines of force of simple and compound fields in a plane perpendicular to the longitudinal axis of the bar magnets, as suggested by Friedr. C. G. Müller (M. T., Fig. 149).	0. 5. 0

Cl. 2025, 371, 5503, 2029, 2028.

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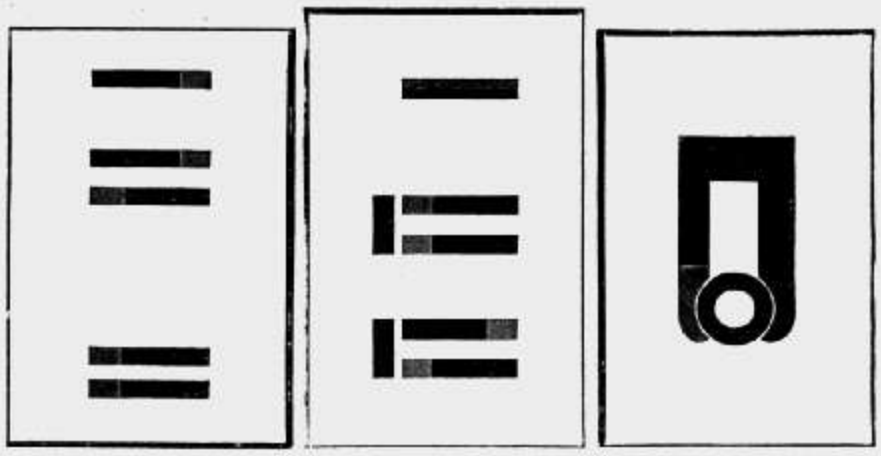
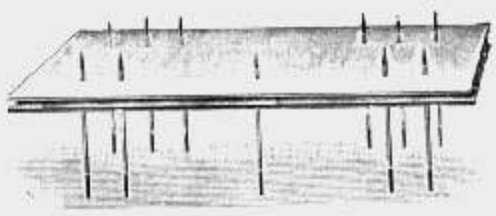


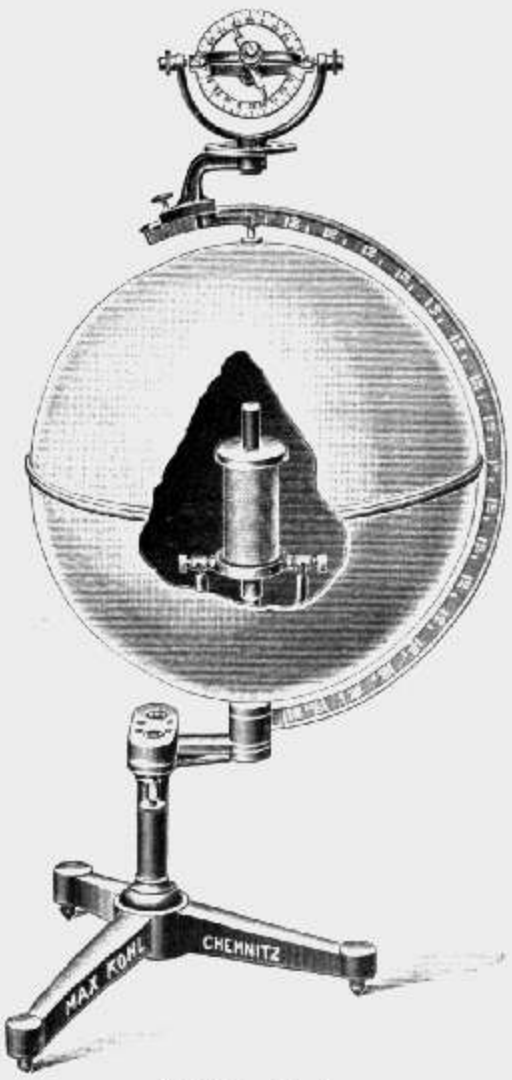
60 076. 1 : 6.



60 084. 1 : 21.



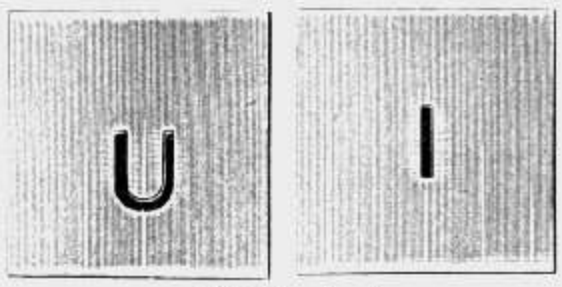
60 077. 1 : 5



60 085. 1 : 6.



60 078. 1 : 8.



60 079. 1 : 8.

60,078. **Horse Shoe Magnet,** of sheet steel, Figure, for demonstrating an approximately homogeneous field (Grimsehl, p. 648) . . . . . £ s. d. 0. 15. 0

60,079. **2 Small Magnets, 1 horseshoe and 1 bar magnet,** Figure, cemented to glass slabs, for objectively demonstrating the magnetic lines of force 0. 5. 0

Apparatus for explaining the theory of the lines of force (Berghoff's), see **Electricity** Section.

60,080. **Glass Tube, half filled with iron filings,** and with closed ends, for explaining the excitation of magnetism 0. 1. 6

60,081. **Iron Filings,** strained . . . . . per 250 g 0. 1. 0

60,082. **Iron Powder** (Limatura Ferri alcoholisata) . . . . . per 250 g 0. 1. 9

60,083. **Sifter** for above 0. 1. 6

60,084. **Soft Iron Rod** for magnetic experiments, Figure (Friedr. C. G. Müller's), 1.5 m long, 2 cm thick (M. T., p. 218) 0. 5. 0

60,085. **Apparatus for explaining declination and inclination,** as suggested by Prof. Zahlbruckner, Figure (Fr. phys. Techn. II, 1, Fig. 566) 8. 0. 0

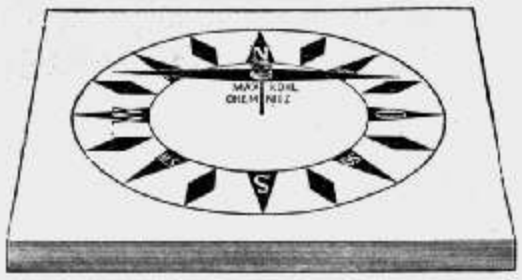
The tripod with pillar carries a short arm, on which is fastened a globe and a rotary meridian arc. Inside the globe is a straight vertical electro-magnet, whose field corresponds to that of terrestrial magnetism. The conducting wires for the magnetising coil pass through the hollow axis and end in two terminals fitted to the stand. A slider is fixed to the arc of meridian with a magnetic needle, which serves as the inclinator and declinator. By adjusting the slider and turning the arc of meridian the needle can be turned in any vertical or horizontal plane. The globe is therefore fixed on the horizontal arm and the inclinator can consequently be brought to the lower magnet pole, which corresponds to the South pole of the earth.

With the exception of the core of the electro-magnet and the magnetic needle the entire apparatus is free from iron.

Cl. 4178, 4177, 4176, 4192, 4144, 5580, 5586, 5587, 2030.



60 086. 1 : 5.



60 088. 1 : 3.



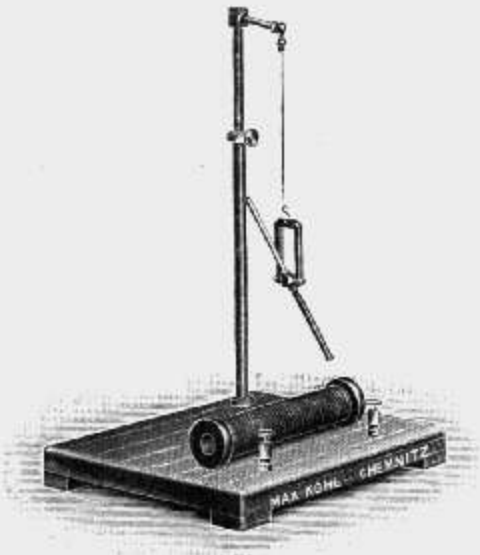
60 089. 1 : 3



60 091. 1 : 4.



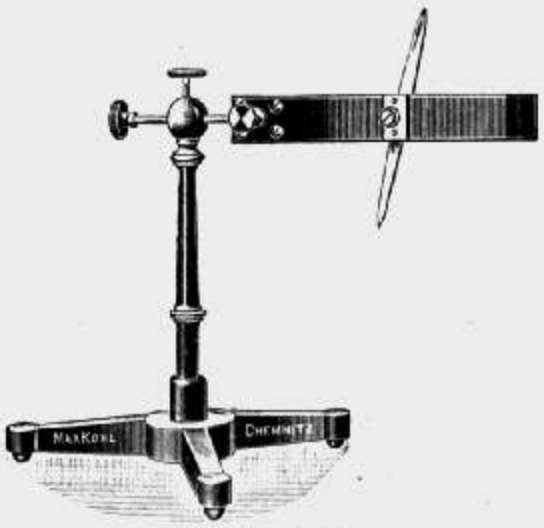
60 094. 1 : 2.



60 092. 1 : 7.



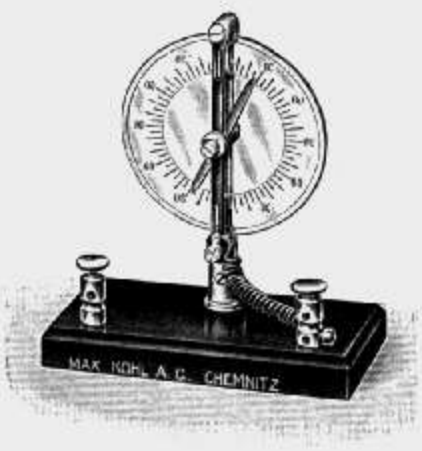
60 093. 1 : 7.



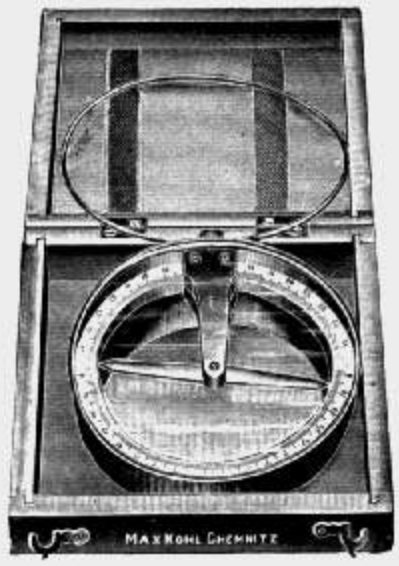
60 095. 1 : 3.

	£ s. d.
60,086. **Apparatus for Explaining the Varying Magnitude of Inclination on the Earth,** Figure (Fr. phys. Techn. II, 1, Fig. 567) . . . . . The apparatus consists of a semi-circular magnet, which can turn about a circle in a stand, and a dipping needle placed above it. According to the position of the magnet relatively to the needle the latter shews none or different inclination.	1. 0. 0
60,087. **Declination Needle,** swinging on a brass divided circle 12 cm in diameter	0. 18. 0
60,088. — idem, simpler, on wood, Figure	0. 7. 0
60,089. **Declination Needle,** on glass graduated circle, Figure, for objective demonstration with the aid of the horizontal projection apparatus.	0. 9. 0
60,090. **Dipping Needle,** simple, for suspending from a thread (M. P. 10th edn., IV, 1, Fig. 39; 9th edn., III, Fig. 34; Gan.-Man., Fig. 604), with well adjusted needle	0. 10. 0
60,091. **Dipping Needle,** simple, on stand, Figure, with well adjusted needle	0. 15. 0
60,092. **Inclination Apparatus with magnetizing spiral,** for demonstration purposes, Figure, for remagnetizing the needle	2. 8. 0
60,093. **Inclinator, with electro-magnet,** Figure (Fr. phys. Techn. II, 1, Fig. 577). . .	2. 0. 0
60,094. **Indicator of Direction of Field,** Figure, consisting of a magnetic needle freely movable in space, in solid frame, with extensible haft, in case	0. 12. 0
60,095. **Declinator and Inclinator,** Figure, can be used at same time as a galvanoscope; pillar turning in tripod, well constructed and carefully balanced needle.	1. 8. 0
60,096. **Dipping Circle,** Figure, for the projection lantern, with glass scale, with two terminals; can also be used as galvanoscope	1. 4. 0
60,097. **Dip Circle,** Figure, with carrying ring, in mahogany carrying case.	1. 10. 0

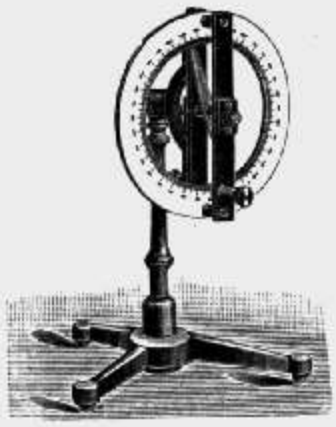
Cl. 2032, 5138, 2033, 2034, 2457, 5092, 5500, 2035.



60 096. 1 : 3.



60 097. 1 : 4.



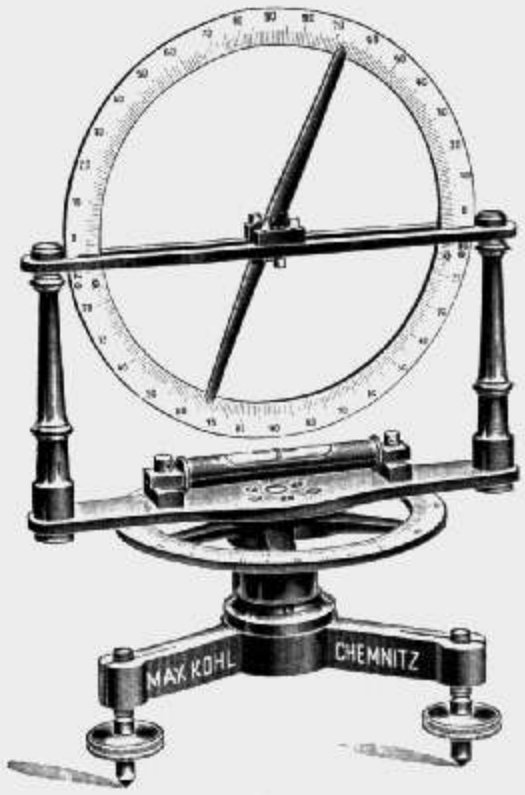
60 098. 1 : 5.



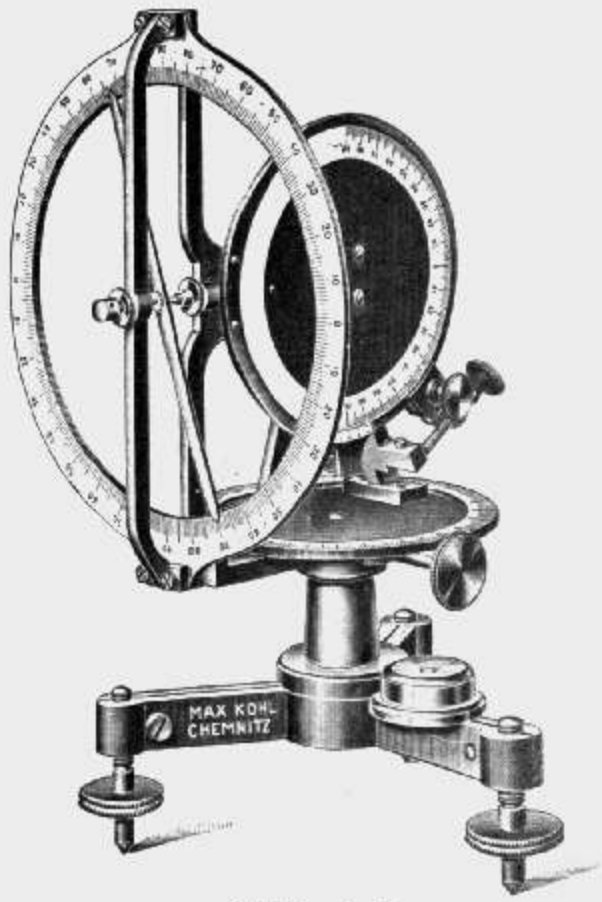
60 100. 1 : 5.



60 101. 1 : 5.



60 102. 1 : 4.



60 103. 2 : 5.

60,098. **Dip Circle,** can also be used as galvanoscope, F i g u r e, with carefully balanced magnetic needle, column turning in base divided circle, movable on hinge . . . . . £ 2. s. 8. d. 0

60,099. **Dip Circle,** F i g u r e 60,064, p. 787, can also be used for the fundamental magnetic experiments (see under No. 60,064) 5. 10. 0

60,100. **Dip Circle,** F i g u r e, with horizontal and vertical circle, on tripod with levelling screws, the needle works in agate bearings. The vertical circle is movable, being 110 mm in diameter 3. 10. 0

60,101. — i d e m, larger, F i g u r e, vertical circle 150 mm, horizontal circle 100 mm diameter, with round spirit level 7. 10. 0

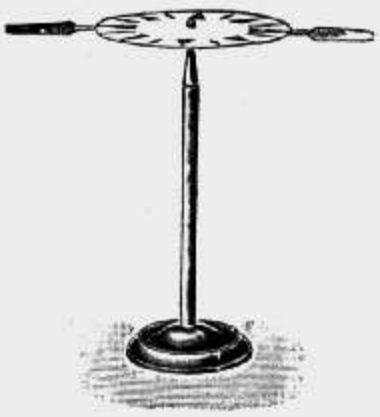
60,102. **Dip Circle,** large type, F i g u r e (M. P. 9th edn., III, Fig. 35; Gan.-Man., Fig. 611; Gan.-Rein. Fig. 703), with detachable needle working in carnelian bearings, vertical circle 190 mm diameter. The instrument gives accurate data 12. 10. 0

60,103. **Dip Circle,** F i g u r e, with vernier reading for the circle and with micrometer adjustment of the vertical circle; diameter of upper circle: 180 mm 11. 0. 0

Cf. 5753, 2037, 2038, 5750, 2040, 2041, 2042.



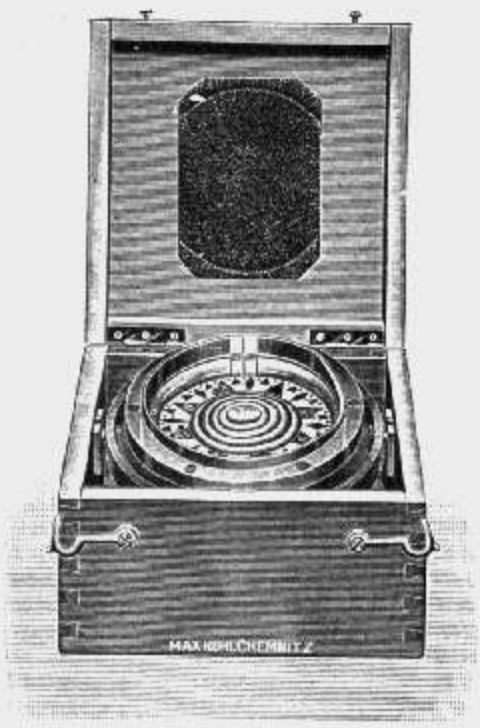
60 116. 1 : 2.



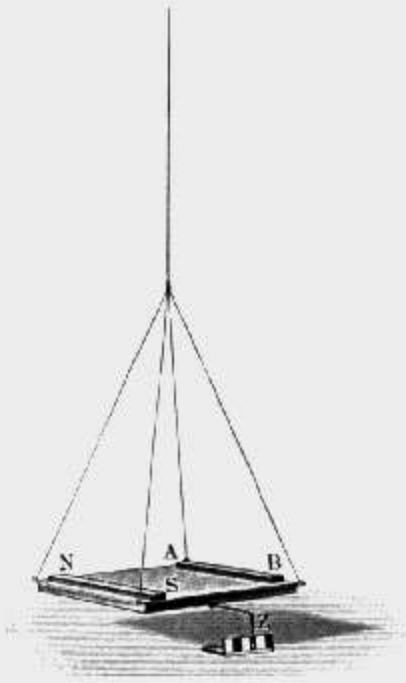
60 117. 1 : 5.



60 118. 1 : 1



60 120. 1 : 4.



60 121.



60 119. 1 : 4.

Compass with nickel case, watch form, stops when cover is closed.

					£ s. d.
List No.	**60,105**	**60,106**	**60,107**	**60,108**	
Diameter of cap	35	40	45	50 mm	
£	**0. 5. 0**	**0. 5. 6**	**0. 6. 0**	**0. 6. 6**	

Compass, in metal case, with glass cover and arrestment.

List No.	**60,109**	**60,110**	**60,111**	**60,112**	**60,113**
Diameter	30	40	50	60	70 mm
£	**0. 2. 9**	**0. 3. 0**	**0. 3. 6**	**0. 4. 3**	**0. 5. 0**

60,114. **Compass** in wood case, 8 cm square, stopping when cover is closed 0. 4. 6

60,115. — i d e m, with winding and terminals for use as galvanoscope 0. 5. 6

60,116. **Compass with sun-dial,** F i g u r e, 60 mm diameter 0. 10. 0

60,117. **Magnetic Needle with compass card,** on stand, F i g u r e 0. 12. 0

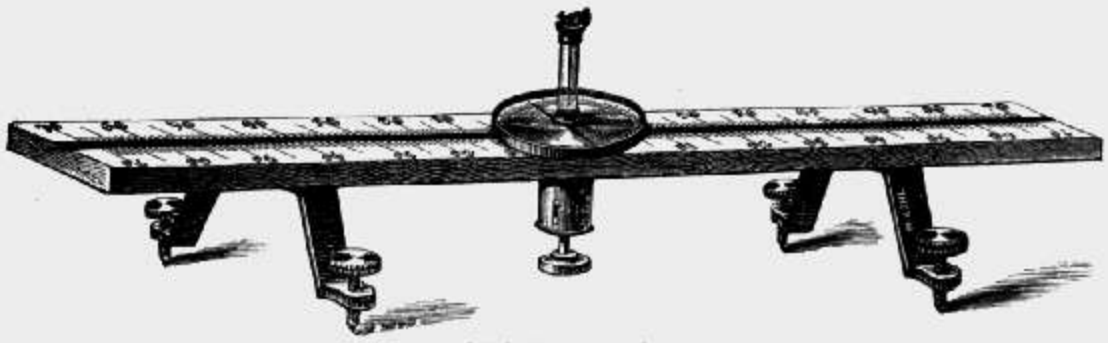
60,118. **Precision Compass,** F i g u r e, for finding the poles in magnetic fields 0. 12. 0
The instrument is watch form and is closed on both sides by watch glasses only, thus rendering the magnetic needle visible. The needle itself is very light, well balanced and rests in stones.

60,119. **Ship's Compass,** F i g u r e, in Cardan suspension, on stand, card 80 mm diameter 1. 10. 0

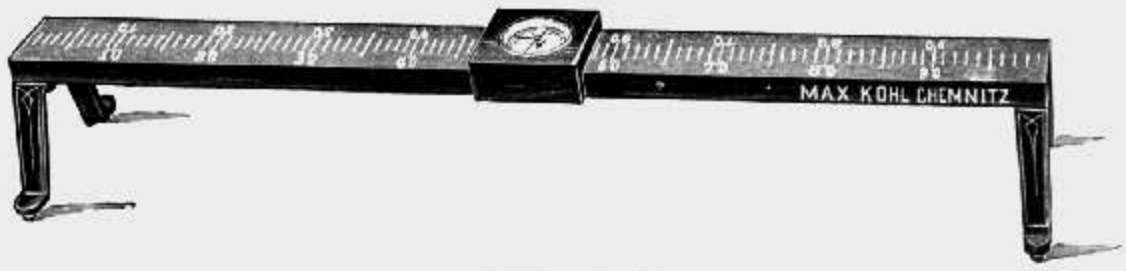
60,120. **Ship's Compass (Fluid Compass),** F i g u r e, with card floating on alcohol 4. 5. 0
This instrument is specially adapted for explaining the fluid compass. The compass card floats almost aperiodically in the liquid. The apparatus is the standard model of ship's compass of the Marine and as such, it is, along with its case, let into the ship's box.

Cl. 2014, 2044, 2456, 2046, 5623, 2045.

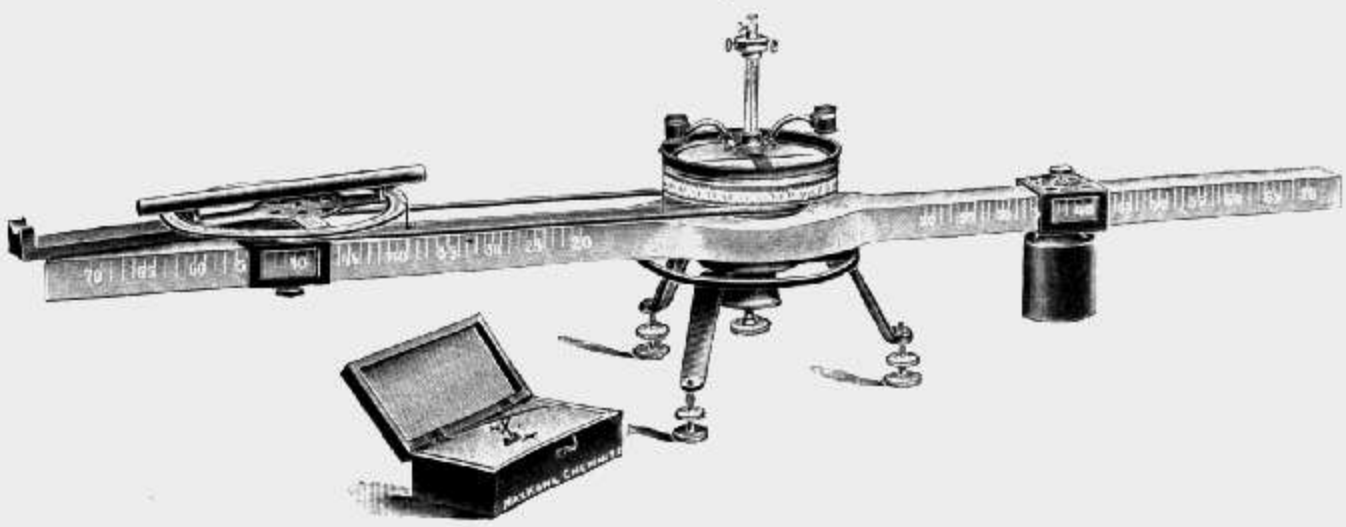
Max Kohl A. G. Chemnitz, Germany.



60 123. 1 : 12.



60 125. 1 : 10.



60 126. 1 : 10.

60,121. **Apparatus for Proving that the Total Free Magnetism is equal to Zero,** Figure (M. P. 10th edn., IV, 1, Fig. 43) . . . . . £ s. d. 0. 12. 0

60,122. **Compass** (Friedr. C. G. Müller's) (M. T., Fig. 151) 1. 10. 0

60,123. **Compass** (W. Weber's), Figure, graduated in $^1/_2{}^0$, on silvered brass 7. 10. 0

A 20 cm diameter compass with a short powerful magnetic needle is fixed on a polished wood rail, 1.5 m long, divided in centimetres. The needle is suspended on a raw silk fibre and carries a long aluminium pointer and a sheet of mica swinging in a box, for damping purposes. The compass can be moved up and down by means of a screw for the purpose of bringing the magnetic needle into the axis of the magnets to be investigated.

60,124. — idem, graduated in $^1/_5{}^0$, on silver, with magnifying glass for reading 11. 0. 0

60,125. — idem, simple (M. P. 10th edn., IV, 1, Fig. 45; 9th edn., III, Fig. 88), Figure 2. 5. 0

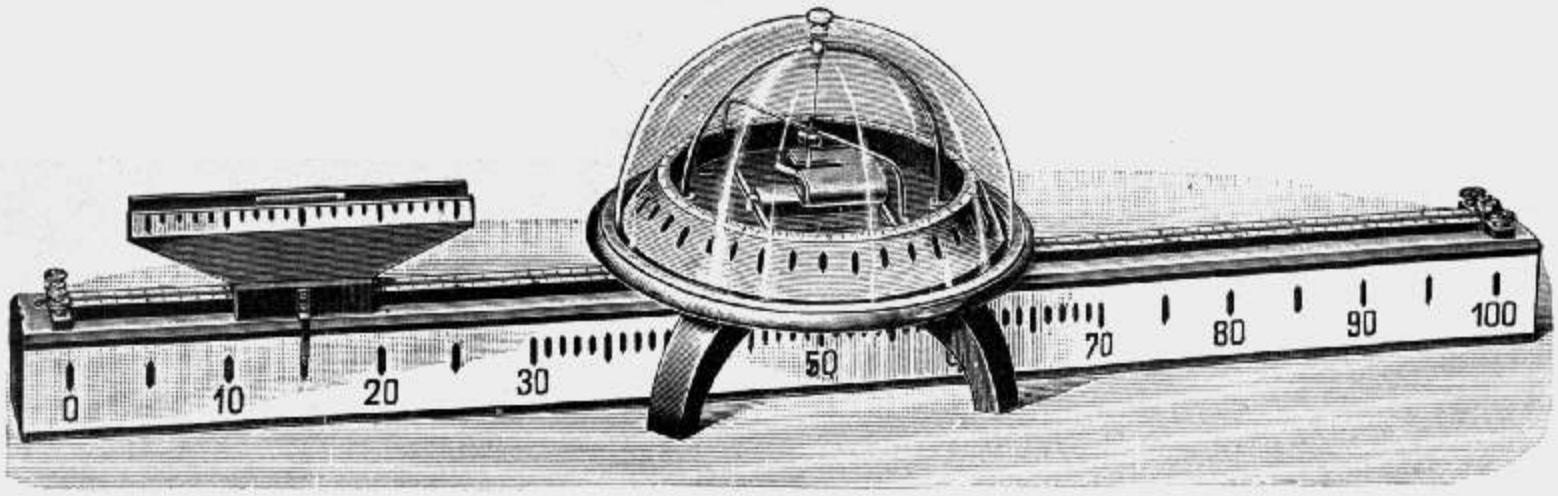
60,126. **Magnetometer** (Salcher's), Figure (Ztschr. f. d. phys. u. chem. U. **3**, p. 195), very finely constructed, with **2 magnet suspensions** in case and **6 bars of Swedish Charcoal Iron** 32. 10. 0

A graduated rail turns on a vertical pin, to which a cord pulley is firmly fixed. The rotary bearing for the magnet bars to be tested and for the iron rods possesses a cord pulley of the same size as the one just mentioned, being connected to it by a length of cord. On rotating the rail the bar set up maintains its initial position to the magnetic meridian. The compass case and the disc of the bar-bearing are graduated; the compass itself has a graduation in $^1/_5{}^0$ on silver, read by a magnifying glass. The magnetometer is especially adapted for nautical schools.

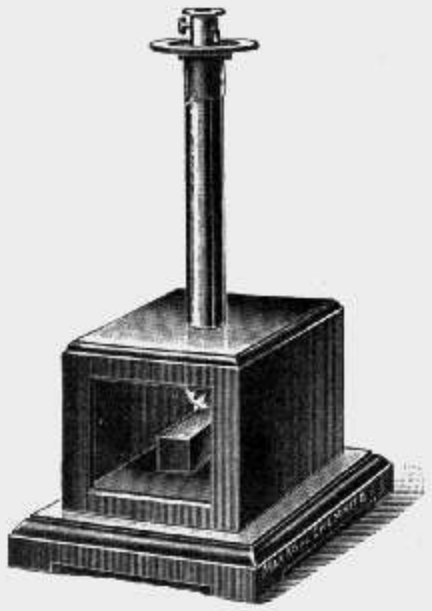
Of the 6 soft iron bars 1 each is 10, 15, 20 mm thick and 30 cm long, 1 each 25 and 30 mm thick and 40 cm long, and 1 35 mm thick and 60 cm long.

Cl. 2047, 2048, 2049.

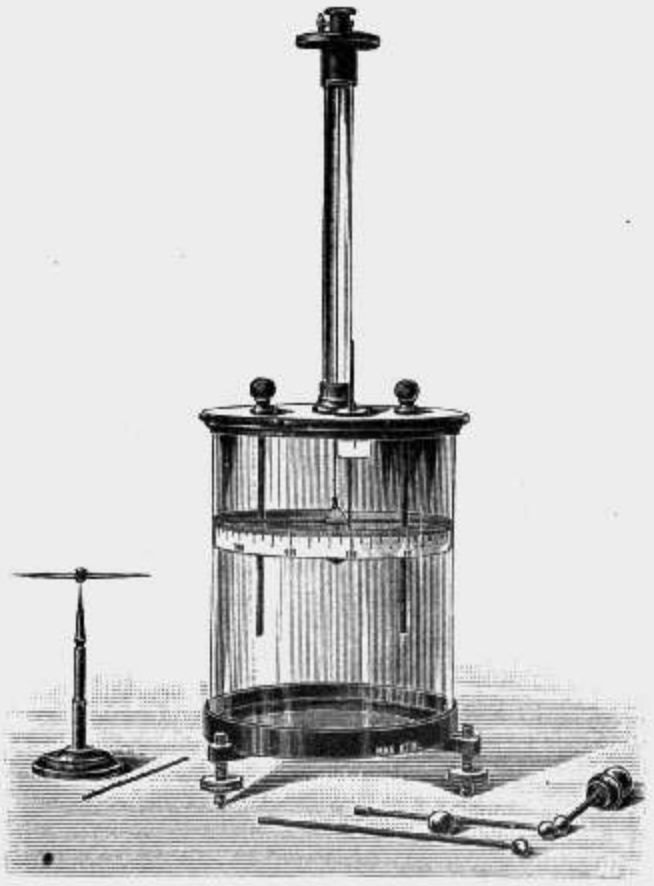
Max Kohl A. G. Chemnitz, Germany.



60 127. 1 : 6.



60 129. 1 : 4.



60 130. 1 : 10.

60,127. **School Magnetometer,** Figure, consisting of a **School Galvanometer** (see under), a **Resistance Bridge** (see under), a **Slider** for taking magnets of any shape, a **Stage** for the galvanometer and an **Aluminium Bush,** graduated, for taking annular weights of each 20 g . . . . . £ s. d. 7. 10. 0

The apparatus are set up in the manner shown in the Figure.

60,128. **Slider, Stage** and **Aluminium Bush, alone** 1. 10. 0

60,129. **Magnetometer** (Weber's), Figure (M. P. 10th edn., IV, 1, Fig. 48; 9th edn., III, Fig. 91), **for proving the intensity of terrestrial magnetism,** with good plane mirror . 3. 15. 0

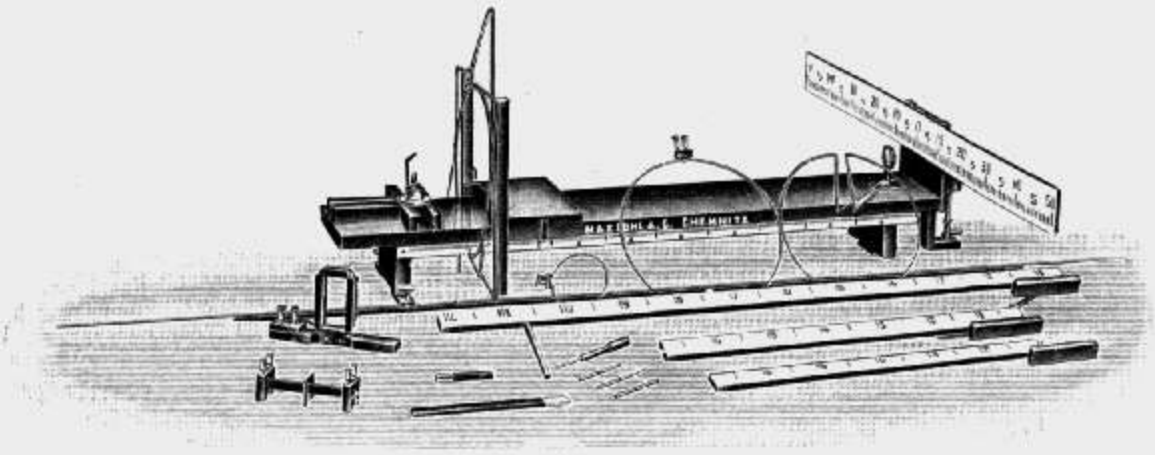
60,130. **Coulomb's Torsion Balance,** Figure, for measuring magnetic forces and for experiments on electric attraction and repulsion (Gan.-Rein. Fig. 690), ... 3. 15. 0

The following are supplied as accessories to the balance: (1) for experiments on magnetic repulsion: 1 magnetic needle with stand, 1 bar magnet for setting in the suspension bow, 1 bar magnet for deflecting the previous magnet, 1 brass bar of the same size as the first magnet, 2 brass rods with knobs; (2) for the experiments on electric repulsion: 3 ebonite rods with nickelled balls. — We give complete description and directions for use with the apparatus from which the experiments can be made with ease and certainty.

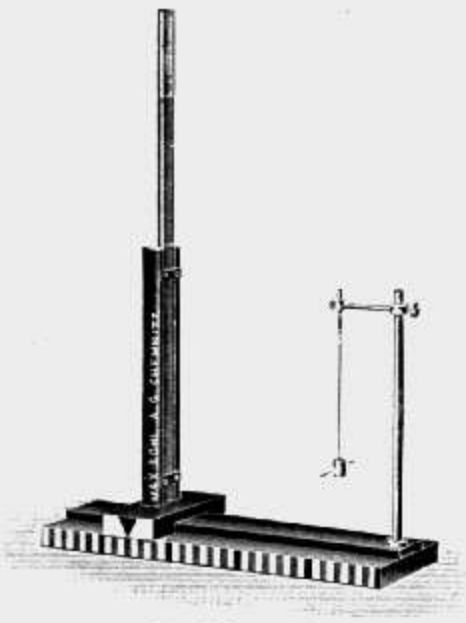
Cl. 2050, 2051, 2053.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



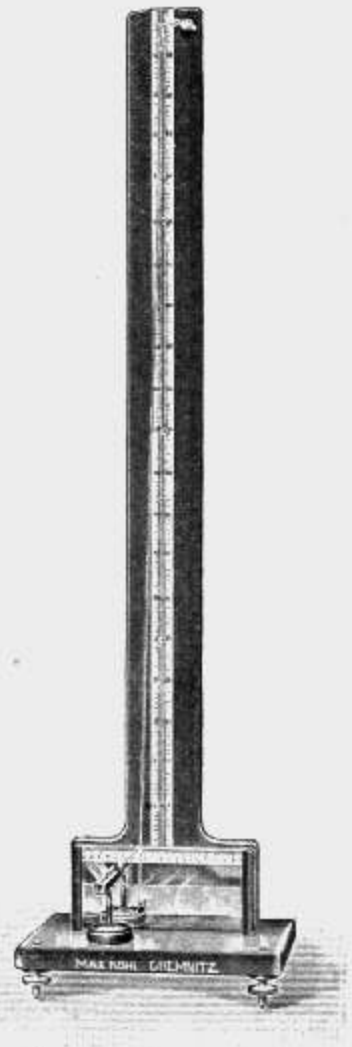
60 132. 1 : 17.



60 131. 1 : 7.



60 134. 1 : 9.



60 133. 1 : 10.

60,131. **Apparatus** as suggested by Fischer-Meutzner, Figure, **for Coulomb's Law on the Decrease of Magnetic Force with Distance** (Ztschr. z. Förd. d. phys. U. 1885, p. 229) £ 2. 0. 0

An astatic needle is suspended in front of a vertically placed bar magnet. The time of swing is altered by approaching or removing the bar from the needle.

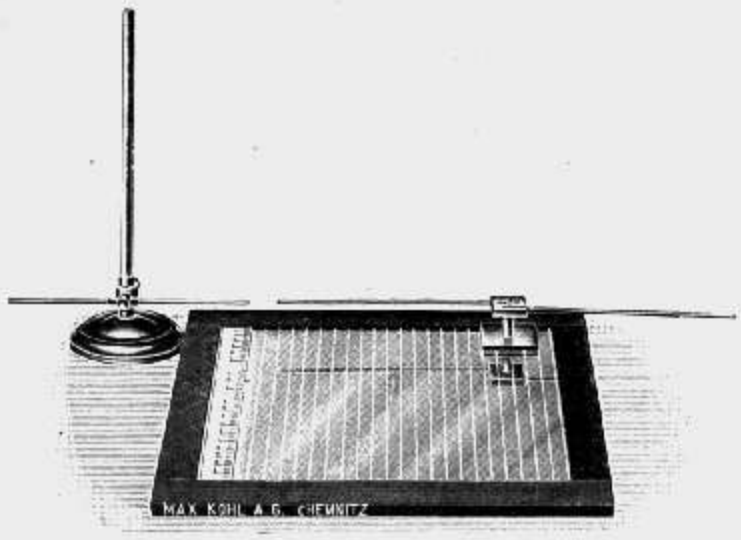
60,132. **Luminous Needle** (Friedr. C. G. Müller's), for magnetometry and galvanometry (Ztschr. f. d. phys. u. chem. U. **22**, p. 1), Figure, with following accessories: short magnet bar with lug and cap, 2 long steel wire magnets, 2 m long; 1 coil for Remanence experiments with compensating winding and 4 test bars; 1 tangent galvanometer ring 300 mm in diameter; 1 idem 100 mm diameter; 1 multiplier frame; 1 astaticising magnet; 1 wire figure in circular, square and triangular form for shewing a special case of the Biot-Savart Law.

The luminous needle has an excellent damping system 7. 10. 0

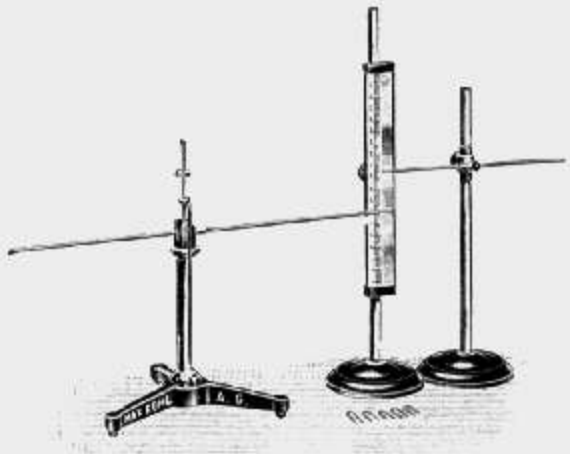
60,133. **Dynmeter** (Friedr. C. G. Müller's), Figure (M. T., Fig. 157), with a small bar magnet for same 100 × 10 × 6 mm, with agate cap, on stand 2. 10. 0

60,134. **Magnetic Balance** (Kleiber's), Figure (Kleiber, Physik f. Gymn., Fig. 293) . . 1. 0. 0

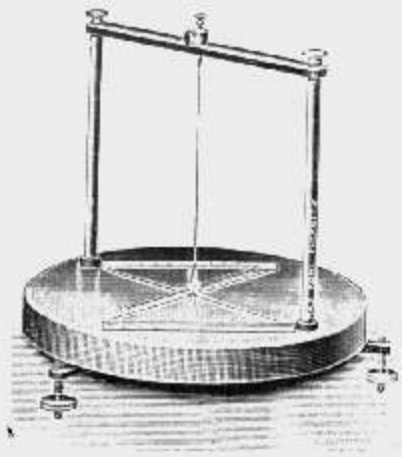
Cl. 5505, 5749, 5053, 4508.



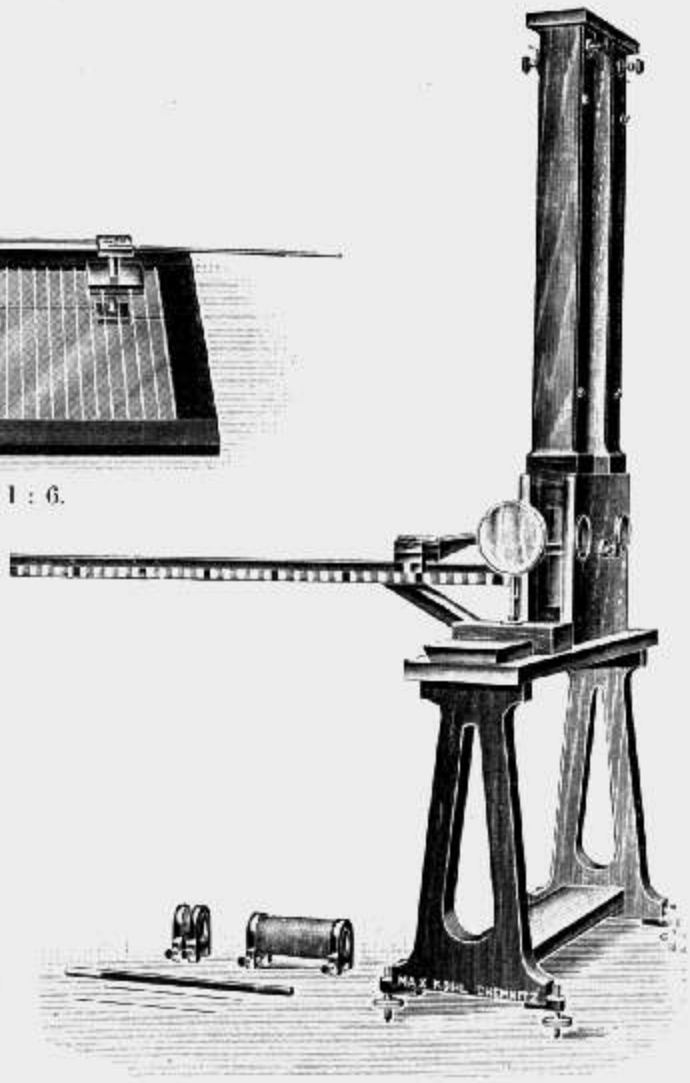
60 136. 1 : 6.



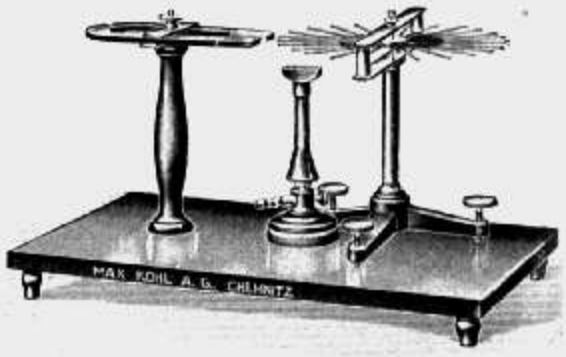
60 135. 1 : 10.



60 139. 1 : 7.



60 137. 1 : 10.



60 140. 1 : 8.

60,135. **Pole Balance** (Grimsehl's), for determining the pole-density of magnetic needles, Figure (Ztschr. f. d. phys. u. chem. U. **16**, p. 334) . . . . . £ 2. 14. 0 s. d.

Three stands carry: 1 knitting needle which takes the form of a balance with rider scale; 1 vertical rule and 1 horizontally arranged magnetic knitting needle which is adjustable vertically. The repulsion of the two similar poles of the knitting needles is taken up by rider weights and so measured.

60,136. — idem, especially for determining the horizontal intensity of terrestrial magnetism. Figs. 60,135 and 60,136 (Ztschr. f. d. phys. u. chem. U. **16**, p. 337) 3. 9. 0

60,137. **Magnetic Pendulum,** Figure, as suggested by Russner (Ztschr. f. d. phys. u. chem. U. **20**, 1907, p. 96), for subjective and objective observation; **independent apparatus,** on polished stand 7. 10. 0

The apparatus is used for proving Coulomb's Magnetic Law, for proving that the total affect of a short magnetic rod on a single pole equals $\frac{2l \cdot m \cdot m_1}{r^3}$ for determining the magnetic moment and the pole-density of a magnetic bar, the field-density of a short and a long coil (Biot-Savart's Law), the magnetic induction and hysteresis of iron. A complete description and instructions sent on application.

Given in are: 1 short and 1 long bar magnet; 1 short and 1 long magnet coil, and 1 adjustable projection lens.

60,138. — The same apparatus, **for placing on the optical bench** of projection apparatus. Price without stand or projection lens 6. 5. 0

60,139. **Apparatus for determining the horizontal component of terrestrial magnetism,** Figure, Russner's (Ztschr. f. d. phys. u. chem. U. **20**, 1907, p. 172). 1. 4. 0

Complete description on application.

60,140. **Thermo-magnetic Apparatus,** Figure 2. 5. 0

A star formed of iron bars is arranged to rotate in front of the poles of a powerful magnet. In the position where an iron bar is attracted by the magnet, the latter is heated to a red heat by a Bunsen burner which is set up and it thereby loses the magnetism produced in it by distribution, and the next bar is attracted by the magnet. The star is therefore set into slow rotation.

Cl. 5590, 5589, 4153, 3864, 5757.

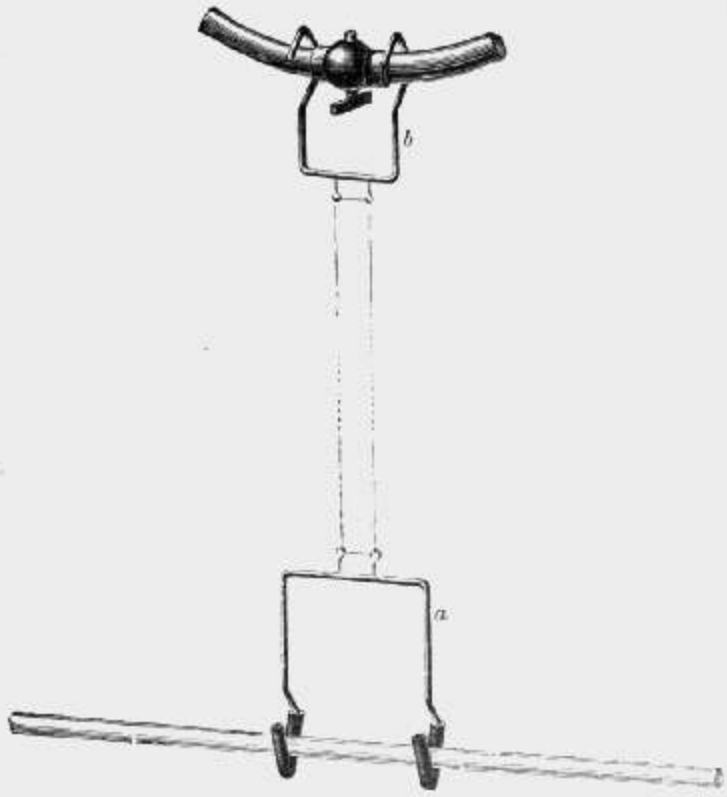
Max Kohl A. G. Chemnitz, Germany.



60141. 1 : 5.



60153. 1 : 6.



60155. 1 : 5.

Static Electricity.

60,141. **1 Flint Glass Rod, 1 Ebonite Rod, 1 Piece Catskin and 1 Piece Amalgamated Felt,** Figure . . . . . £ 0. s. 5. d. 0

60,142. **4 Rods of Glass, Ebonite, Sealing Wax and Sulphur, 1 Rubber** of Amalgamated Felt, **1 Piece Catskin, 1 Brass Rod** with glass handle, **1 Piece Steatite** with ebonite handle . . . 1. 0. 0

60,143. **Collection of Apparatus** for the Fundamental Experiments on Magnetism, Frictional, Contact and Thermo-electricity, in wood box, Fig. 60,065, p. 787 . . . . . 2. 6. 0

The box contains: 2 bar magnets, 1 double hook for suspending the magnets; 1 magnetic needle; 1 ebonite rod; 1 glass rod; 1 rubber; 1 insulating stand; 1 electric needle; pithballs with stand; 1 glass rod with brass cap; 1 ebonite rod with brass cap; 1 Voltaic cell with contact bow, and 1 thermo-electric rectangle.

60,144. **Flint Glass Rod,** 350 mm long, 15 mm thick, with amalgamated felt rubber, for generating positive electricity 0. 2. 0

60,145. — idem, larger, 500 mm long, 20 mm thick, with amalgamated felt rubber . . 0. 5. 0

60,146. **Ebonite Rod,** 350 mm long, 15 mm thick, with 1 Piece Catskin as rubber, for generating negative electricity 0. 3. 0

60,147. — idem, larger, 500 mm long, 25 mm thick, with catskin rubber 0. 5. 0

60,148. **Flint Glass Tube,** with amalgamated felt rubber 0. 3. 0

60,149. **Fox-tail Rubber** 0. 5. 0

60,150. **Catskin Rubber** 0. 1. 0

60,151. **2 Ebonite Rods,** 300 mm long, 12 mm thick, with rubber and with double hooks for suspending on silk threads, for showing the repulsion of the same kinds of electricity 0. 6. 0

60,152. **Brass Rod, with ebonite handle** and rubber (Gan.-Rein, Fig. 708) 0. 7. 0

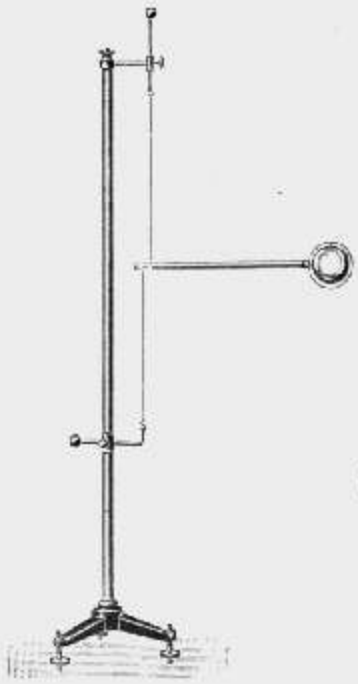
60,153. **Steatite Piece with ebonite handle** (Kolbe's), Figure, for electrostatic experiments (Kolbe-Skellon, Introduction to Electricity, Part I, pp. 13 and 15) 0. 5. 0

60,154. — idem (Weinhold's), with groove (W. D., p. 639). 0. 4. 0

60,155. **2 Double Hooks,** for suspending rods and tubes of wood, glass, ebonite, paper, etc., Figure (W. D., Fig. 422 [398]) 0. 3. 0

60,156. **Paper Tube Drying Device** (W. D., Fig. 423 [399]) 0. 2. 0

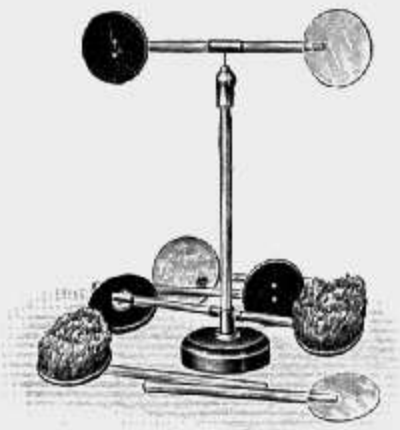
Max Kohl A. G. Chemnitz, Germany.



60 158. 1 : 12.



60 160. 1 : 6.



60 162. 1 : 6.



60 163 and 60 164. 1 : 6.



60 161. 1 : 10.



60 166. 1 : 4.

	£ s. d.
60,157. **5 Rods of Wood, Glass, Ebonite, Sealing Wax and Sulphur,** for suspending by means of the double hooks, No. 60,155, each 60 cm long	0. 10. 0
60,158. **Electric Horizontal Pendulum,** Figure (W. D., Fig. 425 [408]), with hollow aluminium ball, on glass rod, on stand with levelling screws. Highly sensitive and protected by the use of the aluminium ball instead of the glue ball	1. 4. 0
60,159. **Simple Electric Pendulum** (Gan.-Man., Fig. 615, and Gan.-Rein., Fig. 705)	0. 6. 0
60,160. **Double Electric Pendulum,** Figure, on insulated stand (Gan.-Man., Fig. 617, and Gan.-Rein., Fig. 709)	0. 5. 0
60,161. **Double Electric Pendulum,** Kolbe's, Figure, **with two rotary arms** (Kolbe-Skellon, Introduction to Electricity, Part I, Fig. 2)	0. 8. 0
60,162. **Apparatus for the Fundamental Electrical Experiments,** as suggested by Gustav Wiedemann, Figure, comprising a stand to which is fitted an insulated needle on which a glass rod turns. At the ends of this rod are fitted each 1 ebonite and glass disc. In addition there are: 2 ebonite and glass slabs on insulating handles, 2 rubbers, 1 of amalgamated felt, the other of catskin, and 1 rod with amalgamated leather on one end and catskin on the other, in case (Ztschr. f. d. phys. u. chem. U. **4,** p. 196) . .	1. 4. 0
60,163. **Glass Tube,** closed at the ends, and with cap fused in, turning on insulating stand, Figure	0. 7. 0
60,164. **Ebonite Rod,** with brass cap, on insulating stand, rotary, Figure	0. 9. 0
60,165. **Insulating Stand** of No. 60,163, alone	0. 6. 0
60,166. **Horizontal Pendulum** with two balls, on stand, Figure . . . . . 2 quite thin, light, glass balls, 1 being metallically covered, or carried by a thin balance beam which rests on a point.	0. 18. 0
60,167. **Insulating Stand** (Meutzner's) (Fr. phys. Techn. II, 1, Fig. 2)	0. 12. 0
60,168. **Insulating Stand** (Friedr. C. G. Müller's) (M. T., Fig. 161)	0. 12. 0

Cl. 5725, 2060, 5764, 5582, 2061, 2063.

Max Kohl A. G. Chemnitz, Germany.

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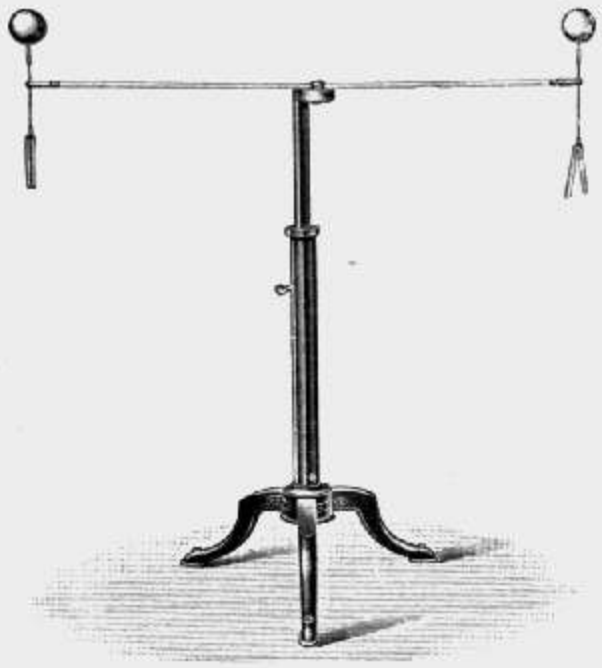
60 169.



60 170.



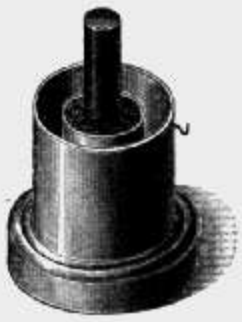
60 171.



60 172. 1 : 4.



60 173. 1 : 7.



60 174. 1 : 7.



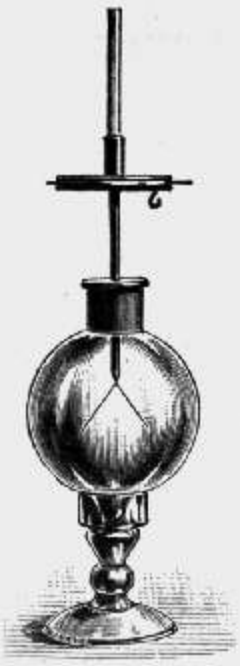
60 175. 1 : 5.



60 176. 1 : 5.

	£ s. d.
60,169. **Simple Paper Electroscope** (Lehmann's), Figure (Fr. phys. Techn. II, 1, Fig. 6)	0.12.0
60,170. — idem, double (Fr. phys. Techn. II, 1, Fig. 7), Figure	0. 8.0
60,171. **Parchment Strips,** as suggested by Kiessling, on insulating stand. Figure (Fr. phys. Techn. II, 1, Fig. 5)	0. 3.0
60,172. **Foot or Stand Clamp** (Holtz's), Figure, with ribbed ebonite insulation (Ztschr. f. d. phys. u. chem. U. 2, p. 55)	0. 6.0
Parts of apparatus for use with Holtz clamps: see under.	
60,173. **Insulating Stand** (Mascart's), Figure, consisting of a bottle to be partly filled with sulphuric acid, and with a support passing through the neck for taking a stage (Fr. phys. Techn. II, 1, Fig. 26; Gan.-Rein., Fig. 707)	0.13.0
60,174. **Apparatus for Demonstrating the Neutralisation of Opposite Kinds of Electricity,** consisting of rod and rubber (Franklin's Law), Figure (Fr. phys. Techn. II, 1, Fig. 38)	0.14.0
60,175. **Paper Electroscope** (Kolbe's), Figure, with amber insulating neck (Kolbe-Skellon, Introduction to Electricity, Part I, Fig. 3)	0.12.0
60,176. **Aluminium Leaf Electroscope,** Figure, with amber insulating neck	0.10.0

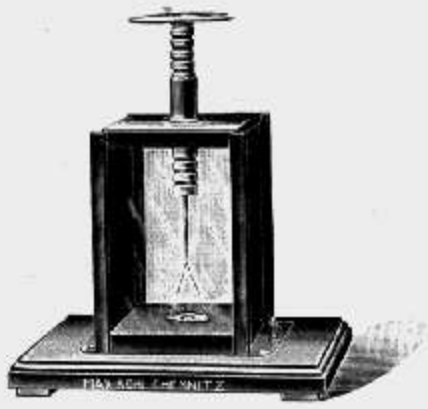
Cl. 5612, 5608, 5609, 5584, 5125, 5613, 2064, 2065.



60 177. 1 : 4.



60 179. 1 : 4.



60 181. 1 : 6.



60 183. 1 : 8.



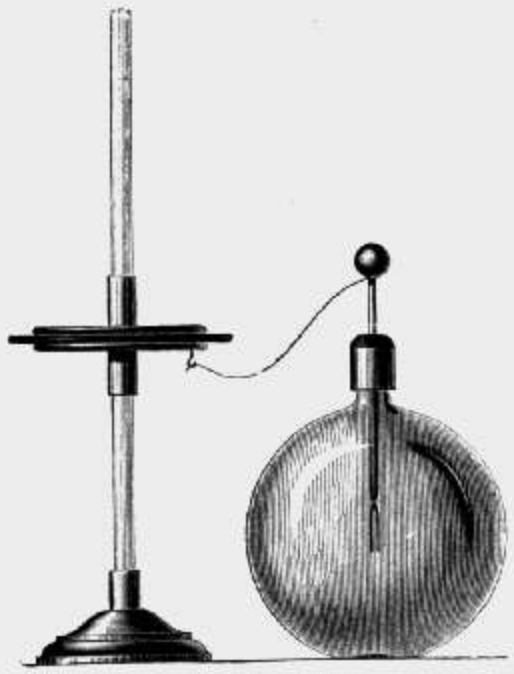
60 180. 1 : 6.



60 182 A. 1 : 5.



60 182 B. 1 : 5.



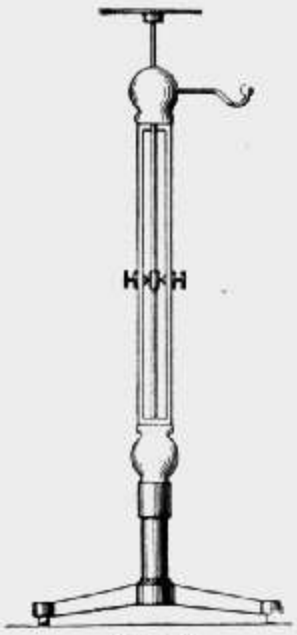
60 184. 1 : 4.

	£ s. d.
60,177. **Aluminium Leaf Electroscope,** larger, with condenser and mica disc, Figure, with amber insulating neck and with detachable base for inserting calcium chloride . . .	1. 2. 0
60,178. — idem, without condenser	0. 15. 0
60,179. **Aluminium Leaf Electroscope,** as No. 60,178, with celluloid graduated arc, Figure	0. 16. 0
60,180. **Electroscope for placing on the air pump,** Figure . . . . . The glass bulb can be detached from the base and be placed with its polished edge on the air pump.	0. 18. 0
60,181. **Electroscope, Chatlock's,** Figure, with first-rate ebonite and air insulation, with aluminium leaf, also suitable for projection	0. 18. 0
60,182. **Aluminium Leaf Electroscope,** with unscrewable **point, condenser and mica disc,** Figs. A and B	1. 5. 0
60,183. **Aluminium Leaf Electroscope** (Kolbe's), Figure, with degree scale	0. 18. 0
60,184. **Electroscope,** Figure, with separate condenser and mica disc, for explaining electrophorus (W. D., Fig. 434 [407])	1. 5. 0
60,185. **Condensor alone,** with mica disc	0. 15. 0
60,186. **Electroscope** (v. Beetz's), Figure, for objective demonstration (W. D., Fig. 432 [405]; M. P. 10th edn., IV, 1, Fig. 111; 9th edn., III, Fig. 109; Gan.-Man., Fig. 618; Gan.-Rein., Fig. 710) . . . . . If not otherwise desired we supply the electroscope with aluminium leaves, but also with paper strips if required.	1. 2. 0

Cl. 2066, 2067, 4103, 2070, 3451, 2068, 2069, 2071.

Max Kohl A. G. Chemnitz, Germany.

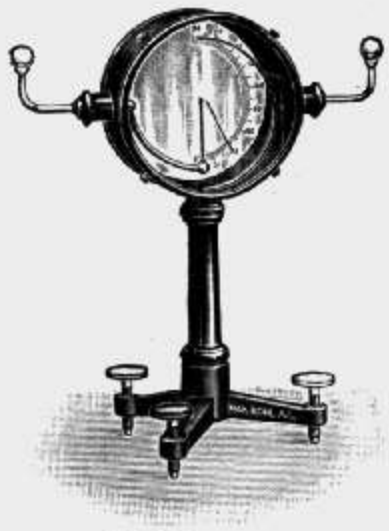
Max Kohl A. G. Chemnitz, Germany.



60 189.



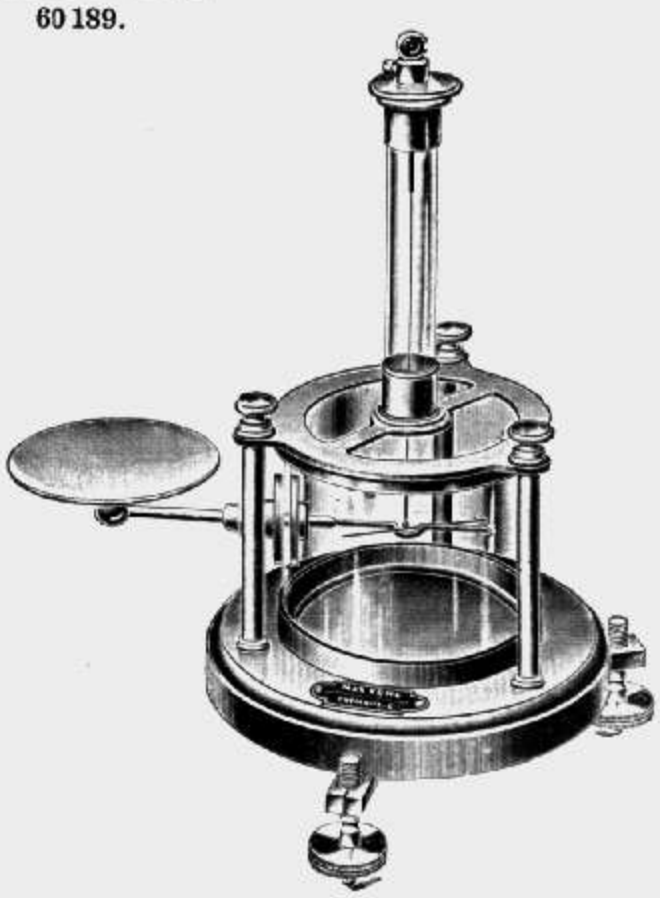
60 186. 1 : 6.



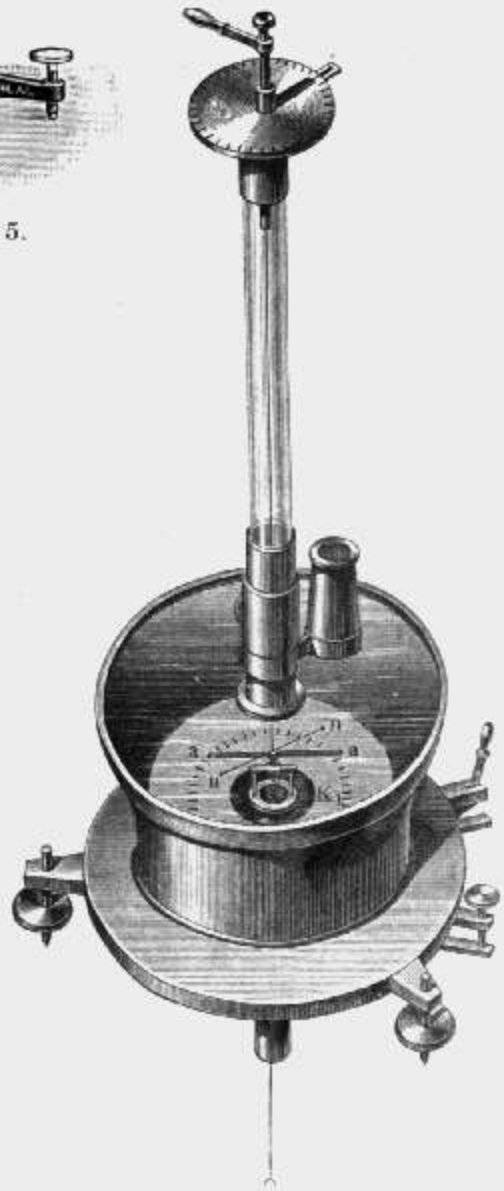
60 190. 1 : 5.



60 191. 1 : 3.

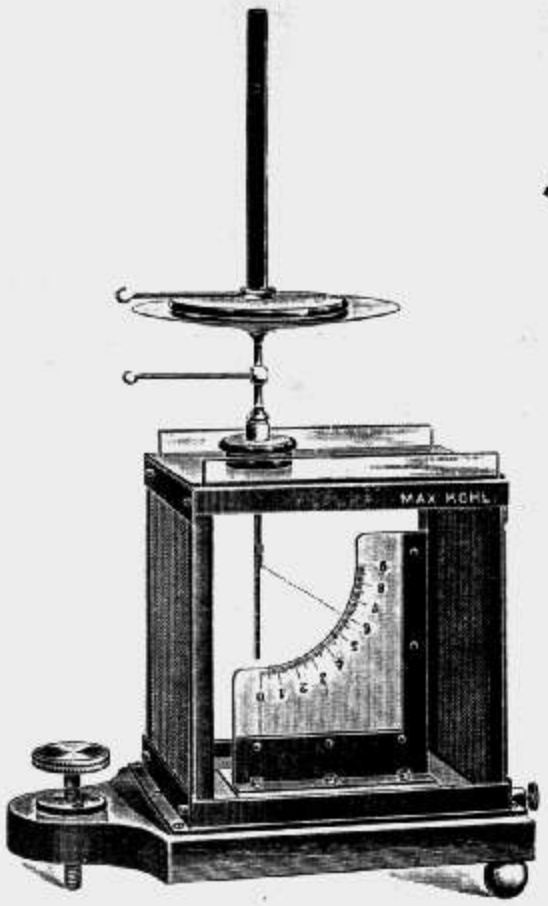


60 195. 1 : 3.



60 195 a. 1 : 5.

	£ s. d.
60,187. **Paper Tube Electroscope** (Weinhold's) (W. D., Fig. 433 [406])	0. 12. 0
60,188. **2 Cylindrical Wire Baskets,** for screwing on Electroscope No. 60,175 to 60,180 (W. D., p. 668 [609]), and **1 Hollow Sphere** on insulating handle	0. 12. 0
60,189. **Fork Electroscope** (Fischer's), Figure (Fr. phys. Techn. II, 1, Fig. 14)	0. 16. 0
60,190. **Electrometer,** Szymansky's, Figure, giving deflections to 180° (Ztschr. f. d. phys. u. chem. U. **4**, p. 60), with gilt metal parts	2. 10. 0
60,191. **Portable Electrometer,** for measuring atmospheric electricity, as suggested by Exner, Figure (M. P. 9th edn., III, Fig. 259), in case	2. 5. 0
60,191 a. **Flame Collector** for above, with supports in walking stick form	1. 10. 0
60,192. **Portable Electrometer** (Elster and Geitel's), with mirror for reading without parallax (M. P. 10th edn., IV, 1, Fig. 112)	3. 0. 0
60,193. **Tangent Electrometer** (Carl's), with condenser (Fr. phys. Techn. II, 1, Figs. 22 and 23)	2. 10. 0
60,194. **2 Glass Rods with glass balls,** for enabling the Grimsehl Pole Balance No. 60,135 to be used also as an absolute electrometer	0. 8. 0
60,195. **Electrometer** (Dellmann's) (M. P. 9th edn., III, Fig. 177), Figure	2. 14. 0
60,195 a. **Electrometer** (Kohlrausch's), Figure (M. P. 9th edn., III, Fig. 178), with magnifying glass reading, platinum or quartz suspension	5. 10. 0



60 196. 1 : 4.



60 200. 1 : 4.



60 201. 1 : 5.



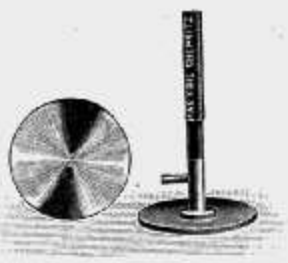
60 200 a. 1 : 3.



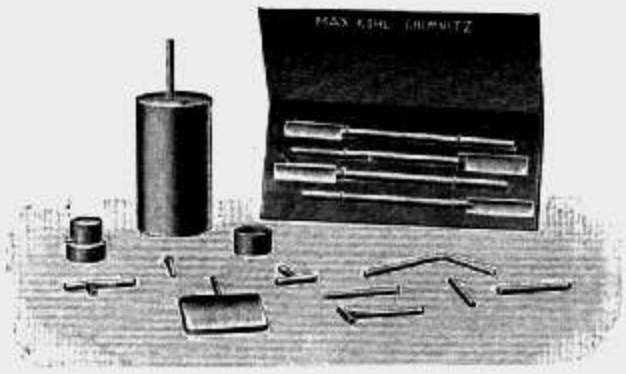
60 200 b. 1 : 3.



60 202. 1 : 6.



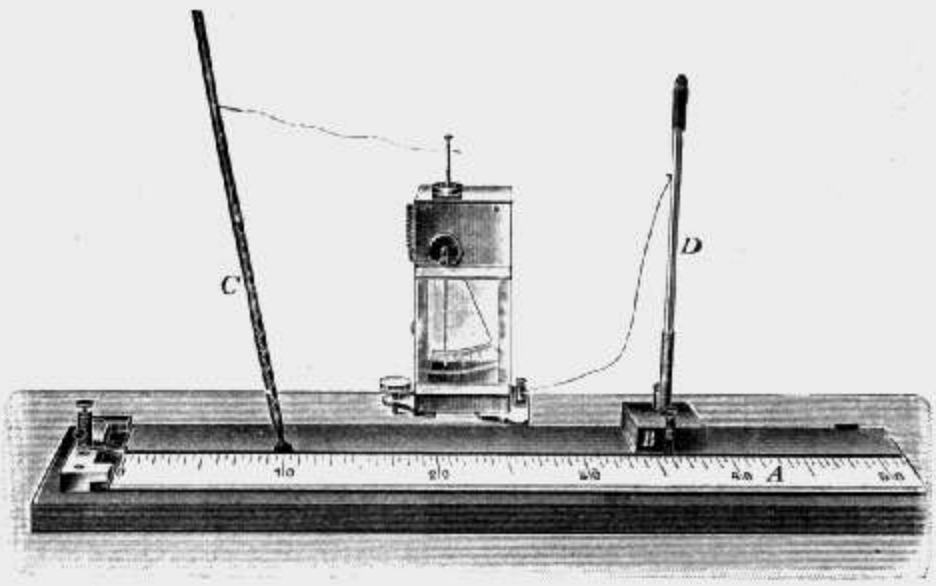
60 203. 1 : 6.



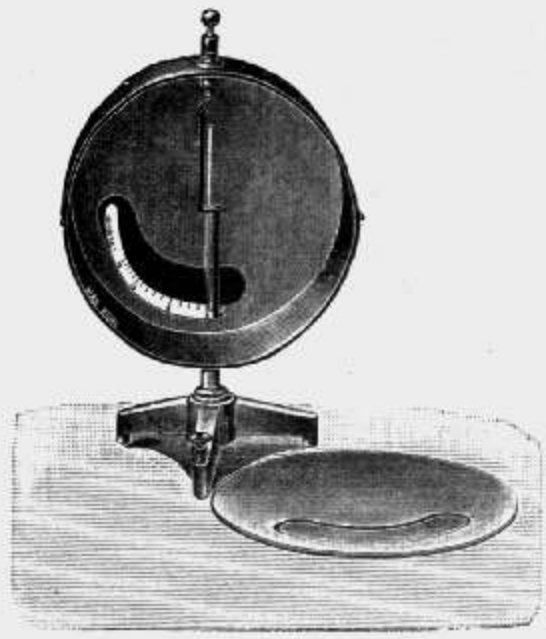
60 205. 1 : 6.

	£ s. d.
60,196. **Aluminium Electrometer** (Kolbe's), Figure (Kolbe-Skellon, Introduction to Electricity, Part I, Fig. 15) similar to Gan.-Man., Fig. 659, with projection scale for calibrating and amber tubes in ebonite plug, one ball 10 mm diameter, two condenser plates (lacquered) with one ebonite handle, one extra ebonite plug with amber tubes, conductor rod and paper leaves	3. 0. 0
The sheet iron house of the instrument is 130 mm high, 140 mm wide, 95 mm deep.	
60,197. **Projection Grade Scale,** for inserting in above, divided on mica	0. 6. 0
60,198. **2 Sheet Metal Pieces** with C-shaped pieces cut away, for quantitative experiments	0. 4. 0
60,199. **Hollow Ball,** for screwing on, 50 mm diameter, and 2 insulated test balls for graduating	0. 6. 0
60,200. **Testing Electroscope** (Kolbe's), Figure (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 79)	0. 6. 0
60,200a. **Auxiliary Electroscope** (Kolbe's), Figure (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 109)	0. 3. 0
60,200b. **Testing Electroscope** with long insulated metal handle, Figure.	0. 3. 0
60,201. **Insulated Wire Fork,** as suggested by Kolbe, Figure (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 81)	0. 18. 0
60,202. **Aluminium Leaf Electrometer** (Grimschl's) (Ztschr. f. d. phys. u. chem. U. **16**, p. 5), suitable for projection, Figure	3. 10. 0
This electrometer is extremely sensitive. An extra ebonite plug, in two parts, and a clamping screw for inserting are given in with the instrument.	
The instrument is built into a brass case and possesses a graduation, going up to 30°, on a mica disc. Glass windows fitted in front and behind render it possible to employ the instrument in conjunction with the projection apparatus.	
An adjustable discharging electrode serves both for arresting and for increasing the sensitivity of the instrument.	

Cl 3454, 4977, 390, 5726, 5711, 3812, 3813, 3814.



60 206. 1 : 6.



60 211 — 60 215. 1 : 6.

	£ s. d.
60,203. **2 Brass Condenser Plates** with one insulated metal handle, Figure	0. 12. 0
60,204. **1 Copper Condenser Plate and 1 Zinc Condenser Plate**	0. 6. 0
60,205. **Additional Accessories** for Grimsehl's Electrometer, Figure	0. 15. 0

A zinc and a brass plate, both on brass rods, for showing the varying potential of these metals plunged in an electrolyte; 2 platinum sheets on brass rods for immersing in the same or in different electrolytes; cylindrical dissipation body for showing the discharge action of air, which is ionised by fog, radio-active substances, Röntgen Rays or by an Auer Incandescent Mantle brought near to it; amalgamed zinc plate with brass pin soldered on for showing the discharge action of magnesium tape burned in the neighbourhood of the apparatus on the aluminium leaf charged with negative electricity; also connecting tube and clamping pieces.

60,206. **Graphite Conductor** for demonstrating the potential drop in electric leads, as suggested by Grimsehl, Figure (Ztschr. f. d. phys. u. chem. U. **16**, p. 11). Price, exclusive of cover plates and without graduation	1. 10. 0
60,207. — idem, with graduation	1. 17. 0
60,208. **Liquid Resistance** for the Electrometer Leaf	0. 1. 6
60,209. — idem, for the Electrometer Case	0. 2. 6
60,210. **Yarn** for connecting the apparatus	0. 1. 0

Electrometers for investigating Radio-active Substances: see section on "**Radio-Activity**".

Absolute Lecture Electrometer, as suggested by Prof. F. Braun (Tübingen), Figure (Wied. Ann. **44**, p. 771, 1891; Ztschr. f. d. phys. u. chem. U. **5**, p. 61; W. and E., Fig. 252).

These electrometers can be used as a substitute for the aluminium leaf electroscopes. When a lamp is placed behind them, the readings are visible at a great distance.

The electrometers are supplied with the following ranges, and are carefully calibrated.

List No.	**60,211**	**60,212**	**60,213**	**60,214**	**60,215**	
Volts	0—1500	0—1500	3500	3500	10,000	
Graduated from	100 to 100	500 to 500	100 to 100	500 to 500	500 to 500	Volts
£	**2. 12. 0**	**2. 1. 0**	**2. 16. 0**	**2. 4. 0**	**3. 6. 0**	

60,216. **Extra Price** if constructed with Mica Scale and figured for projection purposes . .	0. 6. 0
60,217. **Metal Beaker,** with haft soldered on, for graduating the Braun Electrometer (M. T., p. 234)	0. 3. 0

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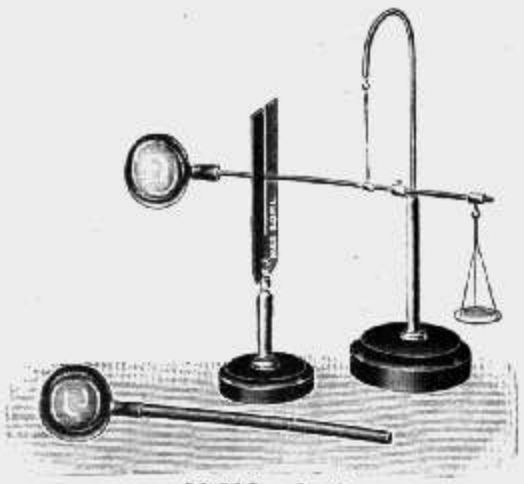
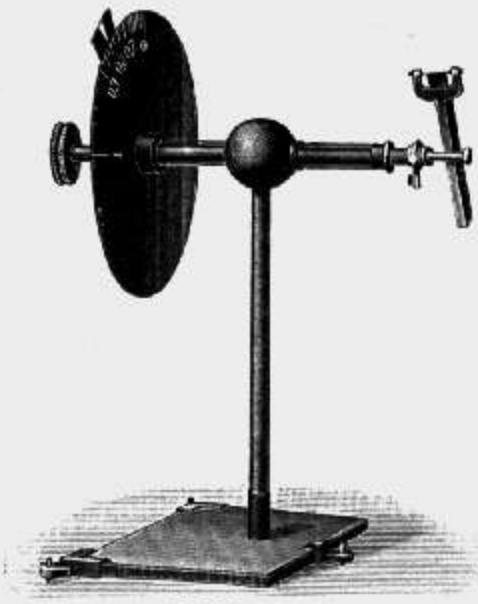
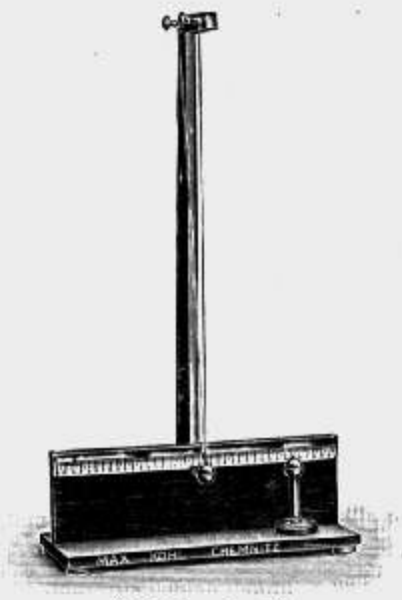


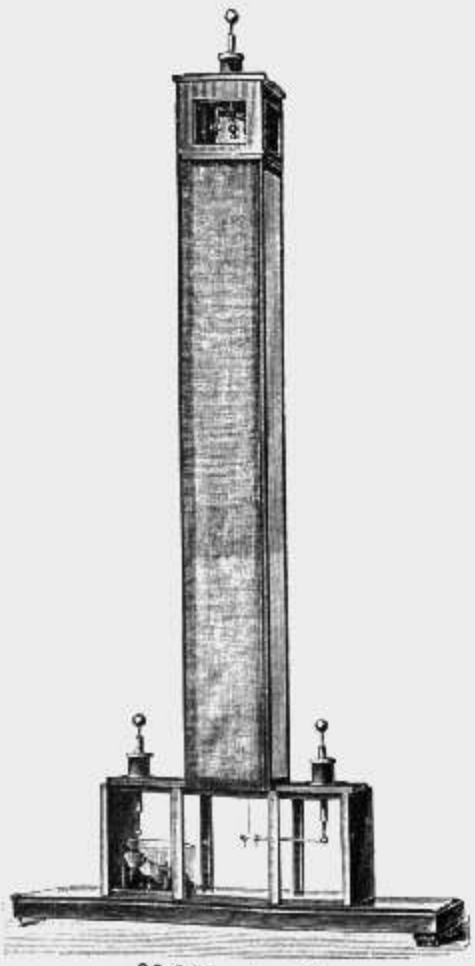
60 218. 1 : 8



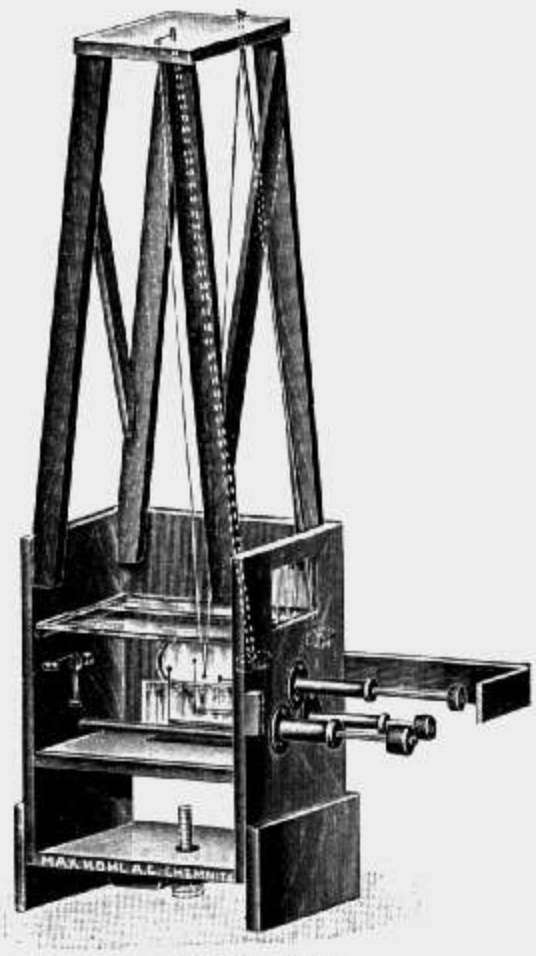
60 219. 1 : 3.



60 221. 1 : 10.



60 222. 1 : 13.



60 223. 1 : 6.

	£ s. d.
60,218. **Electric Balance** (Kleiber's), Figure (Kleiber, Phys. f. Gymn., Fig. 261) . . .	1. 0. 0
60,219. **Sine Electrometer** (Schwedoff's), Figure (Ztschr. f. d. phys. u. chem. U. **5**, p. 235) The rod with the movable leaf can turn about a horizontal axis. After charging the latter is rotated until the electric repulsion is compensated by the weight of the leaf itself. The capacity of the instrument thereby always remains the same.	2. 10. 0
60,220. **Absolute Electrometer** (Korolkow's) (Ztschr. f. d. phys. u. chem. U. **20**, p. 287), without the apparatus there illustrated (inductor, Leyden jar, Kolbe electrometer)	3. 0. 0
60,221. **Pendulum Electrometer,** Odstreil's, Figure, simpler pattern, for demonstrating Coulomb's Law (Kolbe-Skellon, Introduction to Electricity, Part I, Fig. 30)	1. 0. 0
60,222. **Odstreil's Apparatus,** more complete pattern, Figure, for demonstrating Coulomb's Law (Ztschr. f. d. phys. u. chem. U. **6**, p. 224)	3. 10. 0
60,223. **Pendulum Electrometer** for verifying Coulomb's Law on the action of electricity at a distance, as suggested by Weinhold, Figure (W. D., Fig. 429)	4. 5. 0

Coulomb's Torsion Balance: see No. 60,130, p. 794.

Pile Electrometers and Quadrant Electrometers: see under **Voltaic Electricity.**

Cl. 5121, 5611, 4915, 2085, 5594.

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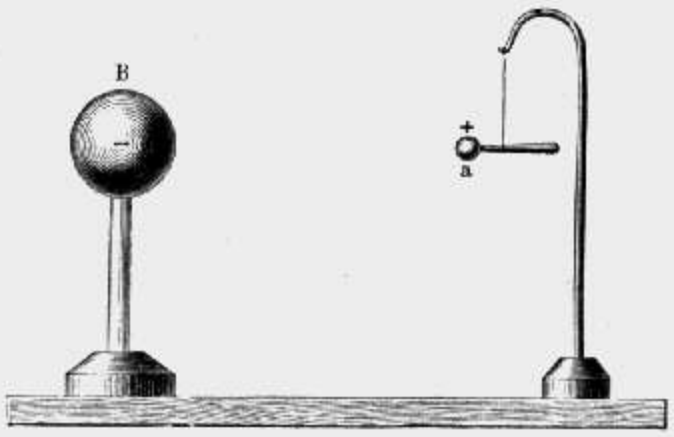
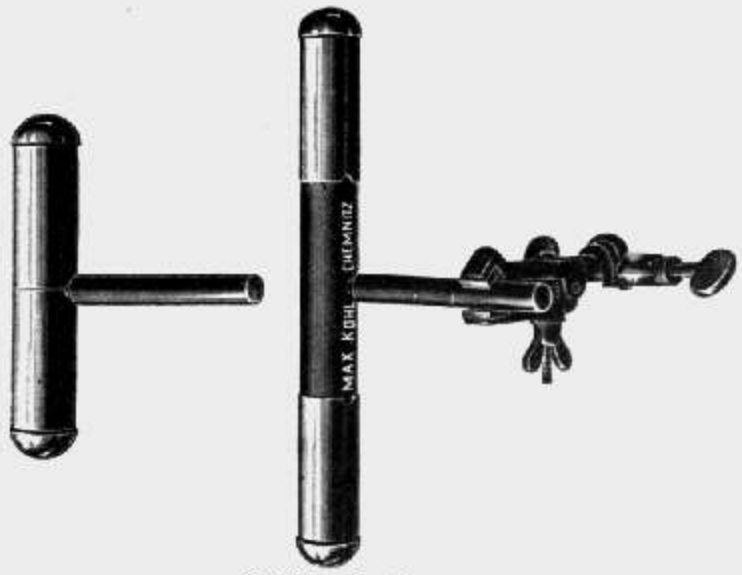
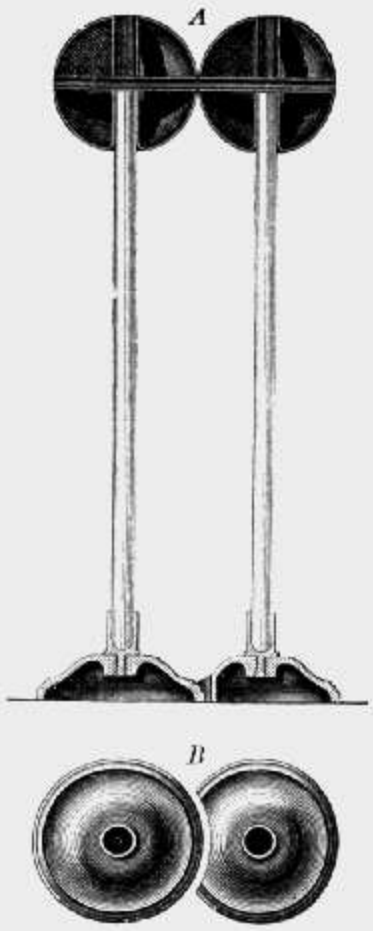


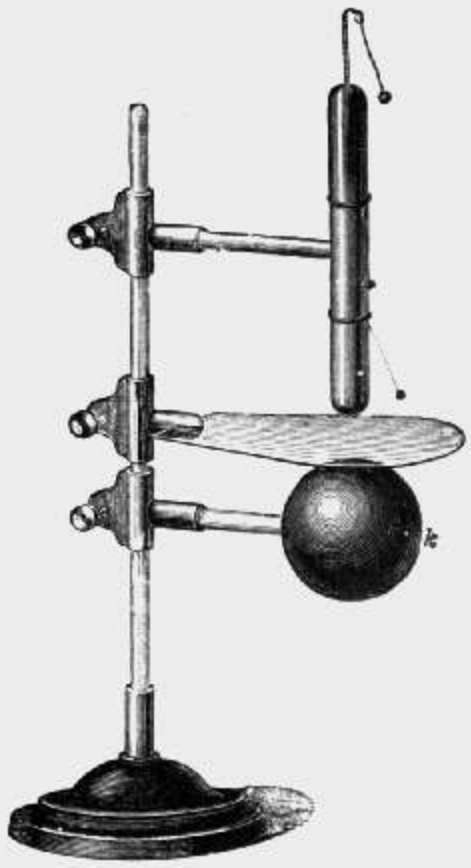
60 224 and 60 225.



60 229. 1 : 5.



60 226. 1 : 9.



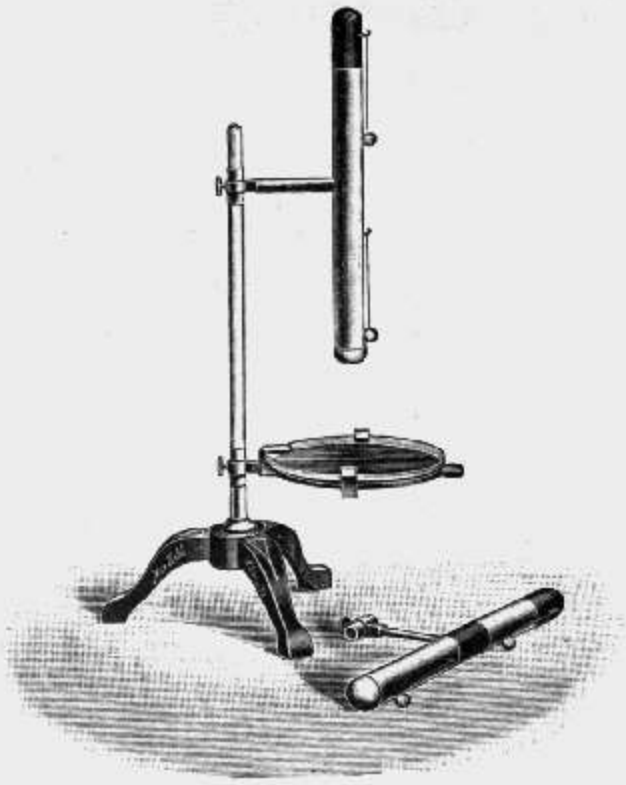
60 230. 1 : 5



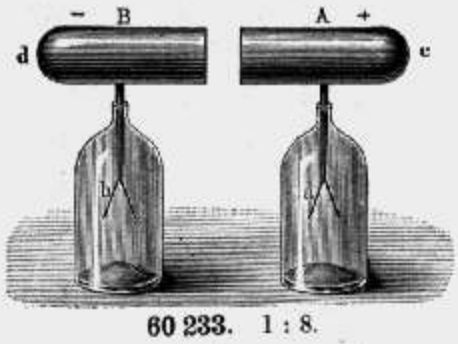
60 231.

	£ s. d.
60,224. **Conductor Ball,** 10 cm diameter, on glass pillar with base, with opening at the upper end (M. P. 10th edn., IV, 1, Fig. 124; 9th edn., III, Fig. 124; Gan.-Man. Fig. 625; Gan.-Rein., Fig. 716)	0. 13. 0
60,225. **Electric Pendulum** on insulated stand, Figure, for verifying Coulomb's Law by the swing of the pendulum at various distances (Fr. phys. Techn. II, 1, Fig. 37; M. P. 10th edn., IV, 1, p. 225)	0. 8. 0
60,226. **2 Conductor Balls,** on 50 cm high glass pillars with bases, Figure (W. D., Fig. 427 [403]), with brass rod pointed at one end and provided with a ball at the other (W. D., Fig. 436 [409]), and with a connecting tube 1 m long	1. 14. 0
60,227. **Test Ball on Ebonite Rod** (M. P. 9th edn., III, Fig. 115)	0. 1. 0
60,228. **Test Disc on Ebonite Rod** (M. P. 10th edn., IV, 1, Fig. 125; 9th edn., III, Fig. 116)	0. 1. 0
60,229. **2 Conductors,** one of which can be lengthened or shortened by a sliding bush, on insulating ebonite handle, Figure (M. P. 9th edn., III, Fig. 121)	0. 18. 0
60,230. **Distributing Apparatus** (Riess'), Figure (W. D., Fig. 431 [404]; M. P. 9th edn., III, Fig. 114)	1. 0. 0
60,231. **Distributing Apparatus** (Wesselhoft's), Figure (Fr. phys. Techn. II, 1, Fig. 45) .	0. 15. 0

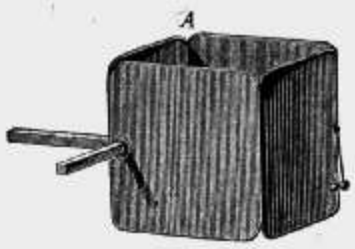
Cl. 5614, 2087, 2086, 2088, 5607.



60 232. 1 : 7.



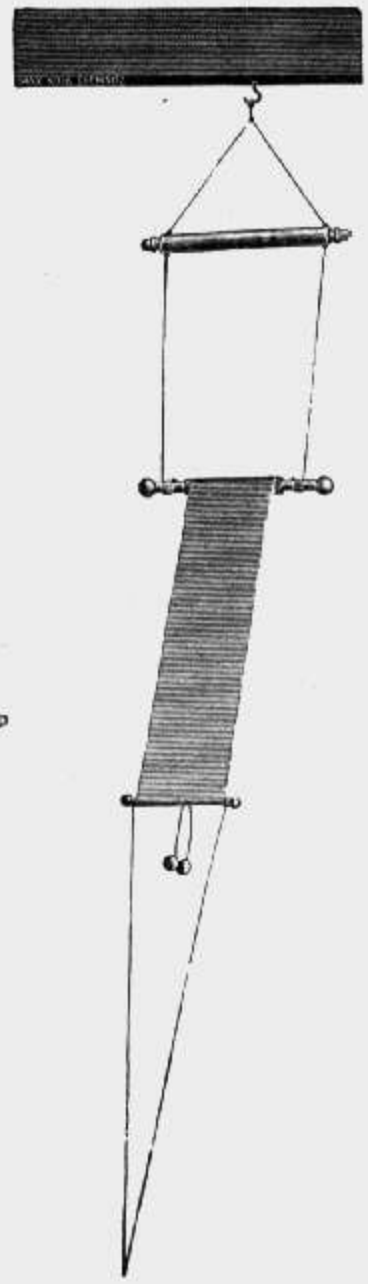
60 233. 1 : 8.



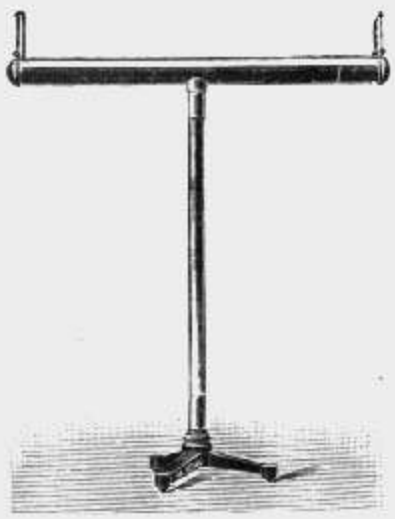




60 236. 1 : 6.



60 238. 1 : 5.



60 234. 1 : 8.



60 235. 1 : 8.

60,232. **Distributing Apparatus,** Kreb's, Figure (Ztschr. z. Förd. d. phys. U. **1**, p. 56), with 2 different distributing cylinders . . . . . £ s. d. 1. 16. 0

60,233. **Apparatus for Generating Electricity by Influence,** consisting of 2 conductors on 2 electroscopes, Figure (W. and E., Fig. 253) 1. 4. 0

60,234. **Hemispherical-Ended Cylinder,** on glass pillar with base, Figure (M. P. 10th edn., IV, 1, Fig. 130; 9th edn., III, Fig. 131; Gan.-Man., Fig. 628), for showing that the density of electricity at the ends of an elongated conductor is greater than in the centre . . 0. 16. 0

60,235. **Large Egg-Shaped Conductor,** for the same experiment, Figure, nickelled (Gan.-Rein., Fig. 721) 1. 10. 0

60,236. **Weinhold's Apparatus,** Figure (W. D. Fig. 439 [412]; M. P., 10th edn., IV, 1, Fig. 131; 9th edn., III, Fig. 132), for the same experiment 0. 6. 0

60,237. **Sheet Iron Hollow Sphere,** with copper wire 1.5 m long and 0.4 mm thick, on insulating handle (W. D., Fig. 442 [415]), for placing on balls No. 60,226 . . . . . 0. 4. 0

60,238. **Electric Blind** for varying the density of electricity with the size of conductor, Figure (M. P. 10th edn., IV, Fig. 134; 9th edn., III, Fig. 175) 0. 12. 0

Cl. 2089, 2090, 2095, 2096, 2097, 2098.

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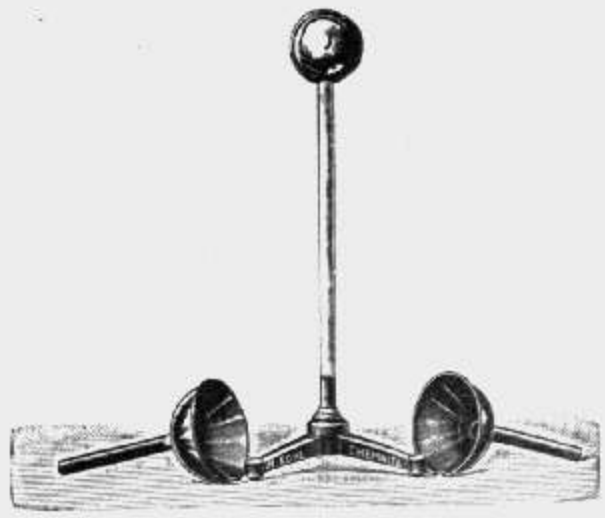
60 240 A. 1 : 6.



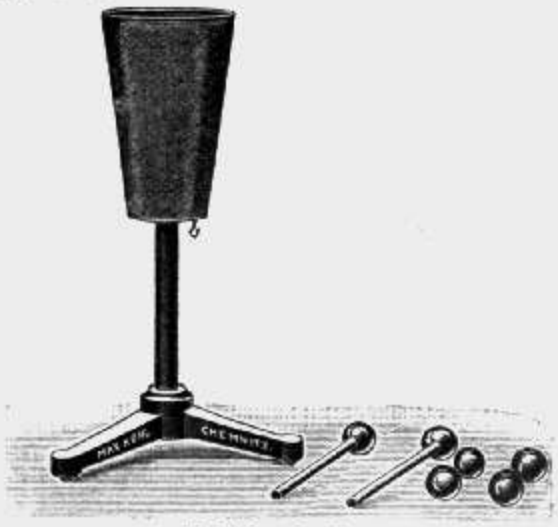
60 240 B. 1 : 5.



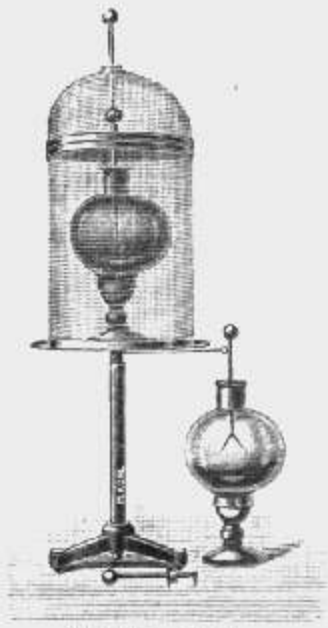
60 243. 1 : 6.



60 244. 1 : 8.



60 242. 1 : 5.



60 245. 1 : 9.

60,239. **Conductor with sharp point,** on stand (Kleiber, Phys. f. Gymn., Fig. 272; Gan.-Man., Fig. 626; Gan.-Rein., Fig. 755) . . . . . £ s. d. 0. 15. 0

60,240. **Apparatus** (Mach's), Figs. A and B, for demonstrating the variation of density of electricity with the size of the conductor 0. 18. 0

The apparatus consists of 4 brass caps telescoping one in the other on insulating stand, with paper pendulums and with glass hooks for withdrawing.

60,241. — idem, double the size of preceding 2. 0. 0

60,242. **Faraday's Beaker,** Figure, for showing that the electric charge of a body is proportional to the quantity of electricity conducted into it (Fr. phys. Techn. II, 1, Fig. 100) 0. 15. 0

The apparatus consists of a beaker of wire netting on insulating stand. The metal bottom of the beaker possesses a hook for a connection with the electroscope; 6 balls of equal size serve for conducting an increasing load to the beaker.

60,243. **Hollow Cylinder of Metal,** for showing that free electricity is present on the surface, Figure, on stand. 1. 0. 0

The cylinder carries 2 pairs of elder-pithballs; when charged the external balls only diverge.

60,244. **Brass Ball on Insulating Stand,** with 2 surrounding hemispheres with glass handles, as suggested by Coulomb, Figure (M. P. 9th edn., III, Fig. 125; Gan.-Rein., Fig. 717), for demonstrating that electricity resides on the surface 0. 18. 0

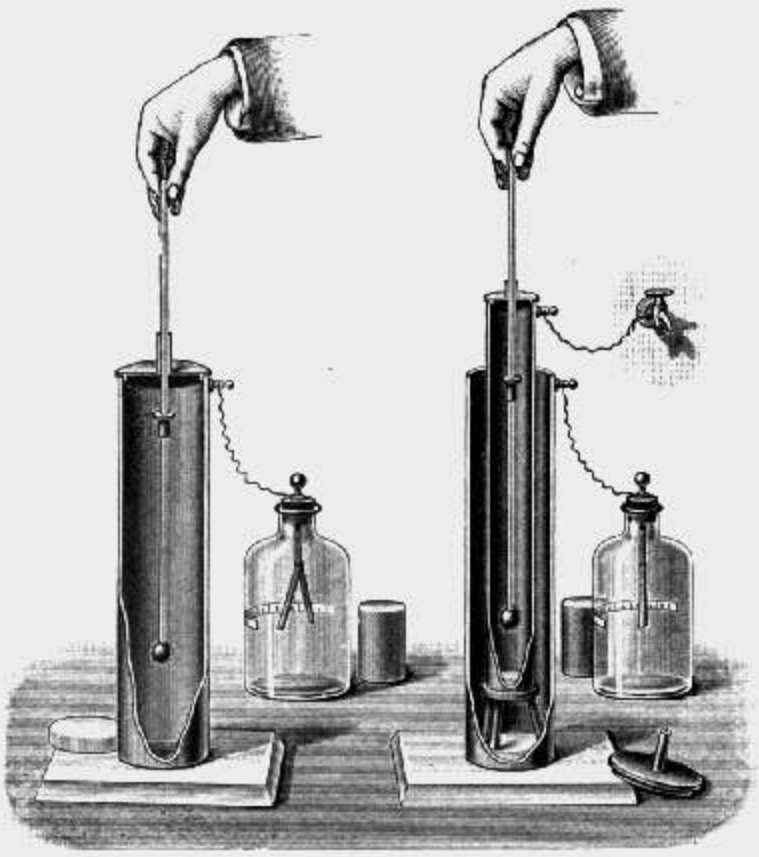
60,245. **Pfaundler's Apparatus** for the same experiment, Figure (M. P. 10th edn., IV, 1, Fig. 127; 9th edn., III, Fig. 127), consisting of a wire cage and insulated metal plate with conducting and insulating lead to the electroscope. Price, without electroscope 1. 7. 0



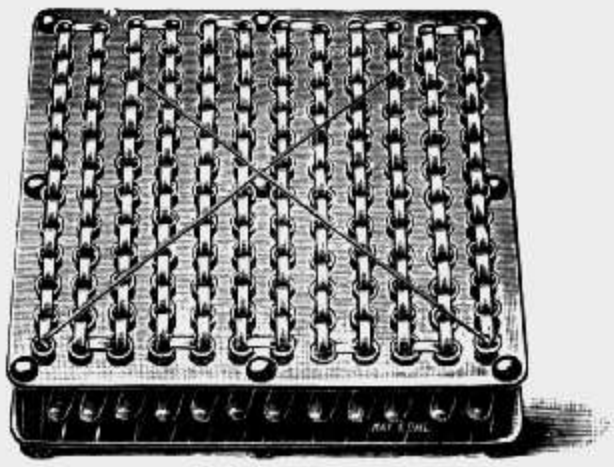
60 252. 1 : 7.



60 249. 1 : 7.



60 253. 1 : 10.



60 258. 1 : 6.

	£ s. d.
60,246. **Aluminium Leaf Electroscope** with **Lead Cap** (W. D., Fig. 438 [411]) and glass vessel, for the same experiment	0. 16. 0
60,247. **Lead Cap** alone, fitting No. 60,176	0. 3. 0
60,248. **Faraday's Muslin Net,** for the same experiment (M. P. 10th edn., IV, 1, Fig. 129; 9th edn., III, Fig. 130; Gan.-Rein., Fig. 720)	0. 8. 0
60,249. **Leyden Jar with large Hollow Ball** having a wide opening, **and with Test Ball,** Figure, for the same experiment	0. 12. 0
60,250. **Apparatus for the same experiment,** consisting of a metallic hemisphere on base and a spherical dish for covering the same at some millimetres distance from the top, the dish having a metal pin with insulating handle for establishing a metallic connection with the hemisphere (Gan.-Rein., Fig. 718)	1. 0. 0
60,251. **Wire Cage** in the form of a cheese-plate cover, with a vane inside and outside, for the same experiment, on insulated stand	0. 15. 0
60,252. **Wire Spiral** with ebonite handle and pithballs, as suggested by Rebenstorff, for showing that a free charge is not present in the interior of a hollow body, Figure, without the electrophorus illustrated	0. 6. 0
The wire spiral is placed upon a charged electrophorus and the balls are placed inside; they remain motionless as no free charge is present here. If, however, the spiral is compressed, the balls fly apart.	
60,253. **Lippmann's Apparatus for Demonstrating the Equality of Induced and Inducing Electricity and the Screen Action,** Figure (Fr. phys. Techn. II, 1, Fig. 143; Gan.-Man., Fig. 630). Price, without the electroscope illustrated	2. 5. 0
The illustration shows the two experiments which can be carried out with the apparatus. The experimental arrangement on the right hand side shows the complete apparatus and also an electroscope not included in the price.	

Cl. 5274, 2094, 5610, 2205.

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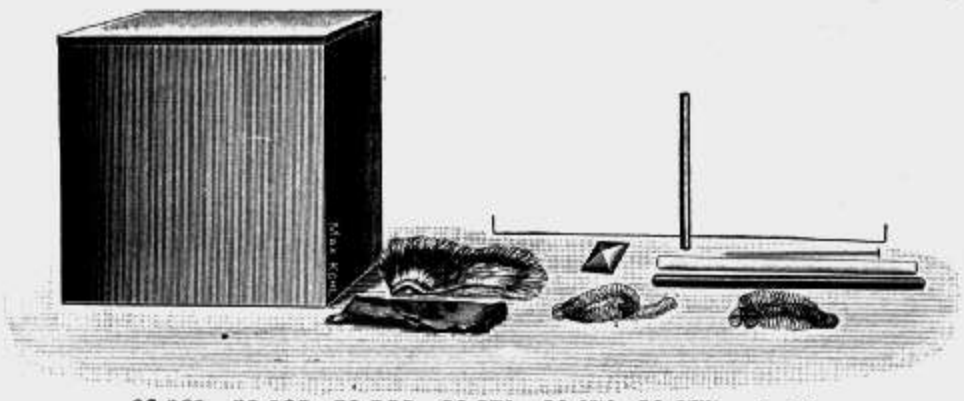
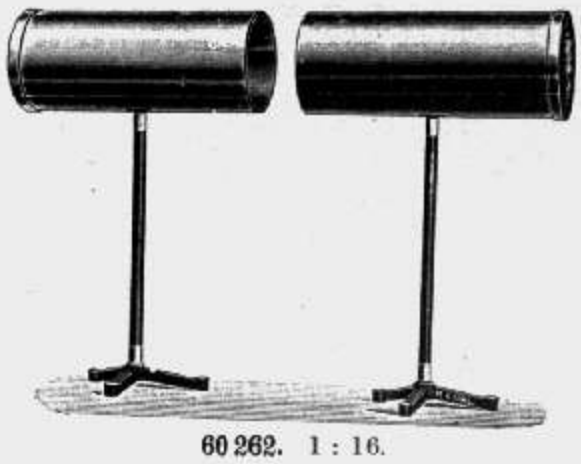
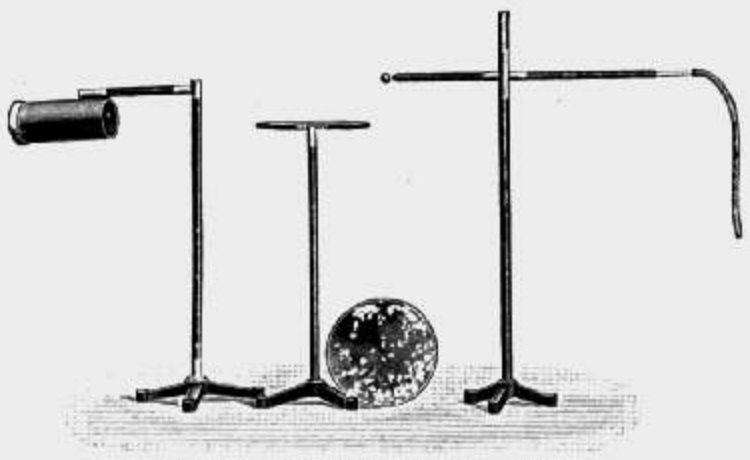


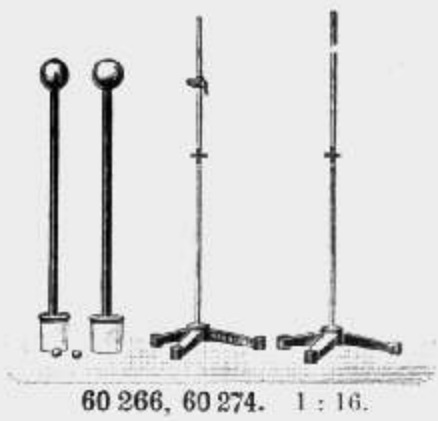
60 261, 60 268, 60 269, 60 271, 60 274, 60 275. 1 : 10.



60 262. 1 : 16.



60 263 — 60 265, 60 267. 1 : 16.



60 266, 60 274. 1 : 16.

Noack's Apparatus for the Study of Potential.

(Ztschr. f. d. phys. u. chem. U. **6**, 1892/93, p. 221.)

£ s. d.

60,196. **Aluminium Electrometer** (Kolbe's), Fig. 60,196, p. 802 (Kolbe-Skellon, Introduction to Electricity, Part 1, Fig. 15), with calibrated projection scale and amber tube in ebonite plug, 1 ball 10 mm in diameter, 2 condenser plates (varnished) with ebonite handle, 1 extra ebonite plug with amber tube, conductor rod and paper leaf 3. 0.0

Zamboni Pile (Elster and Geitel's), modified by Noack, of gold and silver paper with inlaid brass discs with projecting tongues, for taking off a divided potential also

List No.	**60,255**	**60,256**
No. of pairs of plates	1000	2000
Diameter of plates mm	28	28
£	**1. 0. 0**	**1. 7. 0**

60,257. **Electrometer** (Bohnenberger's) 2. 15. 0

60,258. **Water Battery,** Figure, with 144 copper-zinc cells in ebonite frame 3. 0. 0

60,222. **Odstreil's Apparatus,** Fig. 60,222, p. 804, proving Coulomb's Law 3. 10. 0

60,260. **2 Small Electroscopes** 1. 13. 0

60,261. **Sheet Iron Tube,** 30 cm length of side, Figure 0. 5. 0

60,262. **2 Sheet Brass Hollow Cylinders,** Figure, 50 cm long, 20 cm diameter, open at both ends, one of which can be closed by a lid, on ebonite pillar with iron base . . 2. 5. 0

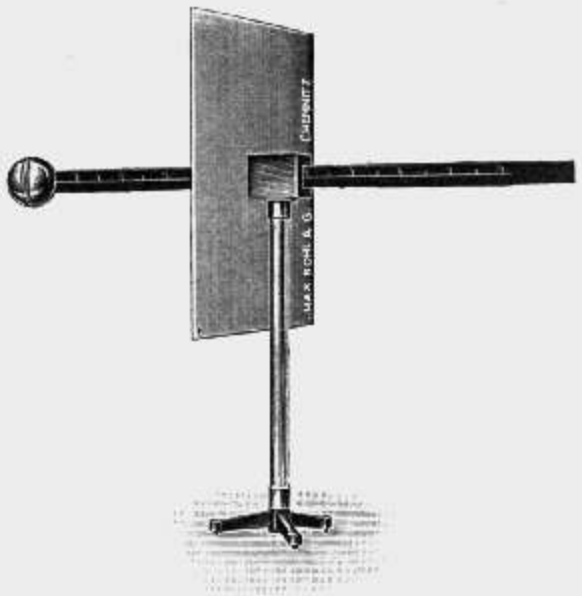
60,263. **Sheet Brass Hollow Cylinder,** Figure, 20 cm long, 8 cm diameter, with carrier bent at right angles on iron base 0. 12. 0

60,264. **Insulating Table, of ebonite,** Figure, 20 cm diameter, with ebonite pillar 50 cm high, on iron base 0. 12. 0

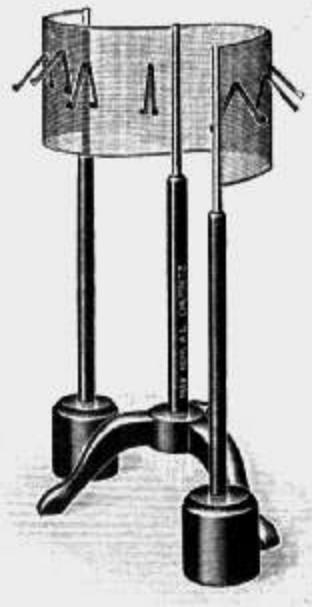
60,265. **Paraffin Plate,** Figure, 20 cm diameter, 5 cm thick 0. 4. 6

60,266. **2 Fixed Sounders,** with ebonite pillar and porcelain base, Figure, with solid balls of 2 cm and hollow cylinders of 6 cm 0. 10. 0

Max Kohl A. G. Chemnitz, Germany.



60 279. 1 : 15.



60 300. 1 : 10.

	£ s. d.
60,267. **Adjustable Sounder** with brass ball, rubber hose and gas outlet tip, on ebonite pillar with iron base, Figure	0. 12. 0
60,268. **2 Pairs Conducting Wires** with lugs and pins, Figure on p. 809	0. 1. 6
60,269. **Connecting Wire,** 50 cm long, with ebonite handle, Figure on p. 809	0. 2. 0
60,270. **Bridge,** Figure, hollow rail with wire inlaid, brass discs and ebonite handles	0. 10. 0
60,271. **Test Disc,** 1 sq. m., with ebonite handle, Figure on p. 809	0. 1. 6
60,272. **1 Test Ball**	0. 1. 0
60,273. **1 Large Leyden Jar,** excellent insulation, of flint glass, 26 cm high	0. 8. 0
60,274. **2 Heavy Iron Stands** and **1 Small Double Cone** of gold paper and silk cord, Figure on p. 809	0. 8. 0
60,275. **Porcelain Rod and Ebonite Rod,** with rubbers, Figure on p. 809	0. 7. 0
60,276. **2 Condenser Plates**	0. 16. 0
60,277. **1 Square Glass Slab**	0. 4. 0
60,278. **6 Ebonite Discs**	0. 1. 0
60,279. **Apparatus for Measuring the Potential Drop in the Neighbourhood of a Conductor** Figure	1. 10. 0

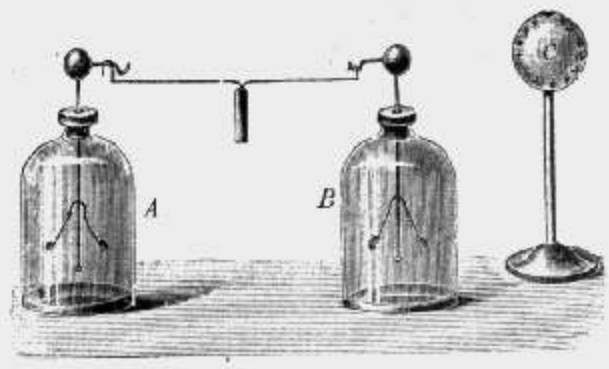
Apparatus for Elementary Electrostatic Measurements as suggested by Dr. Carl Noack, Giessen.

(Abhandlungen zur Didaktik und Philosophie der Naturwissenschaften, Vol. II, part 1, Berlin 1906, published by Julius Springer.)

60,280. **Leaf Electrometer** with 2 insets with aluminium and paper leaves respectively, transparent scale for projection and plate glass scale for subjective reading, Faraday's receptacle and double needle for smoothing the leaf (pp. 14—20, Fig. 7—13)	2. 8. 0
60,281. **Accessories for graduating the Electrometer with a pointed conductor,** consisting of: wire net cage, conductor with fine point, wire netting for making the earth connection, also 1 each test ball of 10, 15 and 20 mm diameter, on long handle (pp. 20—23, Figs. 15 and 16)	2. 8. 0
60,282. **Large Leyden Jar,** 50 cm high, for graduating the electrometer (pp. 23—24)	1. 4. 0
60,283. **Accessories for graduating the electrometer by Faraday's method** (p. 24, Fig. 18), consisting of: 2 sheet iron cylinders of different size, amber ball and insulating cable	0. 16. 0
60,284. **Zamboni Pile for calibrating the electrometer in potential degrees** (p. 25, Fig. 19)	2. 14. 0
60,285. **Sheet Iron Cube** for placing on Leyden Jar No. 60,282 (p. 27, Fig. 20)	0. 5. 6



60270. 1 : 30.



60297. 1 : 10.

	£ s. d.
60,286. **Spherical Condenser,** for external earthing, for determining the capacity of the electrometer (p. 31, Figs. 23 and 24)	0.12.0
60,287. — i d e m, for internal earthing (p. 32, Figs. 25 and 26)	0.12.0
60,288. **Pendulum Discharger,** for measuring the electrometer capacity (pp. 35—38, Fig. 27)	0.15.0
60,289. **Double Spherical Condenser,** for accurately determining the capacity of the electrometer (pp. 40—41, Fig. 28)	1. 2.0
60,290. **Plate Condenser,** for measuring the dielectric constants and cumulative values of condensers (pp. 42—45, Figs. 29 and 30)	4. 5.0
60,291. **High Tension Battery of 200 Daniell Cells,** built in wood box for determining the cumulative values of condensers and for calibrating the electrometer (pp. 48—51, Fig. 31)	3.12.0
60,292. **Simplified Absolute Cylindrical Electrometer,** as suggested by E. Bichat and R. Blondlot (see also Journal de Physique, Series II, 5, p. 325, 1886), with case and protecting cylinder (pp. 51—53, Fig. 32)	5.10.0
60,293. **Spark Micrometer,** for determining spark potentials, with pillar adjustable in the guides by means of micrometer screw (pp. 53—55, Fig. 33)	2. 8.0
60,294. — i d e m, with pillar which, however, is adjusted scissor-wise by a joint (pp. 53—55, Fig. 34)	1. 7.0

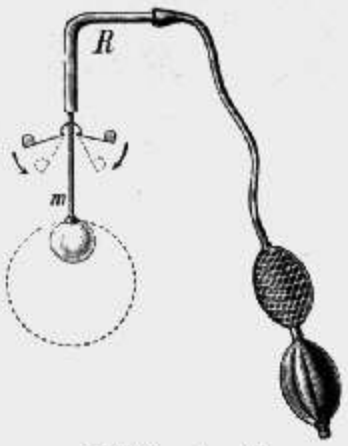
Electrostatic Apparatus as suggested by Bruno Kolbe.

The figures in brackets refer, when not otherwise stated, to the corresponding numbers in the book entitled: Kolbe-Skellon, Introduction to Electricity, I. Part, London, Kegan Paul, Trench, Trübner & Co., Ltd. 1908.

60,161. **Double Electrical Pendulum** with two rotary arms, Fig. 60,161, p. 798 (Fig. 2) . .	0. 8.0
60,175. **Paper Electroscope,** Fig. 60,175, p. 799 (Fig. 3), with nickelled fittings	0.12.0
60,297. **2 Paper Electroscopes,** Figure (Figs. 3, 4, 7, 22, 24, etc.), with nickelled fittings, both balls having holes for inserting the point and the holder for the rods. The following are supplied as accessories: each 1 rod of flint glass, wood, ebonite, sealing wax and fishbone of 350 mm length, 1 discharger (Fig. 24), 1 test ball with 10 metres fine German Silver wire, 1 point bent at right angles (Fig. 22) and 2 holders for the rods The ball on glass pillar illustrated in the figure is not included in the price.	1. 8.0
60,298. **Electric Pendulum with long arm** and 2 balls of different colour (Fig. 5)	0. 4.0
60,299. **Electric Needle,** as suggested by Gustav Wiedemann (Fig. 6), consisting of a light ebonite tube with 1 glass and 1 ebonite disc at the ends, 1 wire bow with silk thread and 1 second ebonite tube with leather and catskin disc on wood board at the ends For the same apparatus swinging on insulated stand with point, see No. 60,162, p. 798.	0.12.0
60,300. **Flexible Wire Netting,** as suggested by Vanderfliet and Kolbe, for demonstrating electric distribution, Figure (Figs. 9 and 10), with a number of movable paper leaves and with 2 insulated stands	0.12.0

When the wire netting in the charged state is bent, the paper leaves are more strongly repelled on the external curved side, corresponding to the accumulation of electricity, while the leaves on the inner side no longer show any repulsion.

Max Kohl A. G. Chemnitz, Germany.



60 301. 1 : 10.



60 307. 1 : 10.



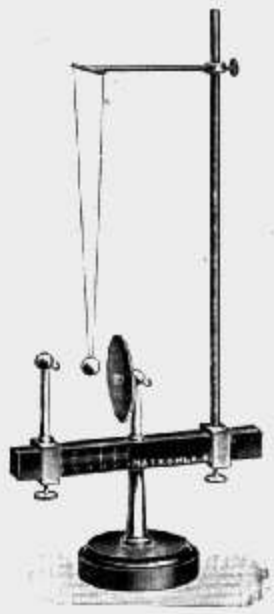
60 316. 1 : 12.

	£ s. d.
60,301. **Soap Bubble Apparatus,** for proving electrical density, F i g u r e (Fig. 12), with test electroscope and rubber bulbs	0. 12. 0
If the soap bubble is blown up, the leaves of the electroscope collapse proportionally to the slight electric density on the larger surface of the soap bubble.	
60,196. **Aluminium Electrometer,** F i g. 60,196, p. 802 (Fig. 15), with calibrated projection scale and amber tube in ebonite plug, 1 ball 10 mm diameter, 2 condenser plates (varnished) with 1 ebonite handle, 1 extra ebonite plug with amber tube, conducting rod and paper leaves	3. 0. 0
The sheet iron case is 130 mm high, 140 mm wide and 95 mm deep.	

Accessories for Aluminium Electrometer.

60,197. **Projection Degree Scale** for inserting, divided on mica	0. 6. 0
60,198. **2 Pieces Sheet Iron** for inserting, with C-shaped pieces cut out, for quantitative experiments	0. 4. 0
60,199. **Hollow Ball** for screwing on, 50 mm diameter, and 2 Insulated Test Balls for graduating	0. 6. 0
60,306. **Brass Rod with 2 Balls,** nickelled (Fig. 26 a)	0. 1. 0
For Kolbe Projection Apparatus: see Vol. I of this Price List, p. 167, Nos. 50,855—50,866.	
60,307. **Conical Conductor,** F i g u r e (Fig. 14), for proving the different distribution of electricity on the surface of an insulated conductor, nickelled, with 3 test balls of 15, 10 and 5 mm, on ebonite hafts	1. 0. 0
60,200. **Test Electroscope,** F i g. 60,200 on p. 802 (Fig. 17)	0. 6. 0
60,309. **Wire Net Cylinder** with sheet iron bottom, for screwing on the electrometer (Fig. 20)	0. 3. 0
60,310. **Ebonite Rod** with amalgamed leather rubber (Fig. 20)	0. 2. 0
60,311. **4 Nickelled Hollow Balls** of 20, 10, 10 and 5 cm diameter on insulating stands (Fig. 22), for experiments on electric density with equal charge	2. 0. 0
If Ball No. 60,199 is already available, this can be omitted, and the price it then reduced to £ **1. 16. 0.**	
60,183. **Aluminium Electroscope** with degree scale, F i g. 60,183 on p. 800 (Fig. 26 B) . .	0. 18. 0
60,313. **Glass Plate** for the screening effect of electricity (Fig. 27).	0. 1. 6
60,314. **Ebonite Plate** for the same (Fig. 27)	0. 3. 0
60,315. **White Metal Sheet Plate** for the same (Fig. 27)	0. 1. 0
60,316. **Wire Net Cylinder and Sheet Iron Plate,** F i g u r e (Fig. 28), for showing that electricity resides only on the surface	0. 10. 0
60,317. **Candle Holder** with wire net for placing on same (Fig. 29)	0. 5. 0
60,221. **Pendulum Electrometer** (Odstreil's), simple construction (Fig. 30), see F i g. 60,221 on p. 804	1. 0. 0
60,319. **1 Pair Air Condenser Plates** (Fig. 34), 15 cm diameter, polished quite plane, nickelled, with ebonite handle, on insulating stand and with 1 mica plate 19 cm diameter . .	1. 8. 0

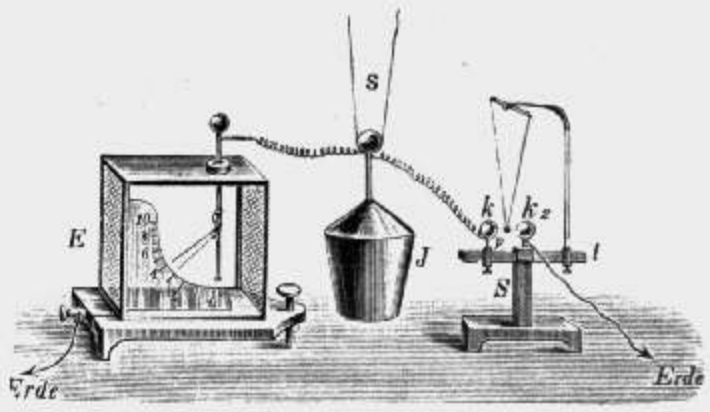
Max Kohl A. G. Chemnitz, Germany.



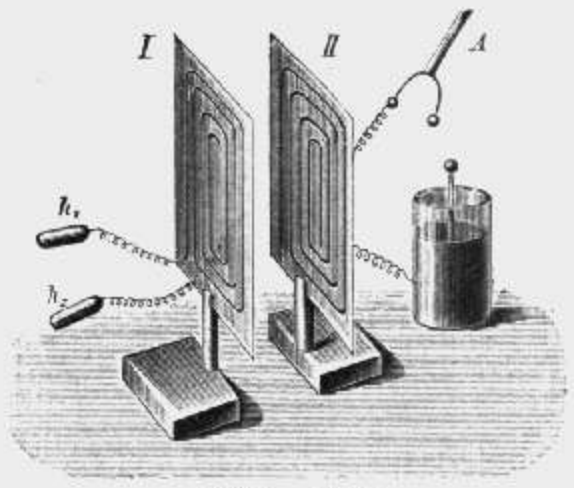
60 325 A. 1 : 5.



60 337. 1 : 4.



60 325 B. 1 : 8.



60 334. 1 : 10.

Mica Plates for Condensers, singly.

	List No.	60,320	60,321	60,322
	Diameter mm	120	150	190
	Each £	**0. 1. 0**	**0. 2. 6**	**0. 5. 0**

£ s. d.

60,200 a. **Small Auxiliary Electroscope,** on base (Fig. 34), Fig. 60 200 a on p. 802 . . . . 0. 3. 0

60,324. **Standard Condenser** (Fig. 37), for screwing on aluminium electroscope No. 60,183, 80 mm diameter, polished quite plane and varnished, in case, for calibrating the electrometer 0. 18. 0

60,325. **Capacity Meter,** Figs. A and B (Fig. 42), for Leyden jars, hollow balls, etc., without the Leyden jar and electrometer illustrated in Fig. B 1. 8. 0
For the experiment the extra ebonite plug with the paper leaf must be inserted in the electrometer.

60,326. **Air Condenser, on Stand,** (Fig. 43) with sliding plates and millimetre graduation . 2. 5. 0

60,327. **Paraffin Plate,** 180 mm in diameter, 20 mm thick, with ebonite handle, for the Air Condenser 0. 3. 0

60,328. **Ebonite Plate,** 180 mm diameter, 10 mm thick 0. 6. 0

60,329. **Mica Disc,** 180 mm in diameter, 1 mm thick 0. 6. 0

60,330. **Mica Disc,** thin, lacquered on both sides 0. 4. 0

60,540. **Apparatus for Igniting Ether** or the like (Fig. 47), Fig. 60,540 on p. 826 . . . 0. 10. 0

60,388. **Model of a Dubrowsky Influence Machine,** Figs. 60,388 A and B on p. 817, with fixing clamp (Fig. 48, see also Ztschr. f. d. phys. u. chem. U. **9,** p. 223), with an exciter plate, a Leyden jar and connecting leads, without Geissler tube 2. 8. 0

60,333. **Small Amalgamated Zinc Plate** with hook (Fig. 53) 0. 0. 6

60,334. **2 Induction Spirals,** Figure (Fig. 57), on ebonite plates with handles, for demonstrating electric induction (Gan.-Rein., Fig. 969) 1. 4. 0

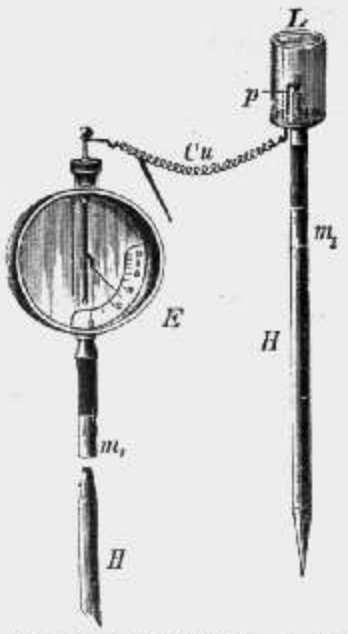
60,335. **Candle Holder** with ebonite handle and platinum wire (Fig. 60) 0. 4. 0

60,336. **Paraffin Block** for insulating the electrometer (Fig. 60) 0. 6. 0

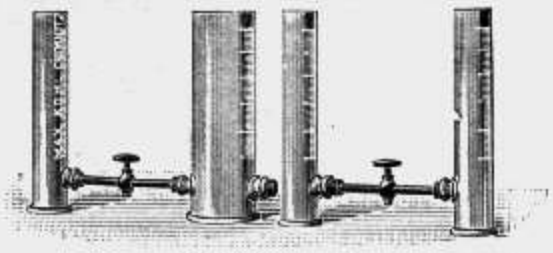
60,337. **Apparatus for Electric Lines of Force,** Figure (Fig. 62), with brass ring for screen effect 0. 6. 0

Cl. 8585, 2118
5417, 2119.

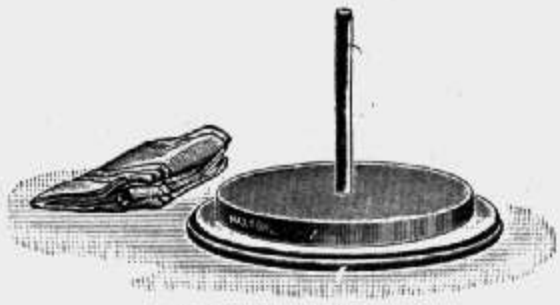
Max Kohl A. G. Chemnitz, Germany.



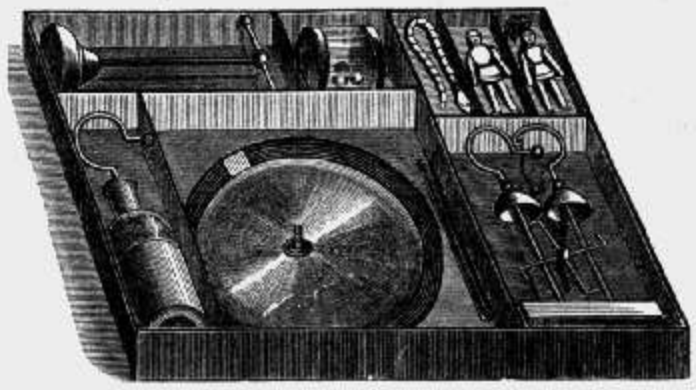
60 338 and 60 339. 1 : 10.



60 340. 1 : 14.



60 358. 1 : 6.



60 362. 1 : 5.

60,338. **Electrometer for Atmospheric Electricity,** Figure (Fig. 63), with volt scale on plate glass and with long wood rod . . . . . £ 3. 0. 0
The instrument is very finely constructed and has a good suspension for the leaf.

60,339. **Flame Collector,** Figure (Fig. 63), with 3 wood rods which may be screwed together 1. 10. 0

60,340. **Communicating Water Vessels,** Figure (Figs. 64 and 65), with depth graduation, 2 of equal and 2 of unequal diameter, connecting tube with stop-cock 1. 4. 0

60,341. **Small Lead Plate on ebonite rod** (Fig. 67) 0. 1. 0

Auxiliary Apparatus and other Accessories.

60,342. **50 m of Fine, Bare Copper Wire** 0. 1. 0

60,343. **25 Sheets Aluminium Foil** 0. 0. 9

60,344. **Forceps** for smoothing the aluminium leaves 0. 1. 0

60,345. **Amber,** long piece with natural surface 0. 5. 0

60,346. **Glass Rod** (Fig. 1), 40 cm long, 20—25 mm thick, with amalgamated leather . . 0. 5. 0

60,347. **Ebonite Rod** (Fig. 1), 40 cm long, 20—25 mm thick 0. 5. 0

60,348. **Piece of Steatite,** with ebonite handle (for experiments on pp. 13 and 15), with boring fitting for the stand of the conical conductor (Fig. 18) 0. 5. 0

60,360. **Ebonite Electrophorus,** 32 cm diameter 0. 18. 0

60,583. **Leyden Jar,** collapsible, 26 cm high (Figs. 39 and 42) 0. 14. 0

60,580 **Leyden Jar** with fixed foiling, 26 cm high (Fig. 56) 0. 8. 0

60,365. **Winter's Frictional Electricity Machine** (Fig. 44), 36 cm diameter, with iron base and ebonite axis 4. 0. 0

60,370. — idem, with wood base and glass axis 3. 10. 0

60,391. **Töpler's Self-Exciting Influence Machine,** 36 cm diameter 3. 10. 0

60,435. **Wimshurst's Machine** (self-exciting), with ebonite plates 35 cm diameter 3. 10. 0

Electrophorus.

Electrophorus, of ebonite, Figure, with metal base, double walled metal cover on ebonite handle and with burled silk rubber (Gan.-Rein., Fig. 738).

List No.	60,357	60,358	60,359	60,360
Diameter cm	17	21	26	32
£	**0. 10. 0**	**0. 12. 0**	**0. 15. 0**	**0. 18. 0**

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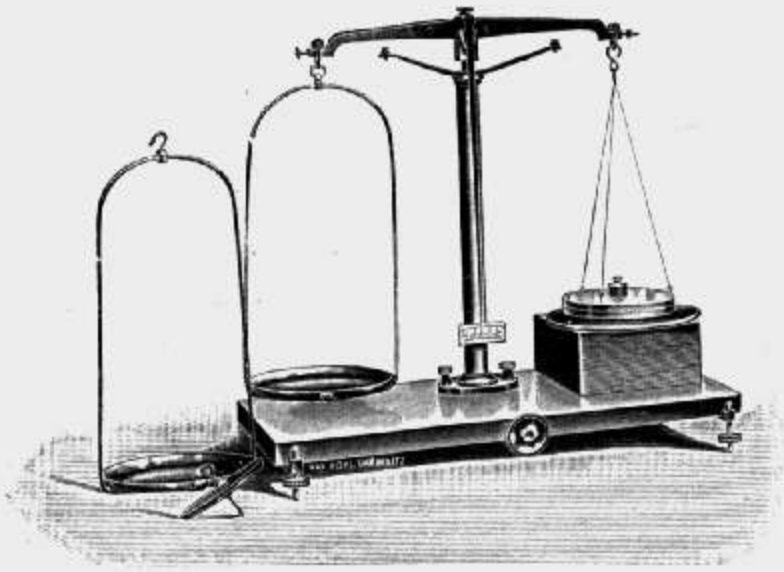
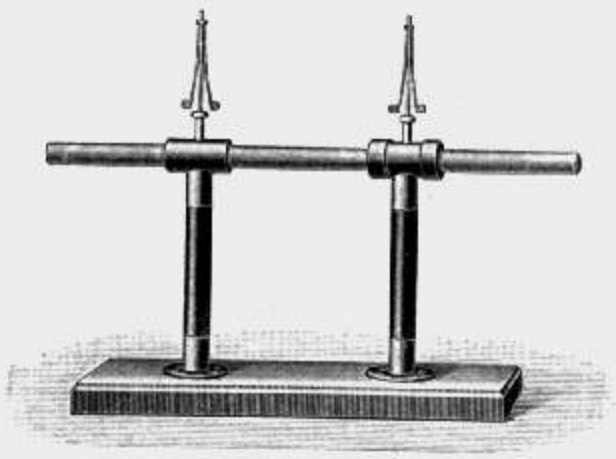
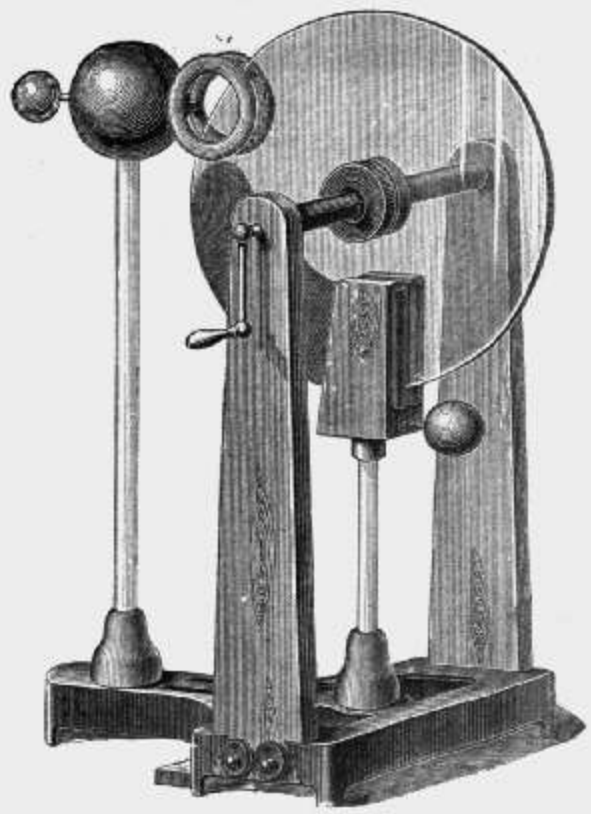


60 363. 1 : 9.



60 364.



60 365 — 60 369. 1 : 8 — 1 : 16.

60,361. **Electrophorus of Palmieri insulating material** (W. D., p. 659 [600]), 26 cm, with metal base, double walled metal cover with ebonite handle and burled silk rubber . . . . £ 0. 12. 0

60,362. **Electrophorus of ebonite,** Figure, 21 cm diameter, with metal cover and auxiliary apparatus, both in box 0. 18. 0

Auxiliary apparatus: 1 small Leyden jar, 1 chime of bells, 1 electric wheel, 1 set dancing balls, 3 elder pith figures, 1 discharger, 2 electric pendulums, 1 ebonite plate for Lichtenberg's dust figures, 1 set instructions.

60,363. **Tyndall's Electrophorus,** Figure (Tyndall, Heat, Fig. 23) 4. 0. 0

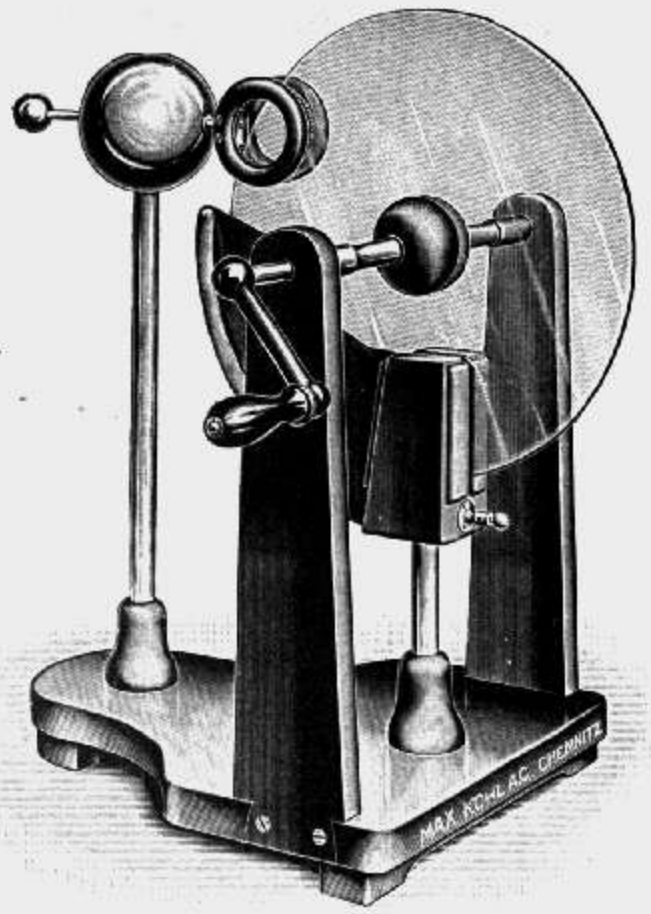
The cover of the electrophorus is suspended from a balance. When the Electrophorus is excited and the cover placed on, a considerable weight is necessary to lift it off. The beam can be used both as an ordinary balance and a hydrostatic balance when the electrophorus is detached.

Frictional Electric Machines, Influence Machines and Auxiliary Apparatus.

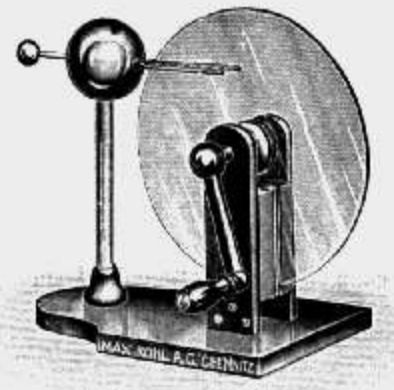
60,364. **Bar Machine** (Grimschl's), Figure (Ztschr. f. d. phys. u. chem. U. **15**, p. 284), for demonstrating the mode of action of the frictional electricity machine, especially the electricity of the rubber 1. 8. 0

Disc Machine, Figure (W. D., Fig. 446 [419]), with iron base and ebonite axis, solidly constructed.

List No.	60,365	60,366	60,367	60,368	60,369
Diameter of Discs cm	36	42	50	60	70
£	4. 0. 0	5. 0. 0	6. 10. 0	8. 0. 0.	10. 0. 0



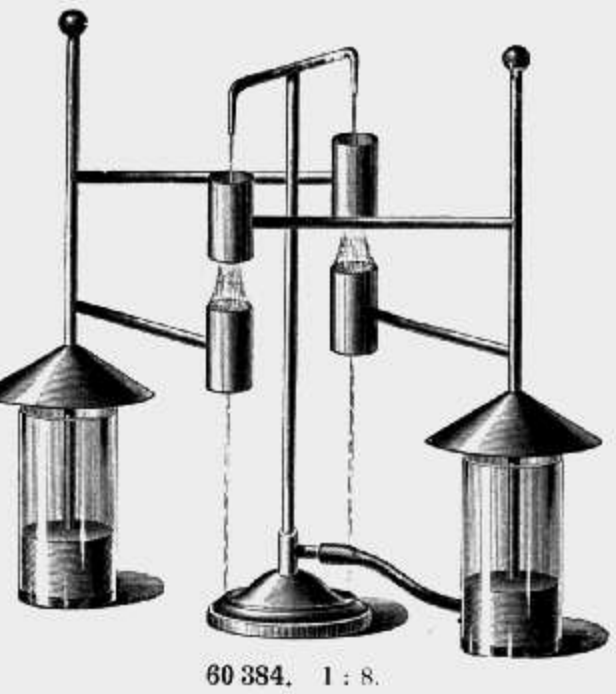
60 370 — 60 374. 1 : 6 — 1 : 12.



60 380. 1 : 8.



60 381. 1 : 6.



60 384. 1 : 8.

Disc Electric Machine, Figure, with wood base and glass axis, disc mounted in wood:

						£ s. d.
List No.	**60,370**	**60,371**	**60,372**	**60,373**	**60,374**	
Diameter of Discs cm	36	42	50	60	70	
£	**3. 10. 0**	**4. 0. 0**	**5. 0. 0**	**6. 10. 0**	**8. 0. 0**	

Winter's Ring for the preceding machines, for considerably increasing the percussive distance.

List No.	**60,375**	**60,376**	**60,377**	**60,378**	**60,379**	
Diameter cm	36	42	52	60	70	
£	**0. 15. 0**	**0. 18. 0**	**1. 4. 0**	**1. 10. 0**	**1. 16. 0**	

60,380. **Electric Machine,** Figure, simple construction, with 26 cm diameter disc, without ring 1. 10. 0

60,381. **Small Electrical Machine,** Figure, for exciting influence machines 1. 10. 0

60,382. **Electrical Machine** (Ramsden's), Figure, with 2 rubbers and 2 conductors, on polished wood table, elegantly constructed, disc 65 cm diameter (Gan.-Man., Fig. 661; Gan.-Rein., Fig. 736). 16. 0. 0

60,383. **Kienmayer's Amalgam** . . . . . per 75 g 0. 1. 0

60,384. **Water Influence Machine,** Figure (W. D., Fig. 444 [417]) 2. 10. 0

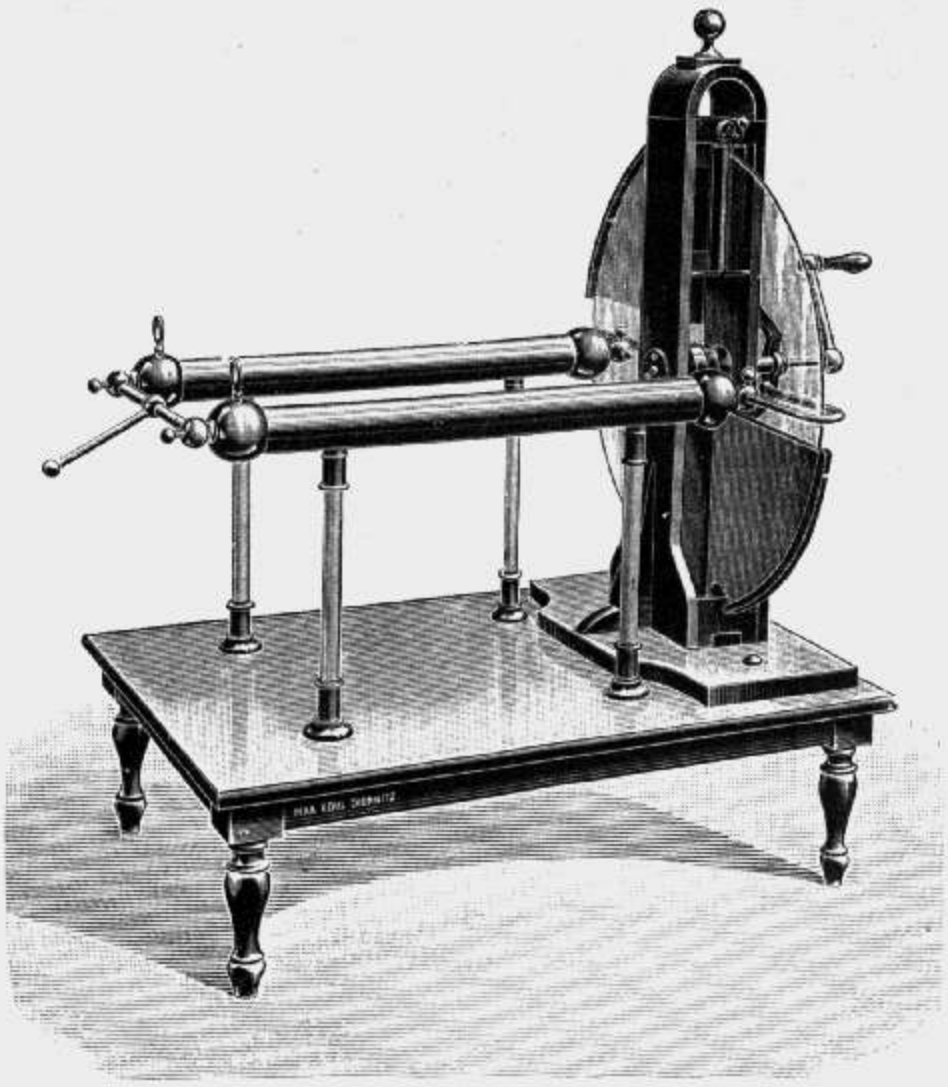
60,385. **Sand Influence Machine** 3. 0. 0

60,386. **Armstrong's Steam Electrical Machine,** simplified model, without steam boiler . . 6. 0. 0

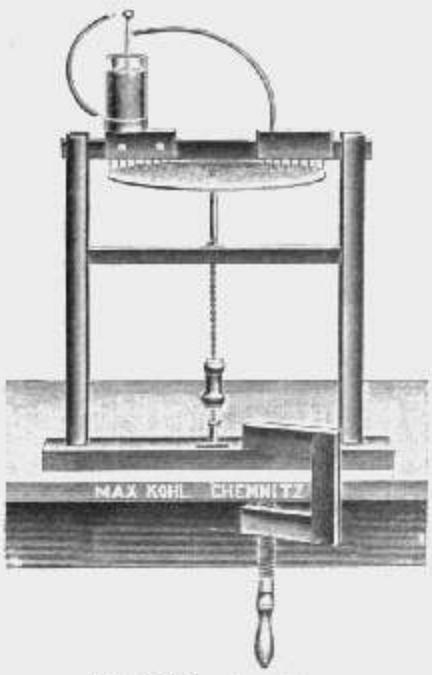
60,387. **Steam Generator** for above, gas heated 8. 0. 0

Cl. 5745, 5803, 5804, 2130.

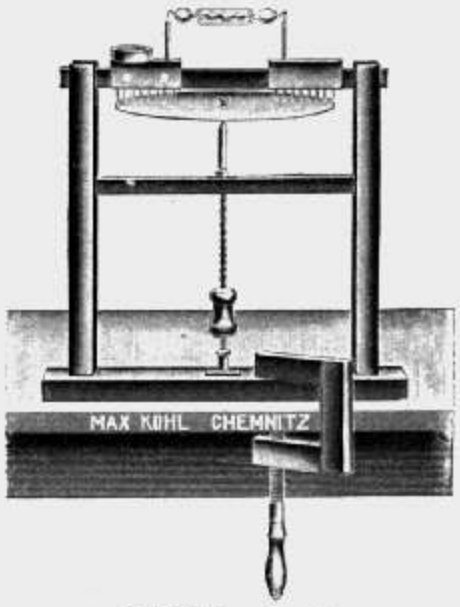
Max Kohl A. G. Chemnitz, Germany.



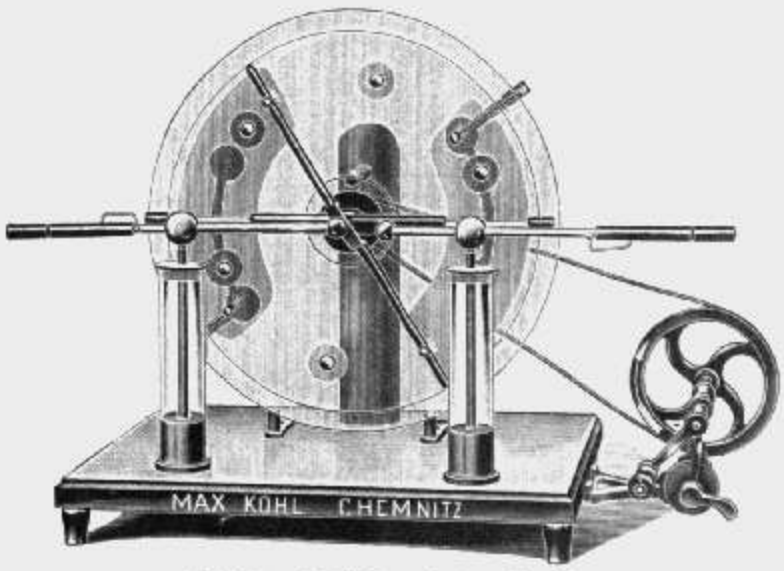
60 382. 1 : 10.



60 388 B. 1 : 10.



60 388 A. 1 : 10.

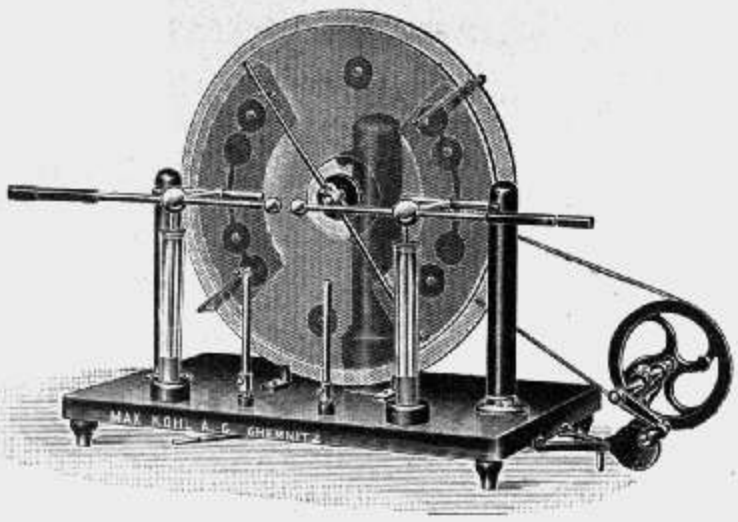


60 389 — 60 396. 1 : 5 — 1 : 13.

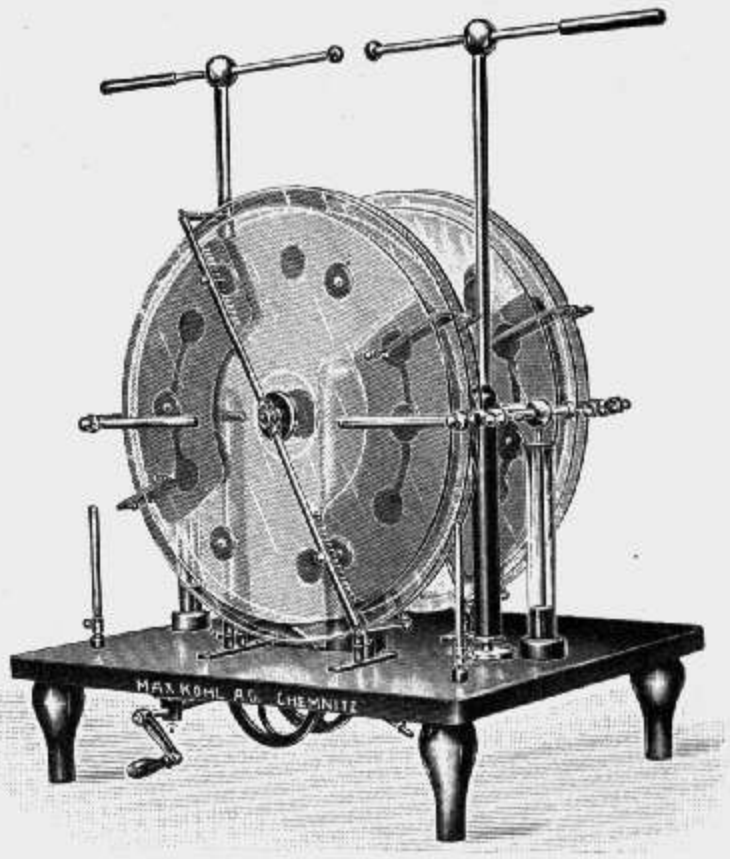
60,388. **Model of a Dubrowski Influence Machine,** Figs. A and B, with fixing clamp (Ztschr. f. d. phys. u. chem. U. **9**, p. 223), with an exciter plate, a Leyden jar and connecting leads, without Geissler tube . . . . . £ 2. 8. 0

Self-Exciting Influence Machine, as suggested by Töpler, with 1 fixed and 1 rotating plate, can be recommended as most practical in all respects; without ebonite pillars, combs resting on the fixed axis, stand of polished alder wood.

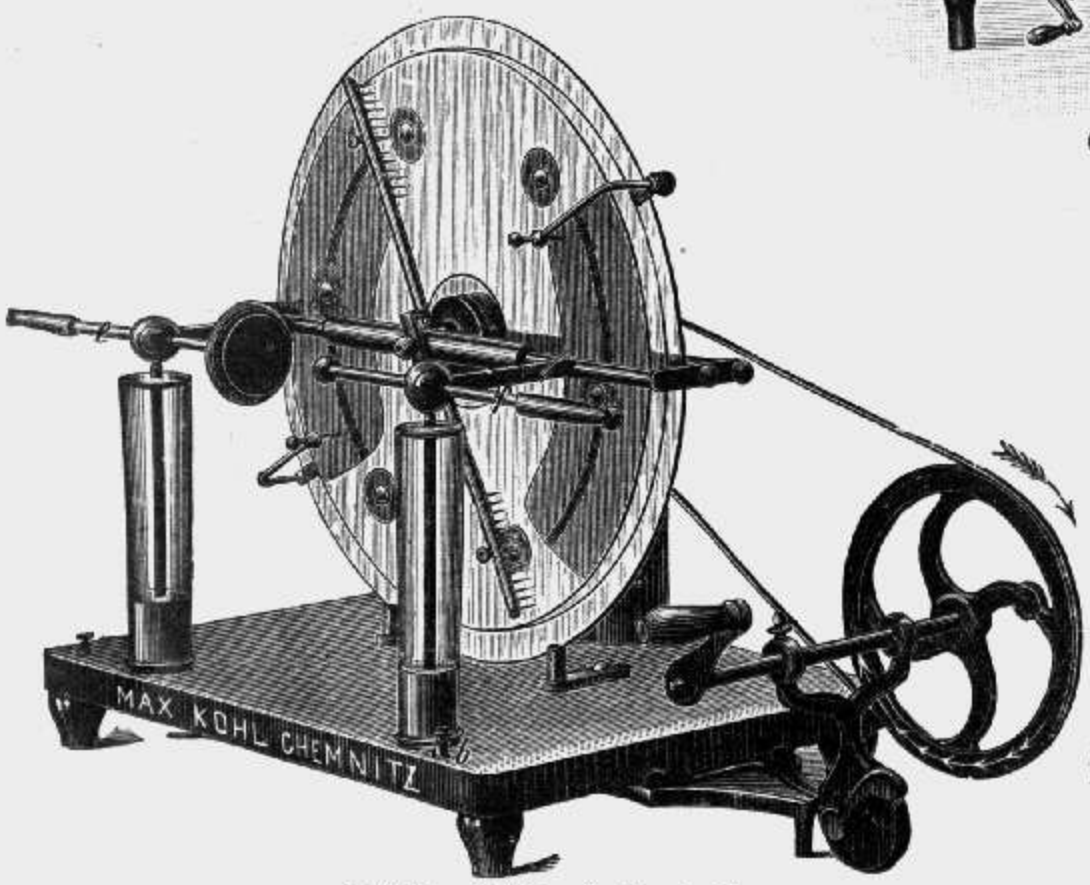
List No.	**60,389**	**60,390**	**60,391**	**60,392**	**60,393**	**60,394**	**60,395**	**60,396**
Diameter of rotating plates	26	31	36	41	47	52	57	62 cm
£	**1. 15. 0**	**2. 10. 0**	**3. 10. 0**	**4. 5. 0**	**6. 0. 0**	**7. 0. 0**	**11. 10. 0**	**16. 0. 0**



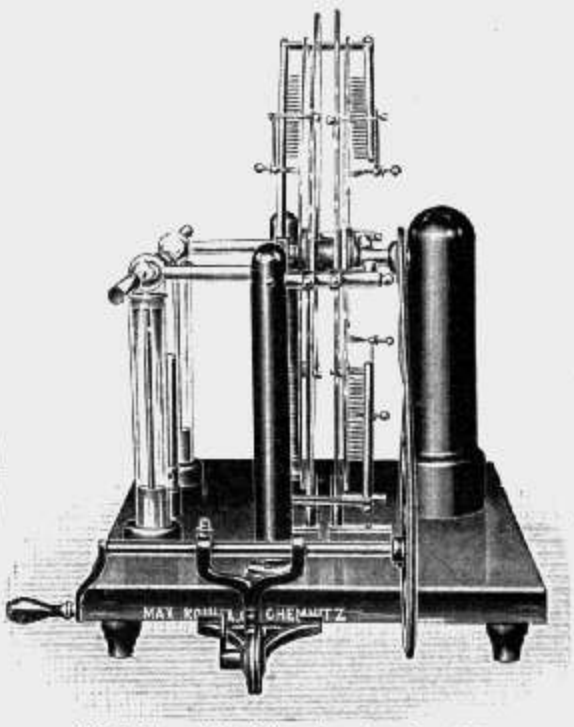
60 397 — 60 406. 1 : 6 — 1 : 24.



60 417 — 60 424. 1 : 11 — 1 : 27.



60 425 — 60 430. 2 : 7 — 1 : 7.



60 407 — 60 416. 1 : 8 — 1 : 27.

Self-Exciting Influence Machine, as suggested by Töpler, with 1 fixed and 1 rotating plate, Figure, with massive ebonite pillars on which the discharging combs are placed, in order to be able to remove the plates forth; with stand of polished mahogany.

										£ s. d.
List No.	**60397**	**60,398**	**60,399**	**60,400**	**60,401**	**60,402**	**60,403**	**60,404**	**60,405**	**60,406**
Diameter of rotating disc.	26	31	36	41	47	52	57	62	75	90 cm
£	**3. 10. 0**	**4. 10. 0**	**6. 0. 0**	**7. 5. 0**	**9. 5. 0**	**10. 10. 0**	**15. 15. 0**	**20. 0. 0**	**27. 0. 0**	**30. 0. 0**

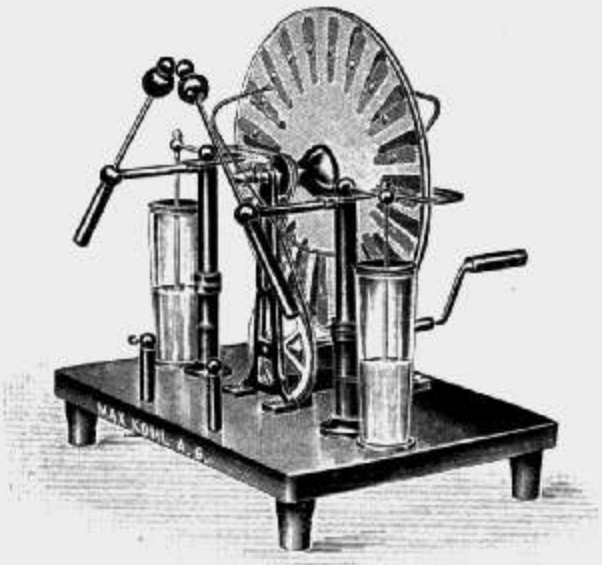
Self-Exciting Influence Machine, as suggested by Töpler, Figure, with 2 fixed and 2 rotating plates, base and pillars of mahogany, discharging combs fixed on ebonite pillars, very neatly constructed and producing twice the quantity of electricity as those with only two plates.

List No.	**60,407**	**60,408**	**60,409**	**60,410**	**60,411**	**60,412**	**60,413**	**60,414**	**60,415**	**60,416**
Diameter of rotating plates	26	31	36	41	47	52	57	62	75	90 cm
£	**6. 15. 0**	**8. 10. 0**	**11. 0. 0**	**13. 10. 0**	**17. 5. 0**	**19. 0. 0**	**25. 0. 0**	**29. 5. 0**	**32. 10. 0**	**41. 5. 0**

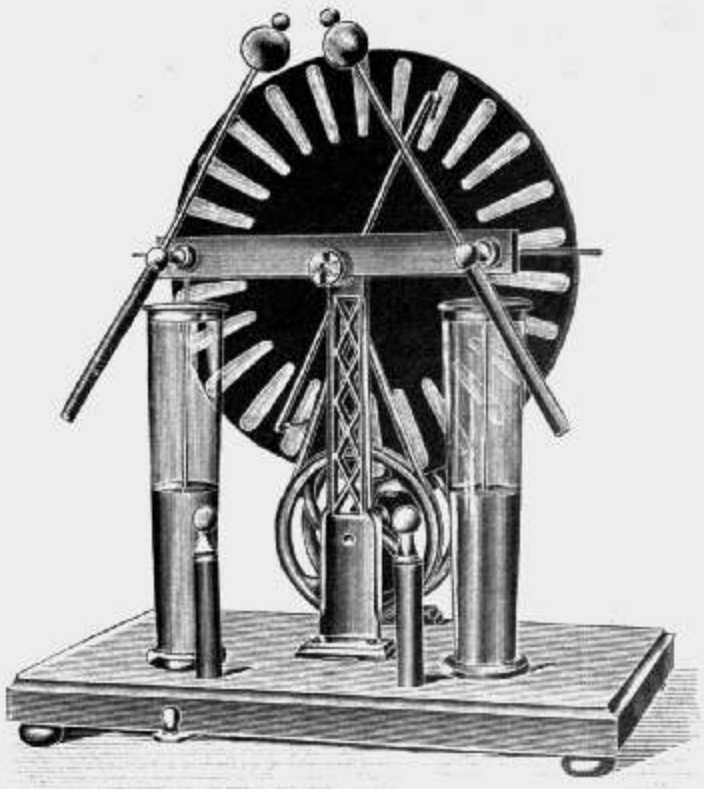
Cl. 5707, 5599, 2134, 5709.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



60431 and **60432.** 1 : 10 and 1 : 12.



60433 — 60438. 1 : 5 — 1 : 10.

Self-Exciting Influence Machine, as suggested by Töpler, Figure, with 4 rotating and 4 fixed plates, wood parts of walnut, very elegantly constructed:

£ s. d.

List No.	**60,417**	**60,418**	**60,419**	**60,420**	**60,421**	**60,422**	**60,423**	**60,424**
Diameter of rotating plates	36	41	47	52	57	62	75	90 cm
£	**15. 0. 0**	**18. 0. 0**	**21. 0. 0**	**24. 0. 0**	**29. 5. 0**	**37. 10. 0**	**45. 0. 0**	**56. 5. 0**

Self-Exciting Influence Machine, as suggested by Töpler, Figure, with 2 rotating and 1 fixed plate, without ebonite pillars, producing half as much electricity again as the machines with only 2 plates.

List No.	**60,425**	**60,426**	**60,427**	**60,428**	**60,429**	**60,430**
Diameter of rotating plates	26	31	36	41	47	52 cm
£	**2. 0. 0**	**2. 15. 0**	**4. 0. 0**	**4. 15. 0**	**6. 15. 0**	**8. 5. 0**

Self-Exciting Influence Machine (Wimshurst's), Figure, with double rotation, with 2 glass plates, polished base. These machines work **without alternation and are independent of atmospheric humidity** (Gan.-Man. Fig. 667; Gan.-Rein. Fig. 747).

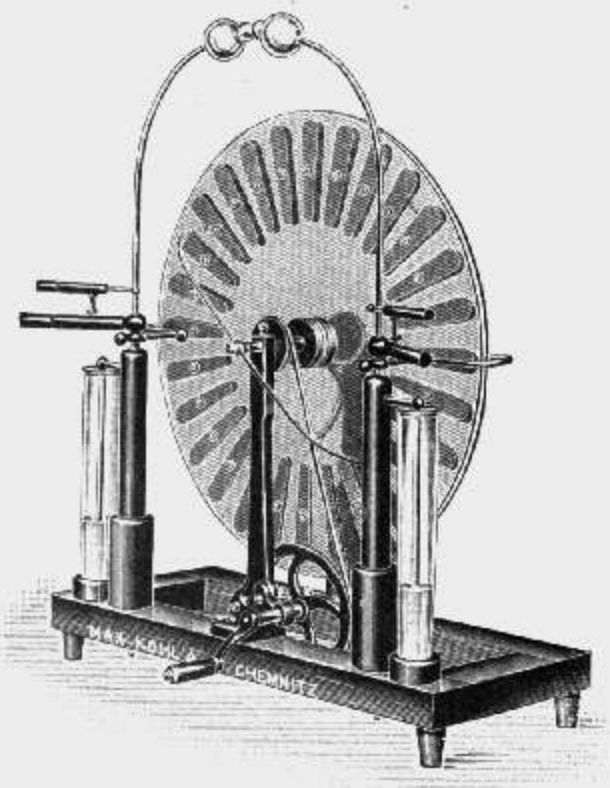
List No.	**60,431**	**60,432**
Diameter of plates	26	31 cm
£	**1. 10. 0**	**2. 0. 0**

Self-Exciting Influence Machine (Wimshurst's), Figure, with double rotation, with two ebonite plates and wood stand.

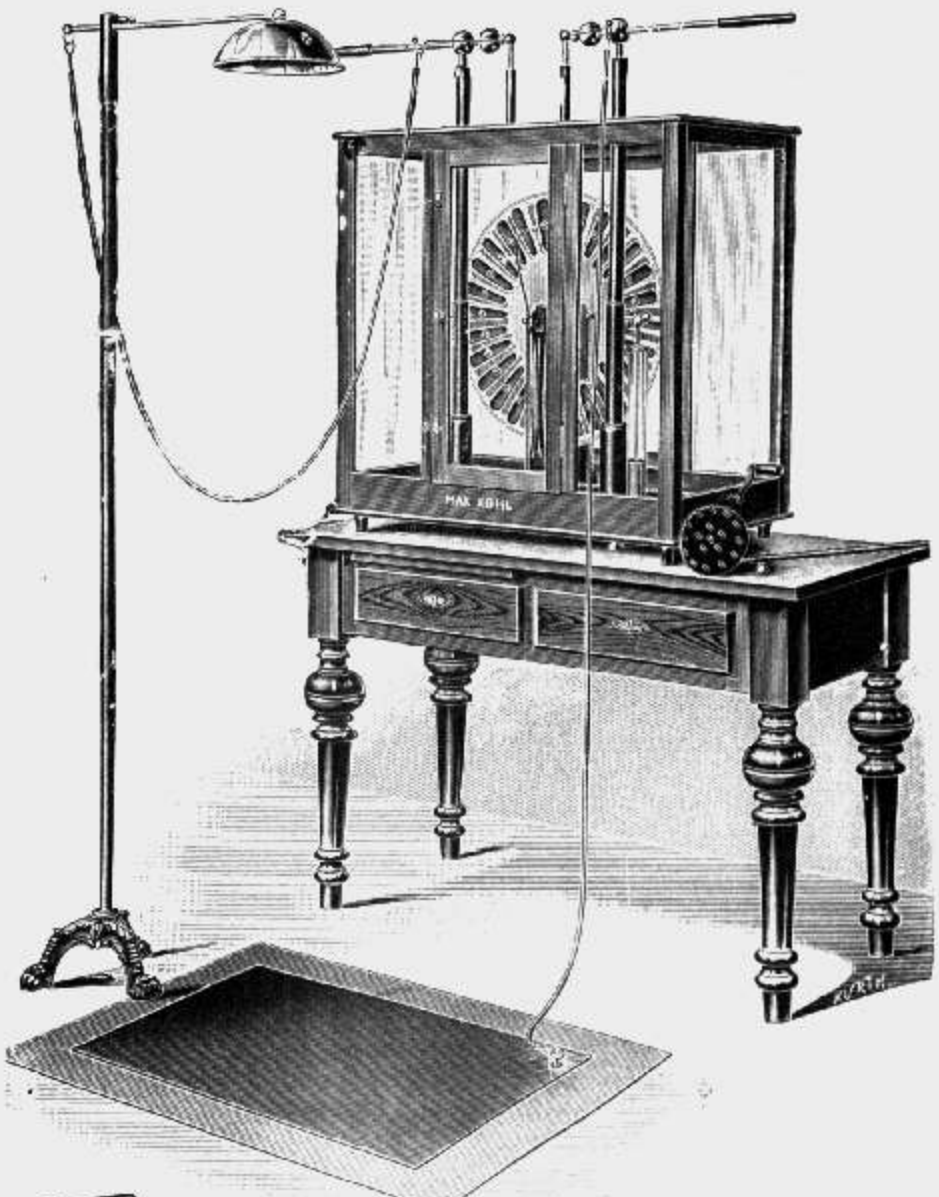
List No.	**60,433**	**60,434**	**60,435**	**60,436**	**60,437**	**60,438**
Diameter of plates	25	30	35	40	45	50 cm
£	**1. 10. 0**	**2. 10. 0**	**3. 10. 0**	**4. 10. 0**	**6. 0. 0**	**7. 0. 0**

Self-Exciting Influence Machine (Wimshurst's), Figure on p. 820, with double rotation and 2 glass plates, base-board of mahogany, insulating pillars of ebonite, with iron supports and drive.

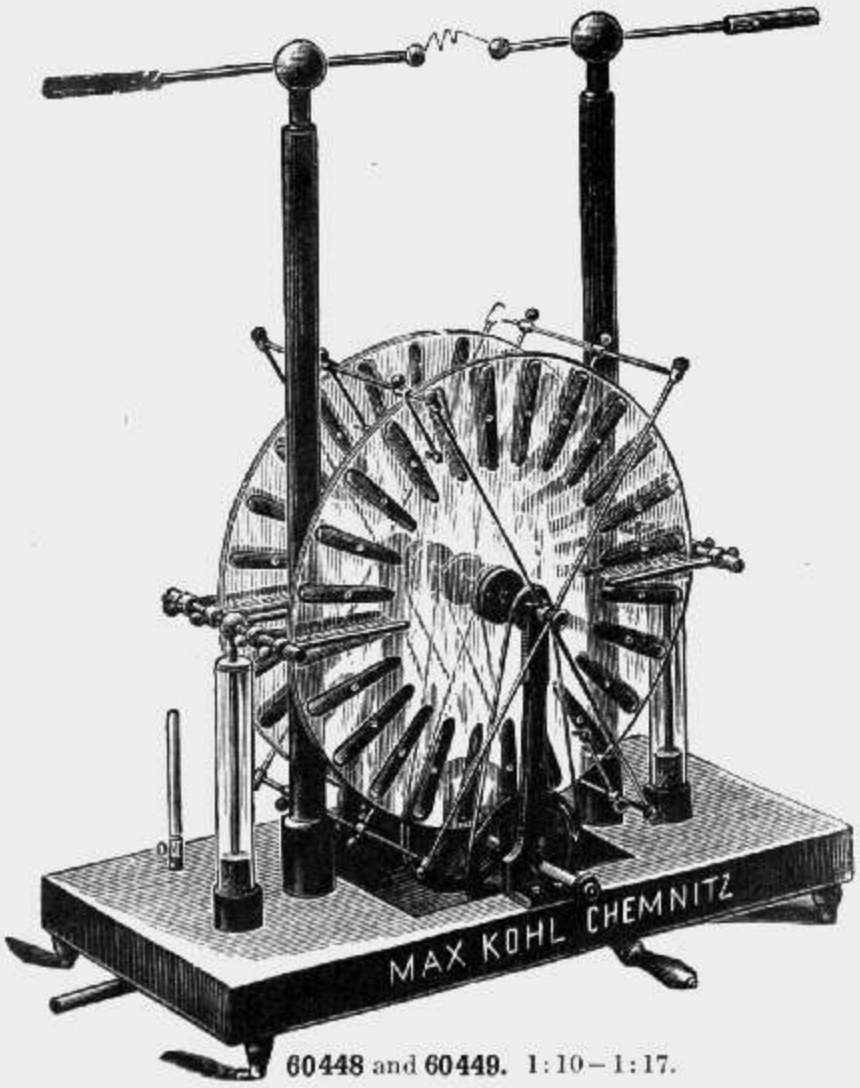
List No.	**60,439**	**60,440**	**60,441**
Diameter of plates	41	52	62 cm
£	**4. 15. 0**	**6. 15. 0**	**8. 5. 0**



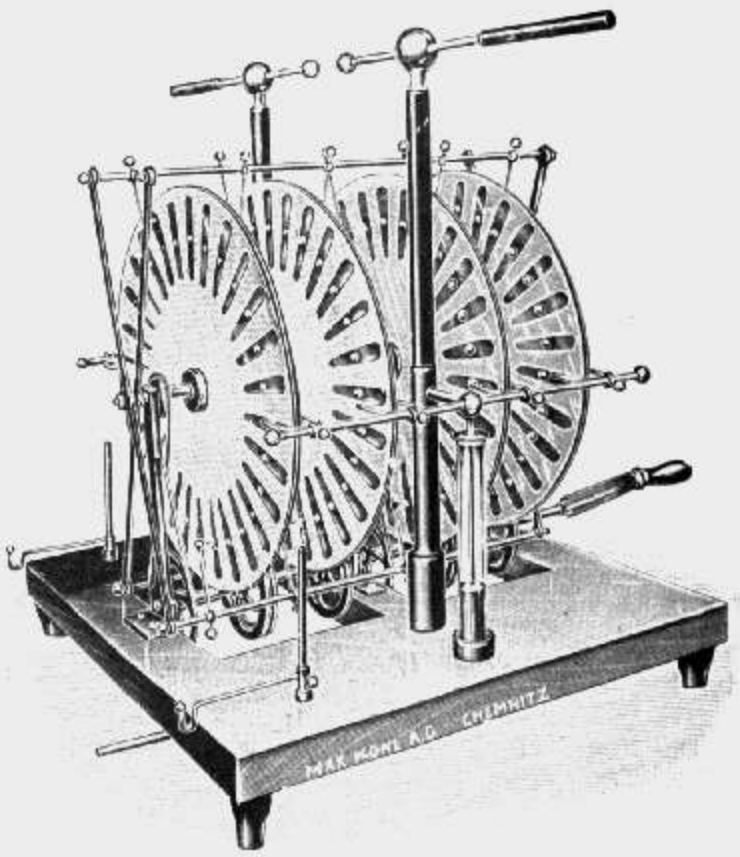
60439 — 60441. 1 : 8 — 1 : 12.



60442 — 60463/69. 1 : 16.



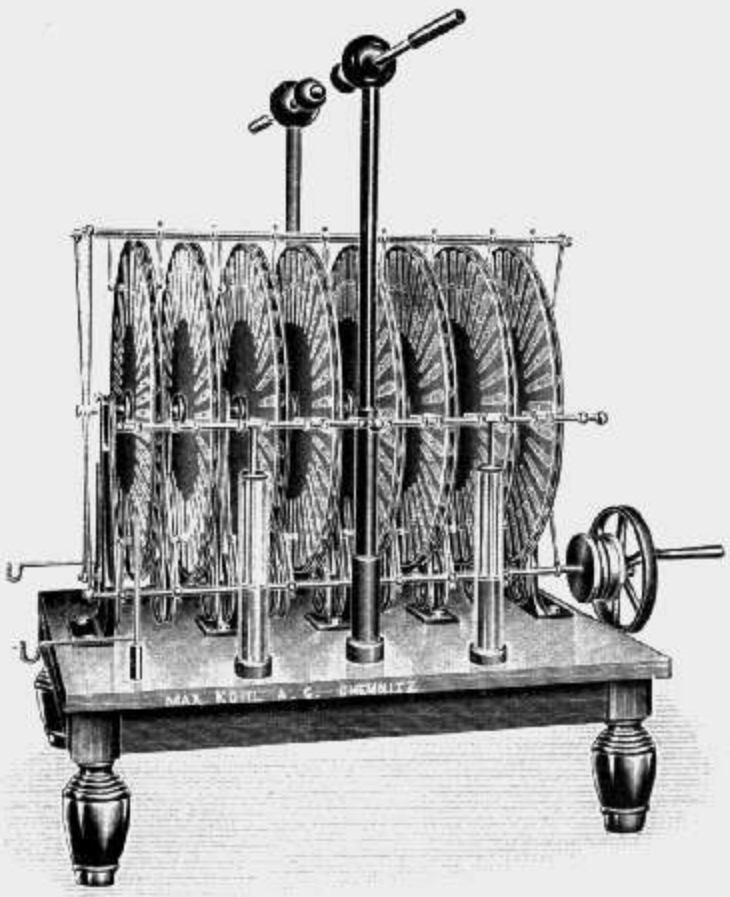
60448 and 60449. 1:10 — 1:17.



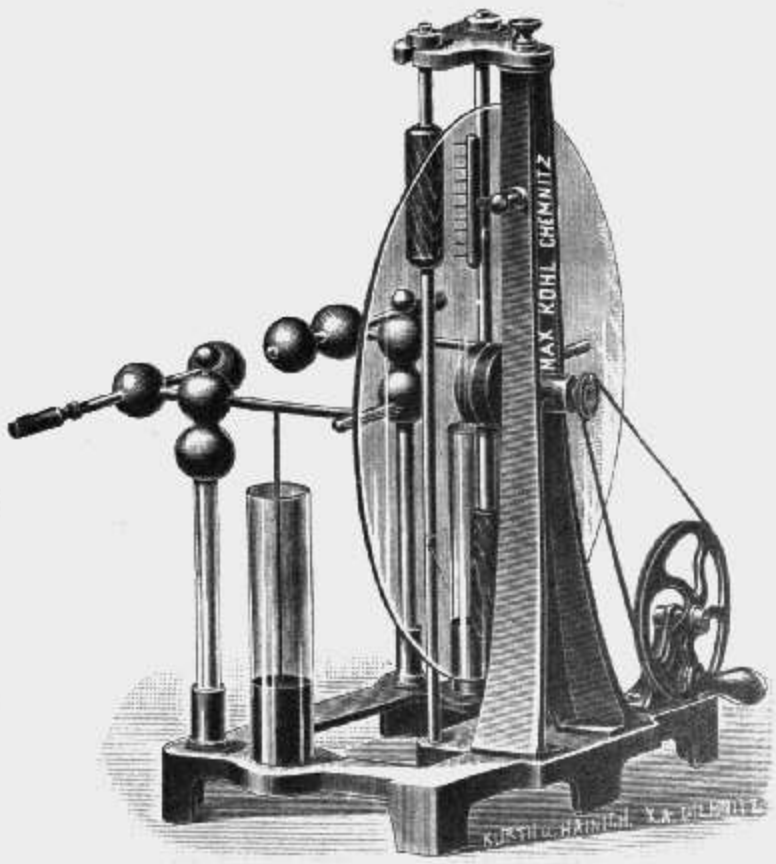
60450 — 60453. 1 : 10 — 1 : 18.

Cl. 5708, 2140, 2137, 5733.

Max Kohl A. G. Chemnitz, Germany.



60 458 — 60 461. 1 : 10 — 1 : 18.



60 470. 1 : 7 — 1 : 14.

Self-Exciting Influence Machine (Wimshurst's), double rotation, with 2 glass plates, specially suitable for Franklinization, Fig. 60,442, without table and other accessories illustrated. £ s. d.

Diameter of plates	52	62 cm
List No.	**60,442**	**60,443**
With Glass Cupboard £	**16. 0. 0**	**18. 0. 0**
List No.	**60,444**	**60,445**
Without Glass Cupboard £	**11. 0. 0**	**13. 0. 0**

Self-Exciting Influence Machine (Wimshurst's), with double rotation, with 4 glass plates.

Diameter of plates	52	62 cm
List No.	**60,446**	**60,447**
With Glass Cupboard, Fig. 60,442 £	**18. 0. 0**	**20. 0. 0**
List No.	**60,448**	**60,449**
Without Glass Cupboard, Figure £	**13. 0. 0**	**15. 0. 0**

Self-Exciting Influence Machine (Wimshurst's), with double rotation, with 8 glass plates, Figure, with four times the effect of the 2-plate machines.

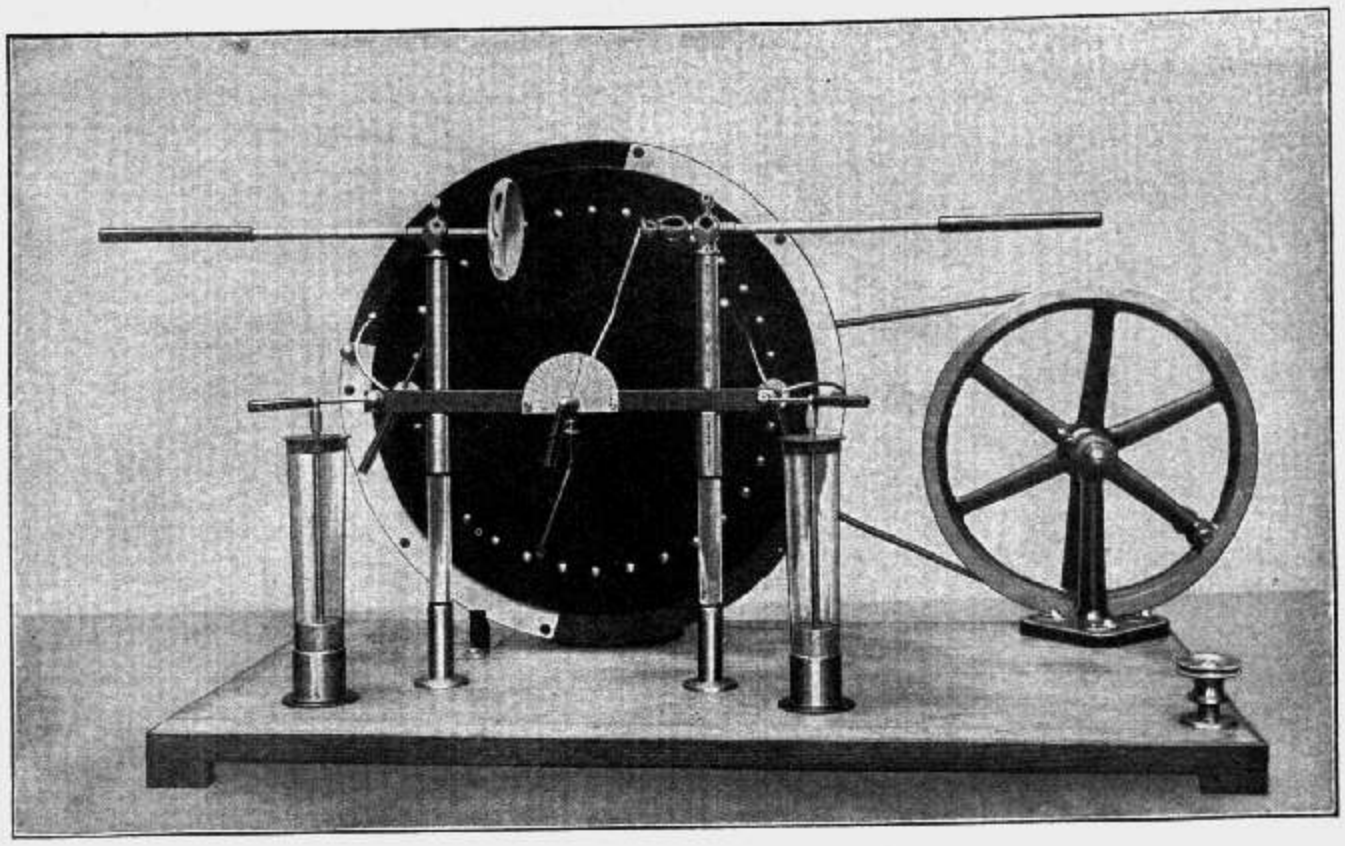
List No.	**60,450**	**60,451**	**60,452**	**60,453**
Diameter of plates	52	62	75	90 cm
£	**18. 10. 0**	**22. 10. 0**	**32. 10. 0**	**40. 0. 0**

— idem, with **12** glass plates, with six times the effect of the 2-plate machines.

List No.	**60,454**	**60,455**	**60,456**	**60,457**
Diameter of plates	52	62	75	90 cm
£	**27. 10. 0**	**32. 10. 0**	**37. 10. 0**	**55. 0. 0**

— idem, with **16** glass plates, Figure, with eight times the effect of the 2-plate machines.

List No.	**60,458**	**60,459**	**60,460**	**60,461**
Diameter of plates	52	62	75	90 cm
£	**35. 0. 0**	**40. 0. 0**	**60. 0. 0**	**80. 0. 0**



60471. 1 : 8.

Accessories for Franklinization.

	£ s. d.
60,463. **Rubber Slab,** 70×100 cm, 3 mm thick, Figure (p. 820) . . . . . This slab, of soft rubber, is used in connection with the metal coating listed under No. 60,464 instead of the insulating stool.	1. 4. 0
60,464. **Metal Coating,** 50×80 cm, for preceding rubber slab, Figure (p. 820) . . . . This metal covering consists of a 0.5 mm thick nickelled zinc sheet with a plug-box.	0. 5. 0
60,465. 2 **Connecting Leads, thickly insulated with rubber,** with spring-hook, Figure (p. 820)	0.12. 0
60,466. **Globe on Insulated Stand,** Figure (p. 820) . . . . . The device can be raised and lowered as well as rotated laterally.	1.10. 0
60,467. **Franklin Electrode Holder,** 50 cm long, with terminal, Figure (p. 820)	0. 6. 0
60,468. **Brass Sphere,** for screwing on the electrode holder, Figure (p. 820)	0. 1. 6
60,469. **Franklin's Rose,** for screwing on the electrode holder, Figure (p. 820) . . . . The rose is 13 cm in diameter, being provided with a number of metal points covered with ebonite sleeves.	0.10. 0
60,470. **Influence Machine,** as suggested by Weinhold, Figure on p. 821, plate diameter 45 cm (W. D. Fig. 453 [430]), **without alternation,** not self excited, with iron frame	5.10. 0

New High-Capacity Influence Machines.

60,471. **Self-Exciting Influence Machine,** as suggested by Wommelsdorf, Figure, with sectors embedded on all sides (Ann. d. Phys., 4th Series, Vol. 23, 1907, p. 609), **for hand and motor drive,** with plates 35 cm in diameter; spark length: 130—175 mm, current to 90 micro-amperes . . . . . The machines are of very high efficiency and work exceedingly well. They are only constructed with simple rotation and the sectors are completely embedded in ebonite discs.	13.10. 0

Max Kohl A. G. Chemnitz, Germany.

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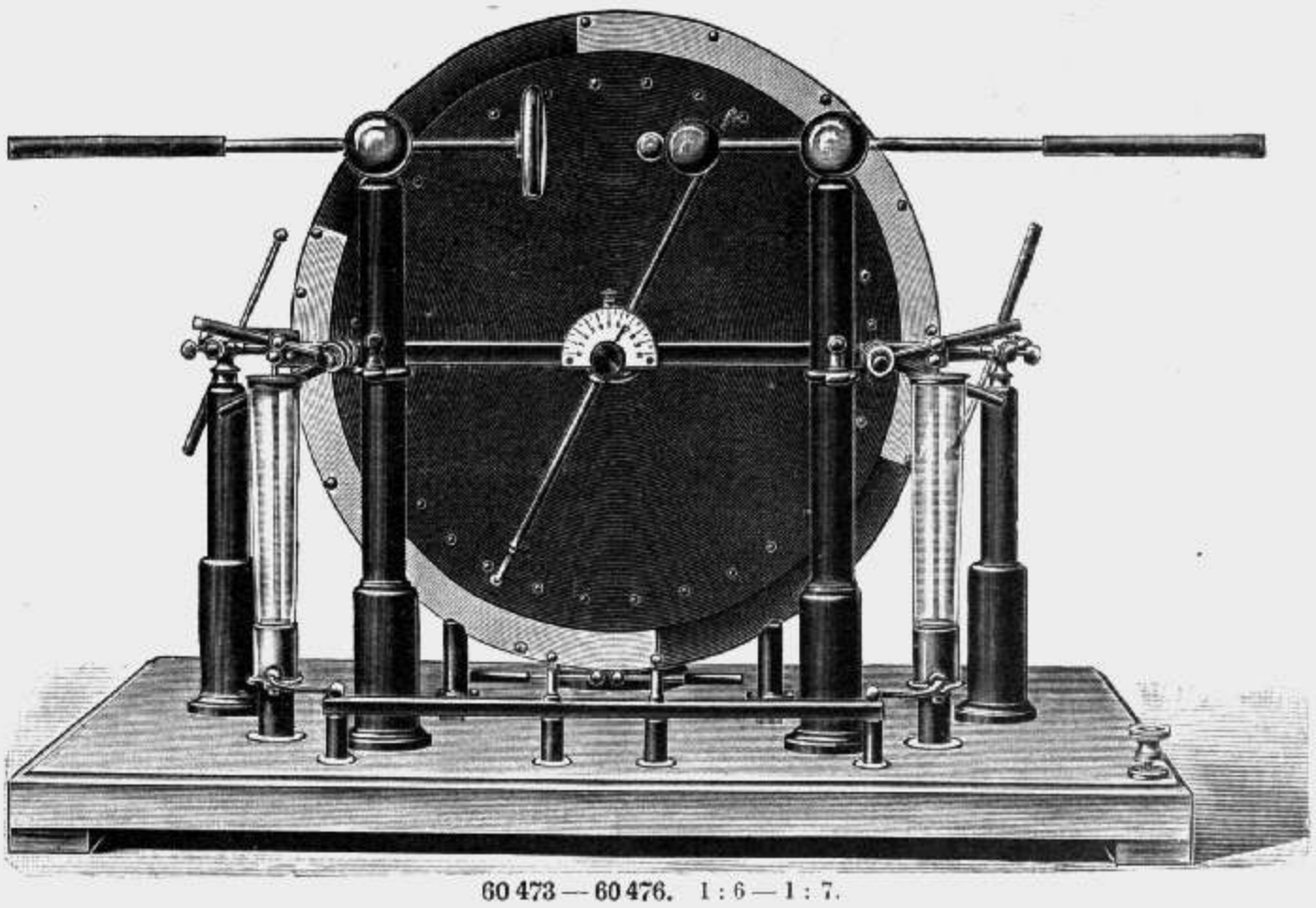


60473 — 60476. 1 : 6 — 1 : 7.

High-Capacity Influence Machines, Figure, suitable for **teaching purposes** as well as for working **Röntgen Ray Tubes** and for **electrotherapeutics,** with embedded corrugated sectors.

List No.	Diameter of Rotating Disc	Spark-length mm	Tension, volts	Current micro-amps	Power required H P	Price £ s. d.
		Construction with **1 fixed** and **1 rotating** plate.				
60,473	**45 cm**	Abt. 180—225	Abt. 115,000	Abt. 250—300	Abt. 1/10	25. 0. 0
60,474	**55 cm**	Abt. 240—275	Abt. 135,000	Abt. 300—350	Abt. 1/10	30. 15. 0
		Construction with **1 fixed** and **2 rotating** plates.				
60,475	**45 cm**	Abt. 200—225	Abt. 115,000	Abt. 500—600	Abt. 1/8	32. 10. 0
60,476	**55 cm**	Abt. 240—275	Abt. 135,000	Abt. 500—600	Abt. 1/6	40. 0. 0

By entirely embedding the sectors the influence machines are almost completely independent of atmospheric humidity. The plates can be utilised better, as all superfluous radiation is avoided. The machines are self-exciting. If an alternation is desired, e. g. for working Röntgen Ray Tubes or the like, this can be effected by a simple handle. The simple machine with plates 55 cm in diameter has the **same** output as an 8-plate Wimshurst machine of the same size; the double machine has a higher capacity than a 16-plate Wimshurst machine of the same size. The construction is extraordinarily simple and the safety in working therefore large; the space required is exceedingly small.

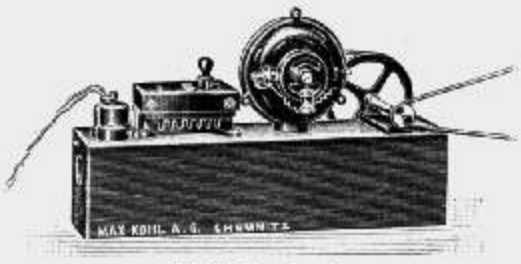
The oblique conductor is arranged to rotate, it can be adjusted over a scale and can also be brought near the disc or removed from it. The non-rotating plate has lateral adjustment; in the double machine the action of the second plate can be switched out.

Machines Nos. 60,473 and 60,474 are arranged for hand and motor drive, Nos. 60,475 and 60,476 for motor drive only. If it is desired to have the latter arranged for hand drive as in Fig. 60,471, they are **increased** in cost by **£ 2. 10. 0.**

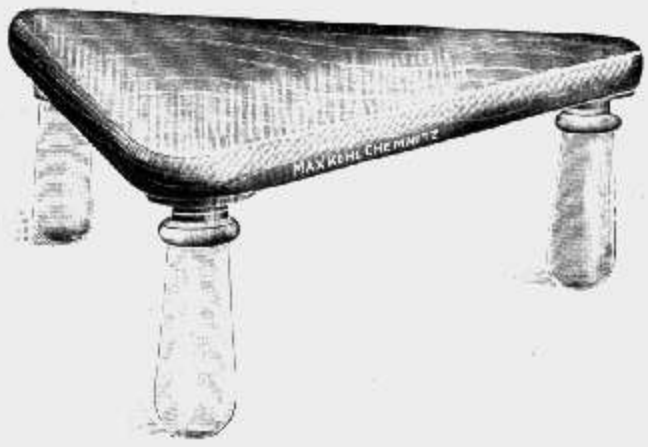
Spare Parts and Auxiliary Apparatus for Influence Machines.

Glass Plates for Töpler Influence Machines.

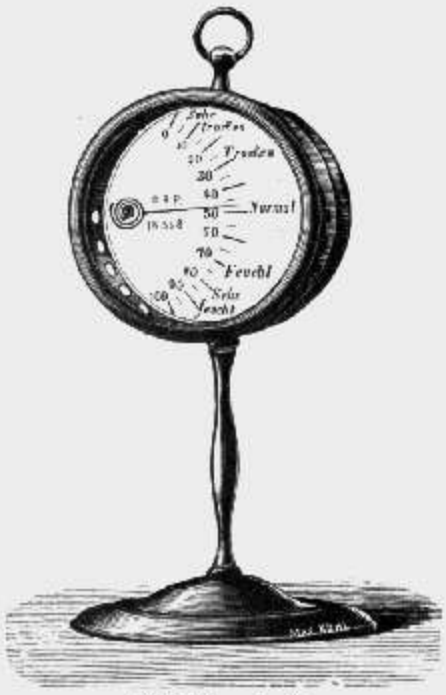
List No.	**60,487**	**60,488**	**60,489**	**60,490**	**60,491**	
For machines with rotating plate of	26	31	36	41	47 cm	diam.
Rotating plate £	**0. 4. 0**	**0. 5. 0**	**0. 6. 0**	**0. 7. 6**	**0. 8. 6**	
Fixed plate £	**0. 4. 6**	**0. 6. 0**	**0. 10. 0**	**0. 12. 0**	**0. 15. 0**	



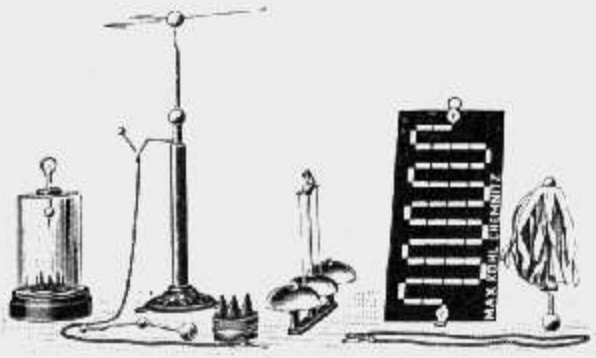
60 512. 1 : 8.



60 526. 1 : 5.



60 525. 1 : 3.



60 527. 1 : 8.

Glass Plates for Töpler Influence Machines.

	£ s. d.
List No. **60,492** **60,493** **60,494** **60,495** **60,496**	
For machines with rotating plate of 52 57 62 75 90 cm diam.	
Rotating plate £ **0. 9. 6** **0. 12. 0** **0. 15. 0** **1. 5. 0** **1. 15. 0**	
Fixed plate £ **0. 17. 0** **1. 1. 0** **1. 5. 0** **1. 15. 0** **2. 5. 0**	

Glass Plates for Wimshurst Machines, with double rotation, Nos. 60,431 and 60,432, and Nos. 60,439 to 60,461.

List No.	**60,497**	**60,498**	**60,499**	**60,500**	**60,501**	**60,502**	**60,503**	**60,504**
Diameter of plates	26	31	36	41	52	62	75	90 cm
Price each £	**0. 4. 6**	**0. 5. 6**	**0. 7. 0**	**0. 9. 0**	**0. 12. 0**	**0. 15. 0**	**1. 5. 0**	**1. 15. 0**

Ebonite Plates for Wimshurst Double Rotation Machines Nos. 60,433 to 60,438.

List No.	**60,505**	**60,506**	**60,507**	**60,508**	**60,509**	**60,510**
Diameter of plates	25	30	35	40	45	50 cm
Price each £	**0. 7. 0**	**0. 9. 0**	**0. 12. 0**	**1. 0. 0**	**1. 5. 0**	**2. 5. 0**

Motor Driving Stand for Influence Machines, comprising direct current motor for connecting up to 65, 110—125 or 220—240 volts, with speed regulator and gearing:

60,512. For machines with 2 plates to 41 cm diameter, Figure 5. 10. 0

60,513. For machines with 2 plates to 62 cm diameter or with 4 plates to 41 cm diameter 6. 10. 0

For other Voltages, Larger Machines and for Alternating and Three-phase Current applications should be made to us.

Dust-proof Lock-up Cupboards for Influence Machine, simple construction.

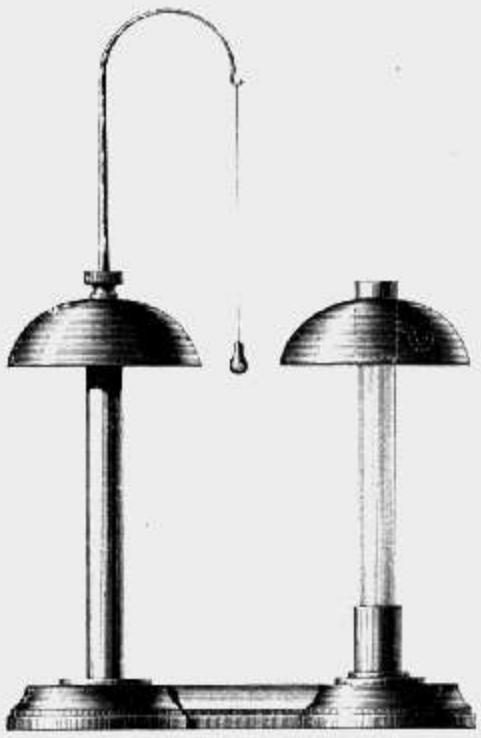
List No.	**60,514**	**60 515**	**60,516**	**60,517**	**60,518**	**60,519**	**60,520**
Suitable for Machines with a plate of	26	31	36	41	47	52	57 cm diam.
£	**0. 15. 0**	**0. 18. 0**	**1. 2. 0**	**1. 6. 0**	**1. 12. 0**	**2. 0. 0**	**2. 8. 0**

60,521. **Connecting Chain,** with hooks at the ends . . . . . 1 metre 0. 1. 0

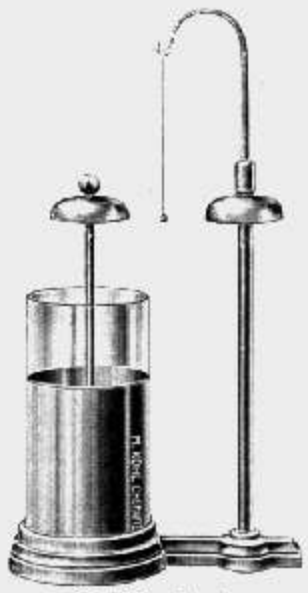
Cl. 5573, 2146, 1986, 2147.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



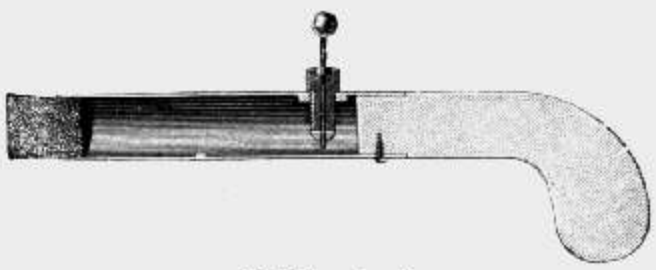
60 528. 1 : 3.



60 529. 1 : 5.



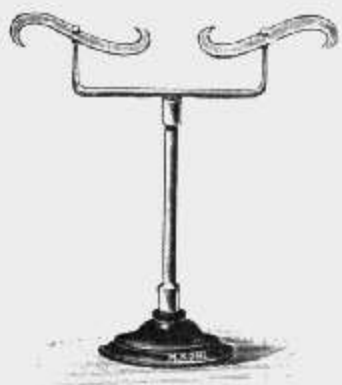
60 530. 1 : 3.



60 531. 1 : 3.



60 532. 1 : 7.



60 534. 1 : 4.



60 535. 1 : 7.

	£	s.	d.
60,522. **Elastics, lined with Copper Wire** and hooks at the ends (W. D., p. 676 [618]) . .	0.	1.	0
60,523. **Argand Burner,** with short base, for placing in the influence machine (W. D., Fig. 456 [428])	0.	5.	0
51,176. **Double Regulating Cock** for above, for quickly turning down the jet without extinguishing it, see No. 51,176 on p. 207 (W. D., Fig. 457 [429])	0.	9.	0
60,525. **Hygrometer,** Figure, for placing in the neighbourhood of influence machine for determining the humidity	0.	8.	0
60,526. **Insulating Stool,** wood, with unscrewable porcelain legs, Figure (M. P. 9th edn., III, Fig. 164)	0.	7.	0
60,527. **Collection of Auxiliary Apparatus for the Influence Machine,** Figure . . . . . The collection is well got up and comprises: 1 general stand, 1 apparatus for condensing smoke, 1 paper tassel, chimes, 1 electric whirl, 1 fulminating pane and 2 brass chains. A complete description is appended to each collection.	0.	15.	0
60,528. **Chime,** Figure (W. D., Fig. 448 [421]), on iron stand	0.	9.	0
60,529. **Chime with Leyden Jar,** Figure, can be used at the same time as a **Capacity Meter** (Gan.-Rein., Fig. 767)	0.	16.	0
60,530. **Apparatus for Igniting Gases,** Figure	0.	4.	0
60,531. **Electric Pistol,** Figure (W. D. Fig. 449 [422]; M. P. 10th edn., IV, 1, Fig. 153; 9th edn., III, Fig. 165)	0.	5.	0
60,532. **Electric Whirl,** on stand, Figure (M. P. 10th edn., IV, 1, Fig. 155; 9th edn., III, Fig. 169; Gan.-Man., Fig. 627; Gan.-Rein., Fig. 755)	0.	4.	0
60,533. — idem, larger	0.	6.	0
60,534. **Double Electric Whirl,** Figure	0.	10.	0
60,535. **Paper Tassel,** on stand, Figure (M. P. 10th edn., IV, 1, Fig. 152; 9th edn., Fig. 163)	0.	4.	0



60 536. 1 : 4.



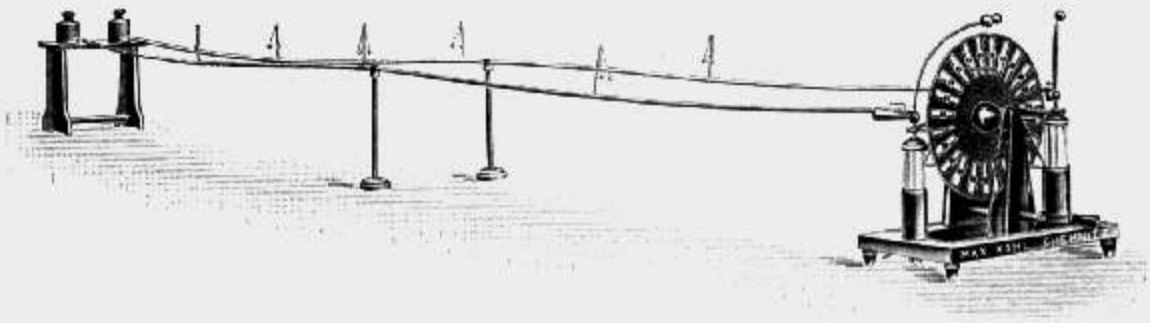
60 538. 1 : 2.



60 539. 1 : 3.



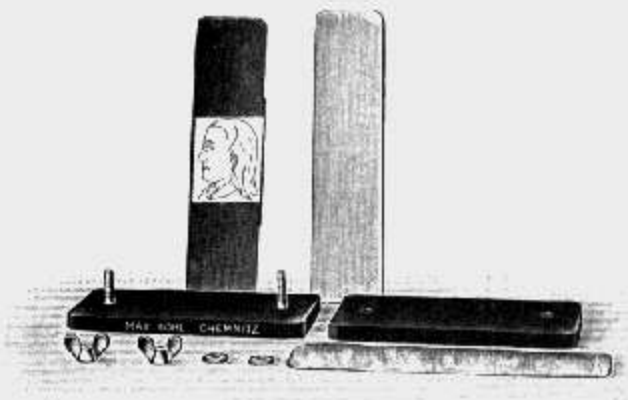
60 540. 1 : 6.



60 541. 1 : 30.



60 542. 1 : 15.



60 543. 1 : 5.

60,536. **Electric Dancing Balls,** Figure, with metal mounts, on stand (M. P. 10th edn., IV, 1, Fig. 150; 9th edn., III, Fig. 162; Gan.-Rein., Fig. 754) . . . . . £ 0. 10. 0

60,537. **Electric Mortar** (W. D., Fig. 477 [452]) 0. 2. 0

60,538. **Apparatus for Igniting Ether,** Figure (W. D., Fig. 450 [423]) 0. 1. 6

60,539. — idem, different pattern, Figure (M. P. 9th edn., III, Fig. 166) 0. 2. 0

60,540. — idem, Figure (Kolbe-Skellon, Introduction to Electricity, Part I, Fig. 47) 0. 10. 0

60,541. **Apparatus for explaining Potential Difference and Potential Drop,** Figure (Höfler, Physik, 1904, p. 438), comprising 1 small table with ebonite top, 2 insulating stands, 2 wood rods 3 m long (folding), and 6 electroscopes, without influence machine . . . 1. 16. 0

60,542. — idem, vertical pattern, Figure 0. 15. 0

60,543. **Press with Portrait Pattern,** Figure, for producing a portrait of Benjamin Franklin by an electric discharge 0. 13. 0

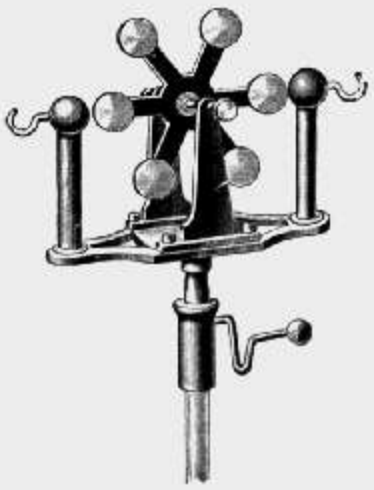
A piece of silk is placed on the baseboard of the press and on top of this silk a pattern portrait of cardboard; the pattern is coated externally on one side with tinfoil, this side must face upwards. The pattern is then covered with a piece of gold leaf in such manner that it also touches the two tinfoil sheets; a second piece of board is placed on top and the press screwed down so as to expose the gold leaf to the discharge.

60,544. **Electrostatic Motor,** on stand, Figure (Fr. phys. Techn. II, 1, Fig. 88) 0. 8. 0

Cl. 3455, 5747, 5746, 5415, 3962, 5739, 3886.

Max Kohl A. G. Chemnitz, Germany.

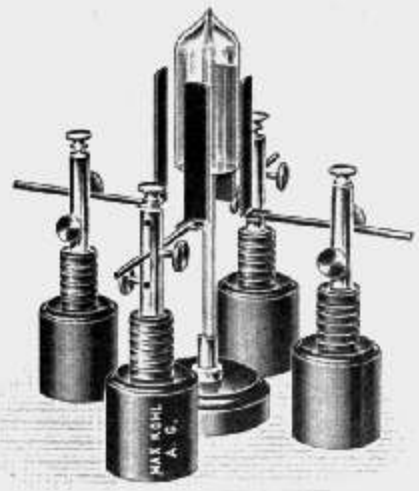
Max Kohl A. G. Chemnitz, Germany.



60 544.



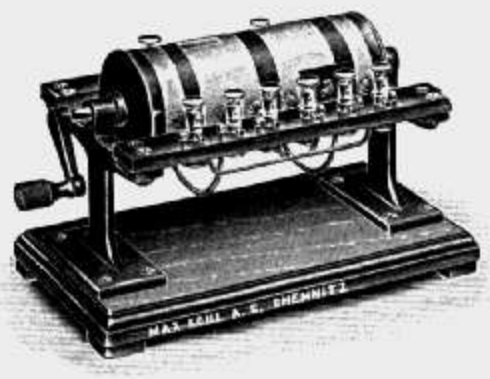
60 545. 1 : 4.



60 545 a. 1 : 5.



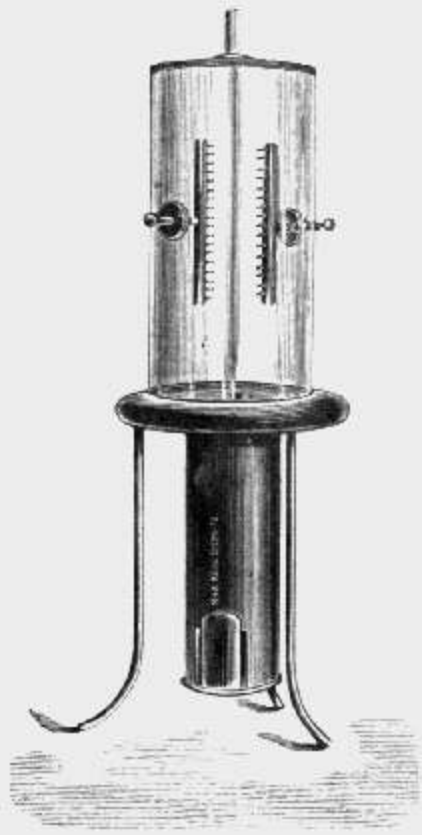
60 546. 1 : 6.



60 547. 1 : 8.



60 549. 1 : 4.



60 550. 1 : 5.

	£ s. d.
60,545. **Electrostatic Rotary Field Motor,** as suggested by Arno, Figure (Ztschr. f. d. phys. u. chem. U. **7**, p. 2)	1. 5. 0
60,545 a. — idem, Figure, for building up with Holtz clamps. Price, without latter (cf. No. 60,172) (Ztschr. f. d. phys. u. chem. U. **7**, p. 4)	0. 10. 0
60,546. — idem, with electric needle, Figure (Ztschr. f. d. phys. u. chem. U. **7**, p. 3), without the Holtz clamps illustrated (cf. No. 60,172)	0. 8. 0
60,547. **Electrostatic Double Roller,** Figure (Ztschr. f. d. phys. u. chem. U. **7**, p. 2) .	2. 10. 0
60,548. **Electric Thunder Cloud** (Köhler's) (Ztschr. f. d. phys. u. chem. U. **21**, p. 113) . .	0. 10. 0
60,549. **Apparatus for Demonstrating the Electric Action of Points,** Figure (M. P. 10th edn., IV, 1, Fig. 154; 9th edn., III, Fig. 167)	0. 12. 0
60,550. **Smoke Condenser,** Figure, for demonstrating the disappearance of smoke by radiant electricity; height of glass: 31 cm (Gan.-Rein. Fig. 758)	1. 0. 0

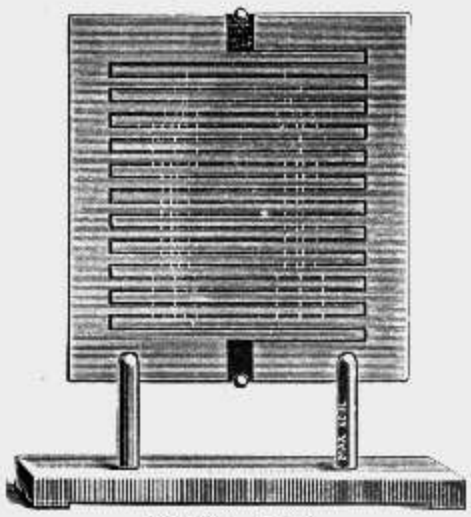
Cl. 5616, 5701, 5700, 5702, 5704, 2153, 2154.



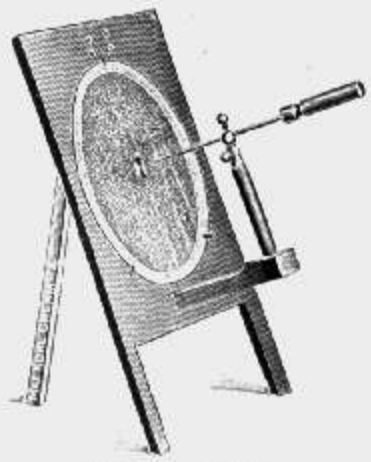
60 552. 1 : 4.



60 554. 1 : 4.



60 555. 1 : 6.



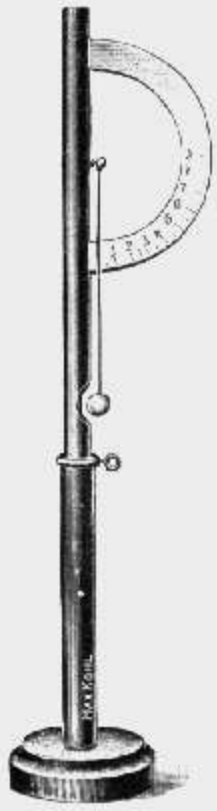
60 556. 1 : 10.



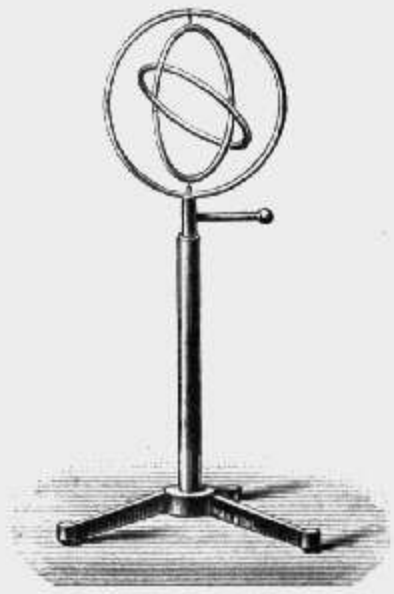
60 557. 1 : 5.



60 558. 1 : 4.



60 559. 1 : 5.



60 560. 1 : 3.

	£ s. d.
60,552. **Fulminating Tube,** Figure, 40 cm long	0. 4. 0
60,553. — idem, 75 cm long	0. 6. 0
60,554. **Fulminating Flask,** Leyden jar 160 mm high and 80 mm wide, coated externally with square shaped pieces	0. 6. 0
60,555. **Fulminating Slab,** of glass, Figure, with tinfoil figure pasted on, 22×28 cm, on stand	0.18. 0
60,556. **Fulminating Slab** (Pfaundler's), Figure, with circular shape magnesium powder coating	1. 0. 0
This fulminating slab is worked by a continuous spark-current of an induction coil or an influence machine. The sparks jump from the pointed electrode on to the plate, glide over the magnesium coating with an accompaniment of striking luminous phenomena, being finally carried off on the external annular coating of tinfoil.	
60,557. **Electric Tourbillion,** as suggested by Grüel, Figure, for showing the electric effect of points (Kleiber, Phys. f. Gymn. Fig. 287)	0.18. 0
60,558. **Cup and Ball,** Figure, on stand	0.12. 0
60,559. **Henley's Quadrant Electrometer** (M. P. 10th edn., IV, 1, Fig. 138; 9th edn., III, Fig. 144; Gan.-Man. Fig. 619; Gan.-Rein. Fig. 711), with base, Figure	0.12. 0
60,560. **Apparatus for Proving that the same Kinds of Electricity repel each other,** Figure, consisting of three metal rings which assume right angles relative to each other when charged with electricity	0.12. 0
60,561. **Apparatus for piercing Thin Glass,** Figure (W. D. Fig. 473 [448])	0. 5. 0

Cl. 2155, 2156, 1711, 1706, 5754, 2161, 2162, 2163.

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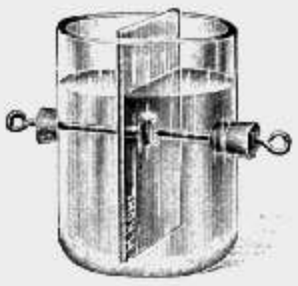
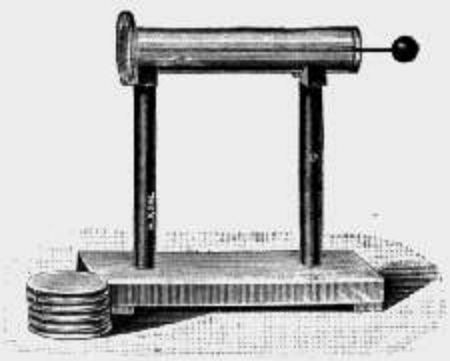


60 561. 1 : 4.



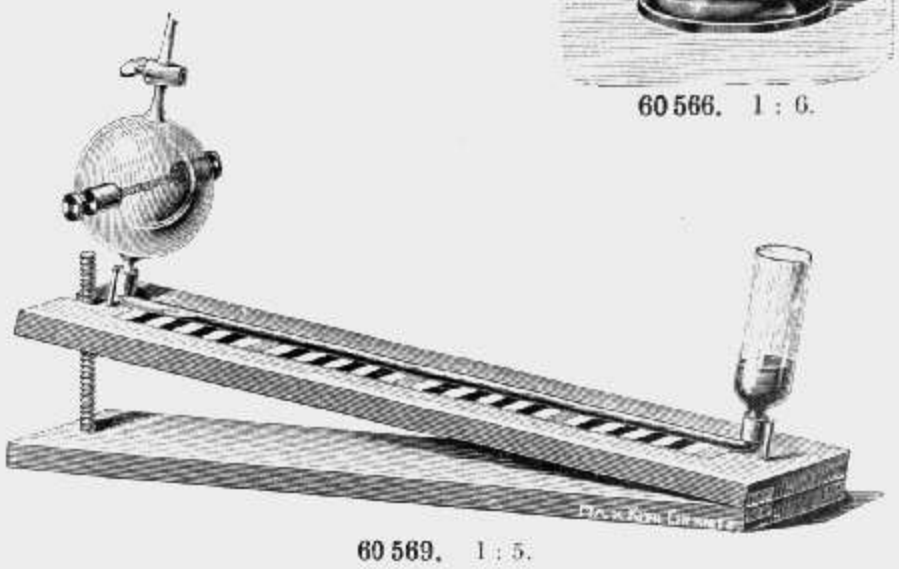
60 563. 1 : 6.



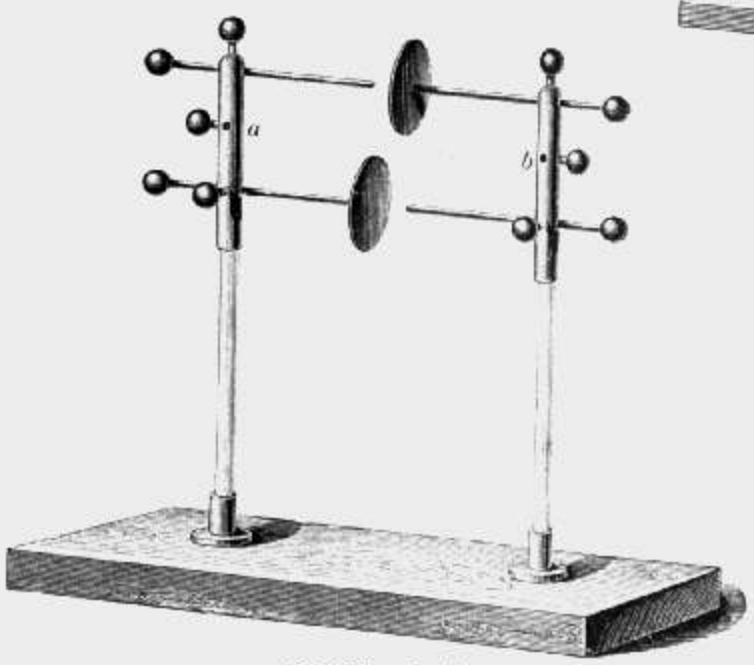
60 566. 1 : 6.



60 562. 1 : 5.



60 569. 1 : 5.



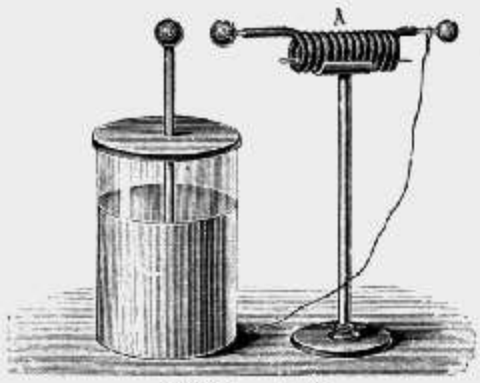
60 567. 1 : 3.



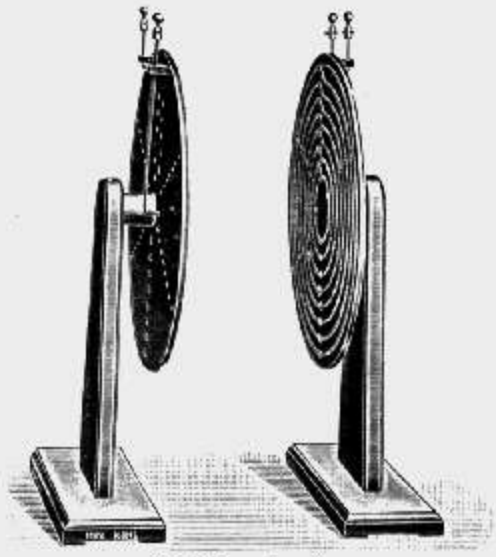
60 568. 1 : 3.

	£ s. d.
60,562. **Apparatus for Piercing Glass** up to 2 mm thick, Figure (M. P. 9th edn., III, Fig. 218; Gan.-Man. Fig. 670; Gan.-Rein. Fig. 793)	1. 4. 0
60,563. — idem, **horizontal pattern**, for piercing Glass Plates up to 15 mm thickness, Figure (M. P. 9th edn., III. Fig. 219), by means of the sparks from an influence machine or an induction coil	1. 4. 0
60,564. **Apparatus for splintering Glass Vessels** (W. D. Fig. 474 [449])	0. 2. 0
60,565. — idem (M. P. 10th edn., IV, 1, Fig. 202; 9th edn., III, Fig. 220; M. T., Fig. 168), with shielding tube and 6 spare tubes	0. 6. 0
60,566. **Insulating Stand** with wood base, ebonite pillar and hollow metallic table, Figure	1. 4. 0
60,567. **Apparatus for showing the difference between the two kinds of electricity**, Figure (W. D., Fig. 451 [424])	1. 0. 0
60,568. **Electric Thermometer** (Kinnersley's), Figure (W. D., Fig. 476 [451])	0. 6. 0
60,569. **Electric Air Thermometer** (Riess'), Figure (W. D., Fig. 478 [453]; Gan.-Rein., Fig. 790; Gan.-Man. Fig. 669)	2. 0. 0
60,570. **Electric Air Thermometer** (Grimsehl's) (Grimsehl, Fig. 753)	0. 12. 0

Cl. 1717, 2166, 2168,
1718, 2171,
2169, 2170.



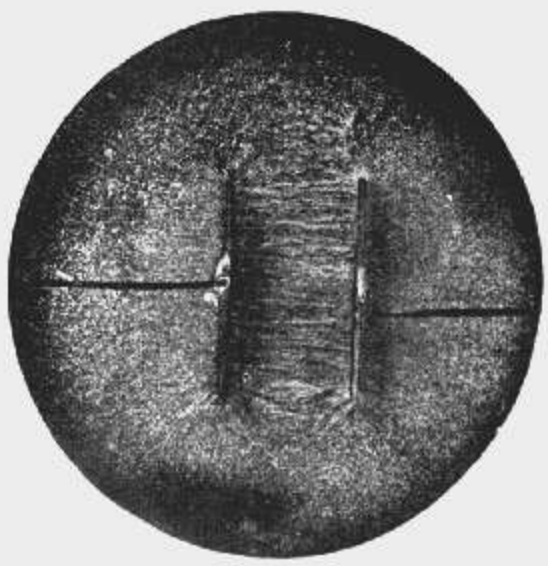
60 571. 1 : 3.



60 573. 1 : 8.



60 576 A.



60 576 B.

Max Kohl A. G. Chemnitz, Germany.

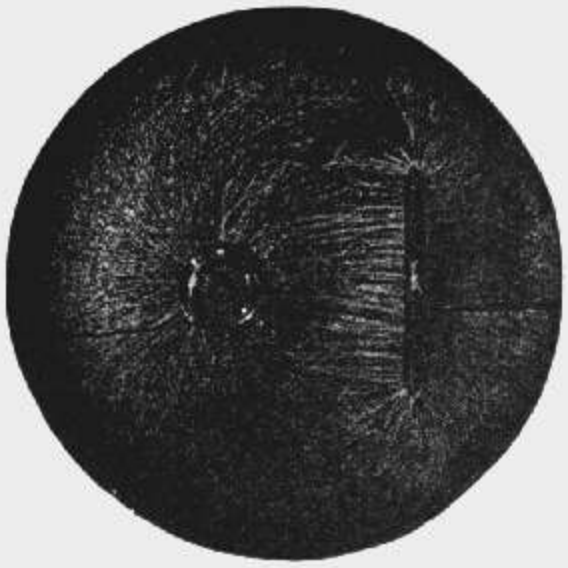
	£ s. d.
60,571. **Apparatus for showing the magnetic effect of the Discharge Shock,** Figure (M. P. 9th edn., III, Fig. 251; Gan.-Rein., Fig. 792). Price without the Leyden jar shown in the illustration	0. 7. 0
60,572. **Apparatus for showing the inductive effect of a Discharge Shock,** as suggested by Friedr. C. G. Müller (M. T. Fig. 169)	1. 10. 0
60,573. — idem, as suggested by Riess, Figure (M. P. 9th edn., III, Fig. 738)	3. 0. 0
— idem, as suggested by Kolbe, see No. 60,334	1. 4. 0
Apparatus for demonstrating Lines of Force, as suggested by Kolbe, see No. 60,337	0. 6. 0
60,576. **Apparatus for demonstrating Lines of Force,** as suggested by Seddig (Phys. Ztschr. **5**, 1904, p. 403; M. P. 10th edn., IV, 1, p. 231), for the line of force images illustrated in Figs. 60,576 A—D (cf. also Gan.-Rein., Fig. 727)	1. 4. 0
60,577. **Electric Egg,** Figure, for demonstrating the Electric Phenomena in Vacuo (Gan.-Man., Fig. 677; Gan.-Rein., Fig. 788)	1. 7. 0
60,577 a. — idem, Figure, with holders for inserting carbons for producing an arc	1. 10. 0
60,577 b. — idem, entirely of glass	0. 18. 0
60,578. **Geissler Tube,** Figure, with glass stopcock and base, for placing on the air pump, for the same purpose	0. 16. 0

Shaking and Rubbing Tubes, as suggested by Geissler, for phenomena in vacuo or in spaces filled with gases, also for flourescence phenomena: see under Geissler Tubes in section **Galvanism.**

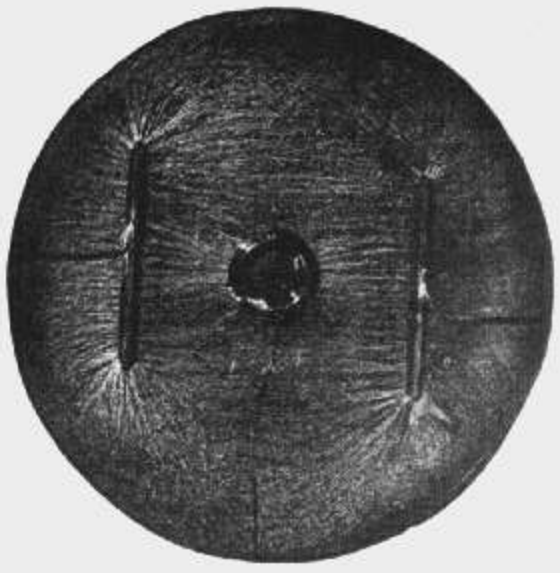
Leyden Jars, Figure, with excellent insulating properties of flint glass (Gan.-Man., Fig. 653; Gan.-Rein., Fig. 765).

List No.	**60,579**	60,580	**60,581**
	16	26	40 cm high
£	**0. 4. 0**	**0. 8. 0**	**0. 12. 0**

Max Kohl A. G. Chemnitz, Germany.



60 576 C.



60 576 D.



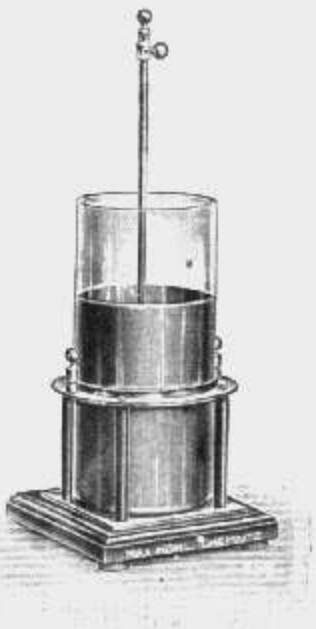
60 577a. 1 : 8.



60 578. 1 : 5.



60 580. 1 : 6.



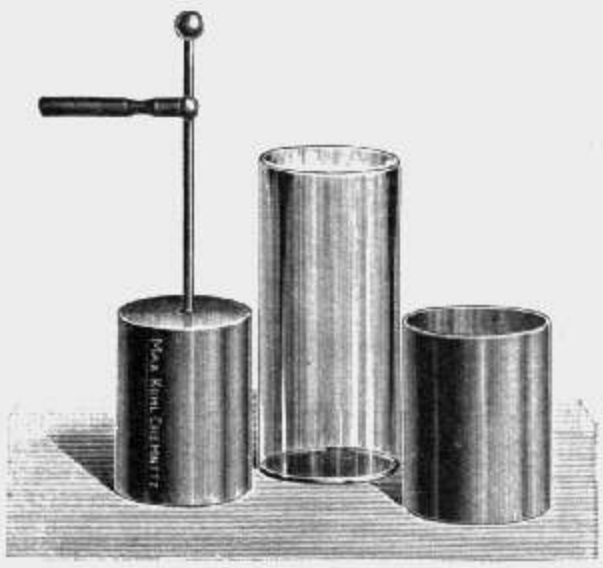
60 582. 1 : 8.



60 583. 1 : 4.



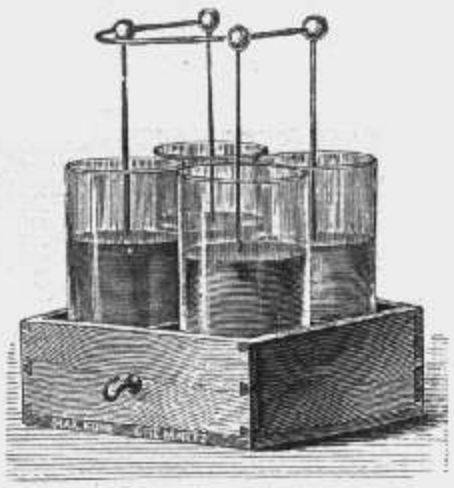
60 577. 1 : 7.



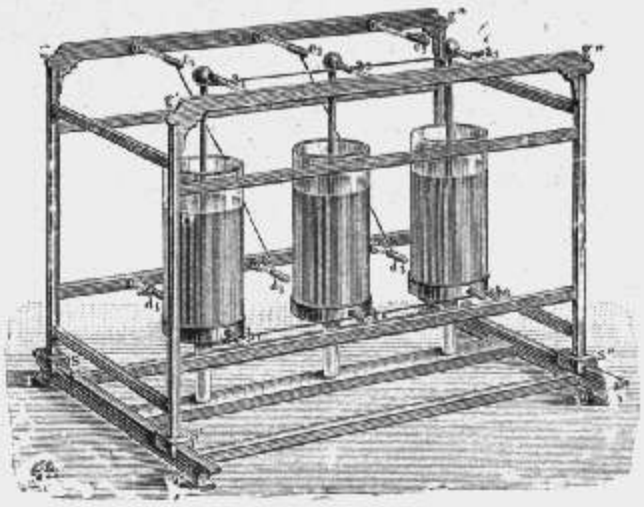
60 584. 1 : 8.

	£ s. d.
60,582. **Leyden Jar,** 26 cm high, Figure, with terminals for both coatings, on wood board	1. 0. 0
60,583. **Leyden Jar,** Figure, **with removable coating, conical Form,** with ebonite handle (Gan.-Man. Fig. 657; Gan.-Rein. Fig. 768)	0. 8. 0
60,584. — idem, cylindrical form, 26 cm high, Figure	0. 14. 0

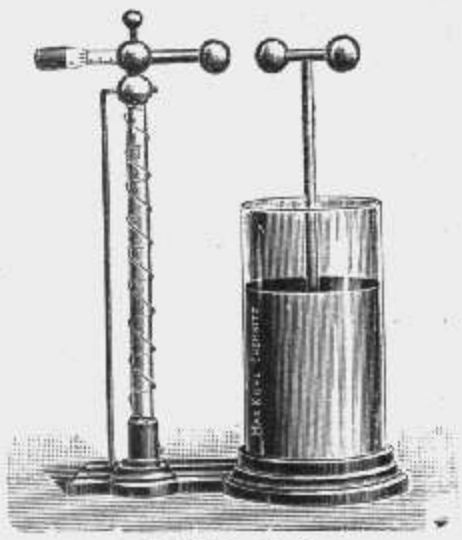
Cl. 5627, 5628, 5348, 2174, 2175, 4511, 2176, 4978, 2177.



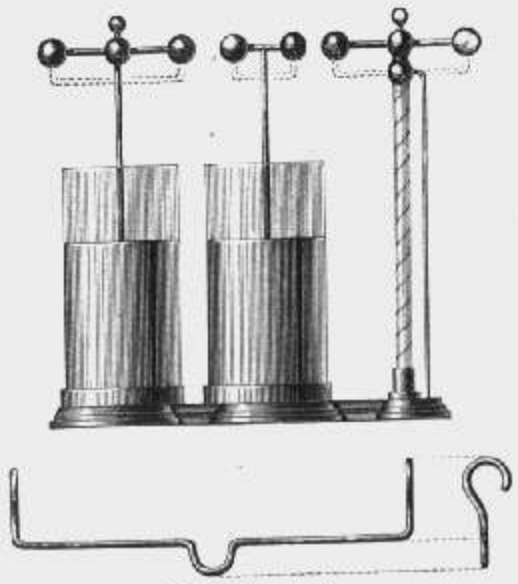
60 585 — 60 587. 1 : 5 — 1 : 12.



60 596 — 60 598. 1 : 8 — 1 : 20.



60 606. 1 : 5.



60 607. 1 : 6.

Leyden Jar Battery, Figure, consisting of 4 jars (Gan.-Man., Fig. 654; Gan.-Rein., Fig. 771, without the electrometer illustrated in the book). £ s. d.

List No.	60,585	60,586	60,587
	16	26	40 cm high
£	1. 12. 0	2. 8. 0	3. 10. 0

Leyden Jar Battery of 6 jars.

List No.	60,588	60,589	60,590
	16	26	40 cm high
£	2. 8. 0	3. 12. 0	4. 10. 0

Leyden Jar Battery of 9 jars.

List No.	60,591	60,592	60,593
	16	26	40 cm high
£	3. 4. 0	4. 16. 0	6. 0. 0

60,594. **Cascade Battery** with 4 Leyden jars in series, 16 cm high (M. P. 10th edn., IV, 1, Fig. 205; 9th edn., III, Fig. 214; Gan.-Rein., Fig. 773) 2. 10. 0

60,595. — idem, with 6 jars 3. 10. 0

Cascade Battery with Mach Commutating Device for putting the Leyden jars in parallel also, Figure (M. P. 10th edn., IV, 1, Fig. 208; 9th edn., III, Fig. 215), with 3 jars.

List No.	60,596	60,597	60,598
	16	26	40 cm high
£	4. 0. 0	6. 10. 0	9. 0. 0

— idem, with 6 jars.

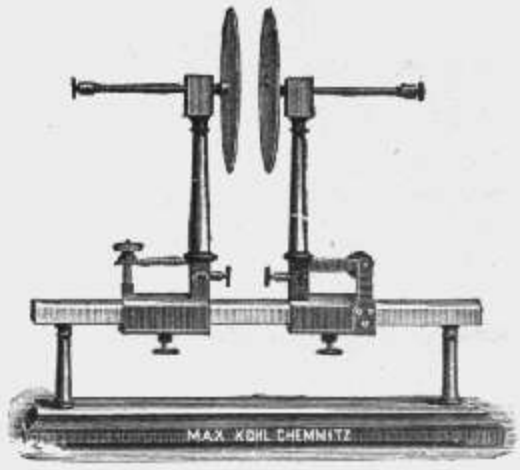
List No.	60,599	60,600	60,601
	16	26	40 cm high
£	6. 0. 0	10. 0. 0	13. 10. 0

Cl. 2178, 2179, 2180, 2180 a.

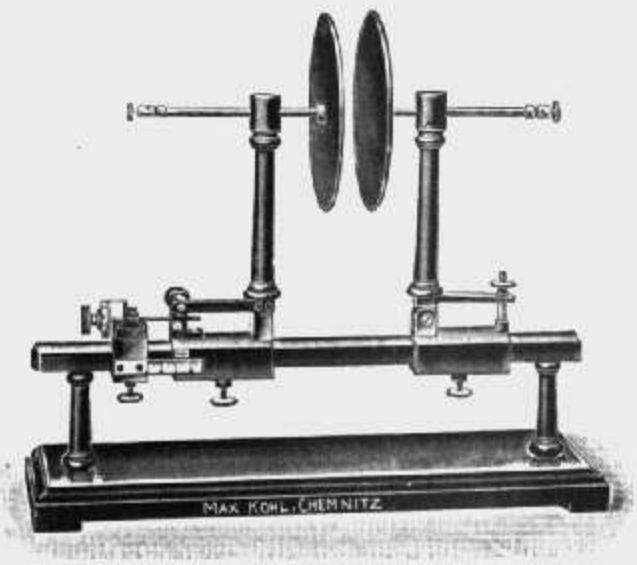
Max Kohl A. G. Chemnitz, Germany.



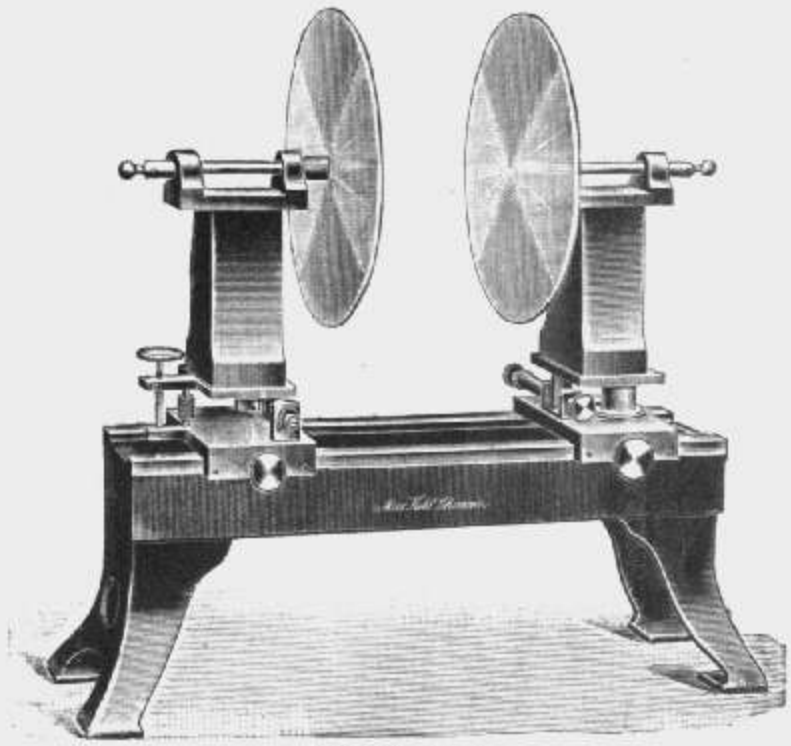
60 608. 1 : 5.



60 611. 1 : 8.



60 612. 1 : 7.



60 613. 1 : 6.

Cascade Battery with commutating device, with 9 jars.

				£ s. d.
List No.	**60,602**	**60,603**	**60,604**	
	16	26	40 cm high	
£	**8. 0. 0**	**13. 0. 0**	**17. 10. 0**	

60,605. **Lane's Measuring Jar,** with 1 jar, on iron base (M. P. 10th edn., IV, 1, Fig. 209; 9th edn., III, Fig. 199) 1. 0. 0

60,606. — i d e m, with micrometer adjustment, F i g u r e 1. 14. 0

60,607. — i d e m, with 2 jars, F i g u r e (W. D. Fig. 469 [444]), can also be used for the Knochenhauer-v. Oettingen Experiment for showing the oscillating discharge 1. 4. 0

60,608. **Condenser** (Weinhold's), F i g u r e (W. D. Fig. 459 [434]), for accumulation experiments. Diameter of metal plates: 21 cm, on glass pillar and base, with elder pith pendulums and a copper- and zinc-strip for galvanic electricity 1. 10. 0

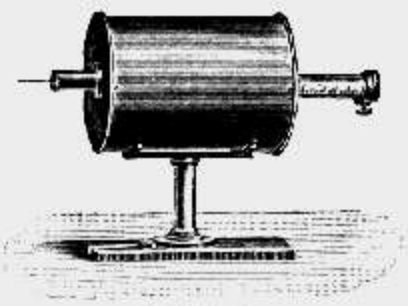
60,609. — i d e m, as modified by Prof. Motz, with 1 ball underneath and 2 balls above 1. 10. 0

Condensers, as suggested by Bruno Kolbe: see No. 60,319 on p. 812 (£ **1. 8. 0**) and No. 60,326 on p. 813 (£ **2. 5. 0**).

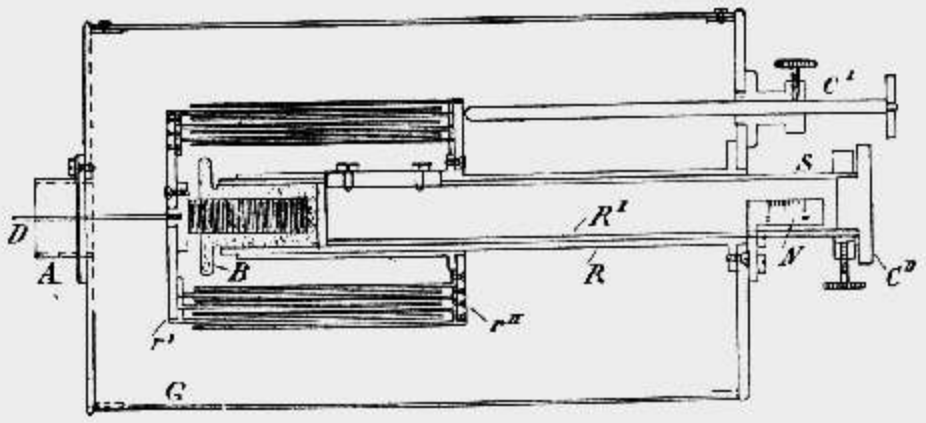
60,611. **Condenser,** as suggested by Kohlrausch, F i g u r e (M. P. 10th edn., IV, 1, Fig. 185; 9th edn., III, Fig. 198), with round plates of 160 mm universally adjustable and prismatic guide 4. 0. 0

60,612. — i d e m, F i g u r e, **with Micrometer Adjustment** for the plate distance 5. 0. 0

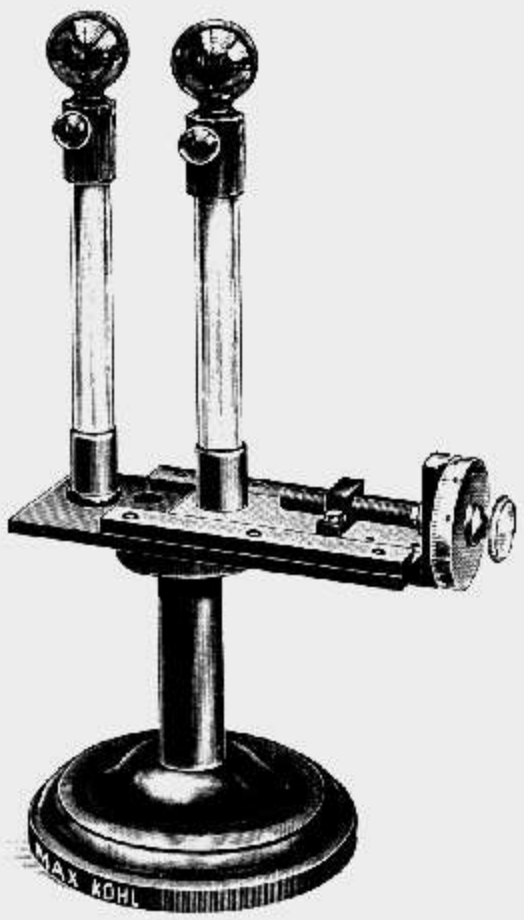
Max Kohl A. G. Chemnitz, Germany.



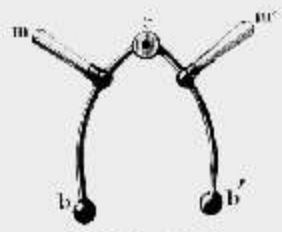
60 614 A.



60 614 B.



60 620. 2 : 5.



60 622. 1 : 8.



60 623. 1 : 5.

60,613. **Condenser,** as No. 60,611, very massive pattern, Figure on p. 833, without micrometer adjustment for the plate distance . . . . . £ s. d 6. 10. 0

60,614. **Cylindrical Condenser,** as suggested by Gerdium, Figs. A and B, permitting of a measurable variation of capacity between 20 and 500 cm (Ztschr. f. d. phys. u. chem. U. **18**, p. 291; M. P. 10th edn., IV, 1, Figs. 186 and 187) 7. 0. 0

60,615. — idem, with Certificate of Calibration of the Physikalisch-Technische Reichsanstalt 8. 5. 0

60,620. **Spark Micrometer,** as suggested by Riess, Figure (M. P. 9th edn., III, Fig. 202), comprising 2 metal spheres on glass pillars, 1 of which can be adjusted by a micrometer screw in a graduated slider 2. 10. 0

60,621. **Discharger,** simple, with ebonite handle 0. 4. 0

60,622. — idem, with 2 ebonite handles and knuckle joint, Figure (Gan.-Man. Fig. 655; Gan.-Rein. Fig. 761) 0. 8. 0

60,623. — idem, with 1 glass handle and knuckle joint, span 35 cm, Figure . . . 0. 10. 0

60,624. **Discharger,** as suggested by Riess, Figure (W. D., Fig. 468 [443]; Gan.-Rein., Fig. 772), for Leyden jar batteries, on iron base 1. 0. 0

Cf. 5678, 5677, 2182, 2181, 2183.

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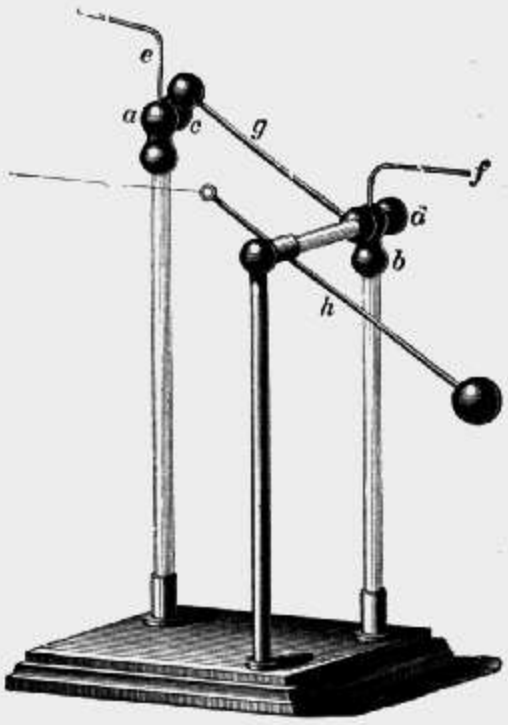
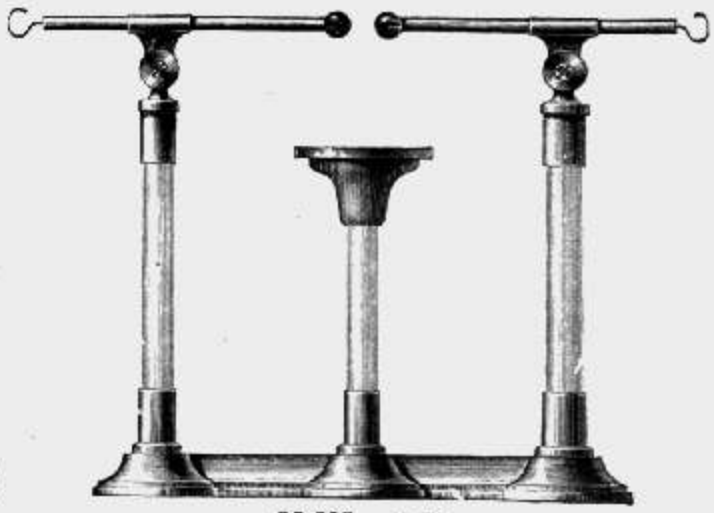
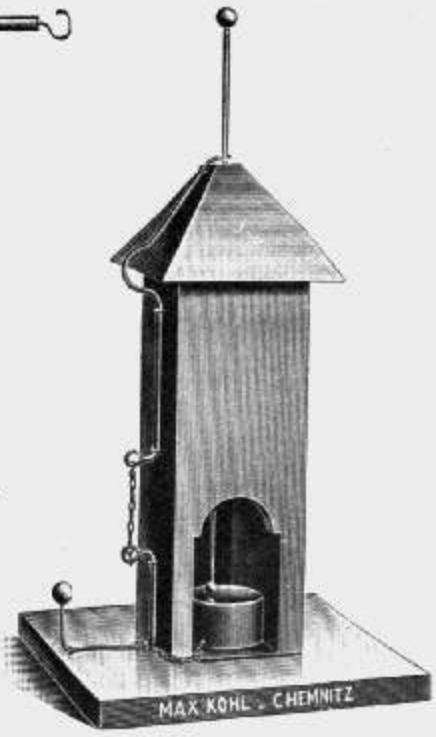


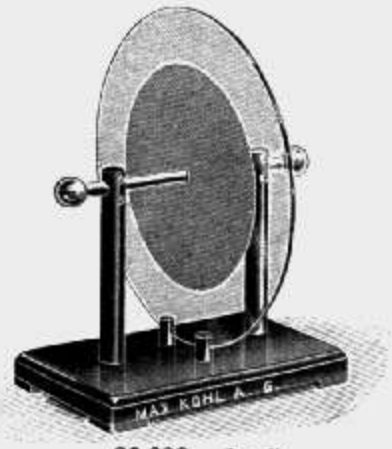
60 624. 1 : 5.



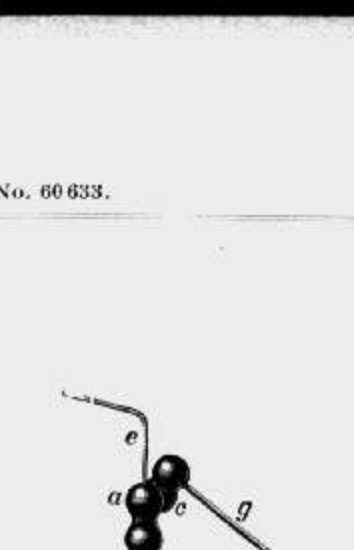
60 625. 1 : 5.



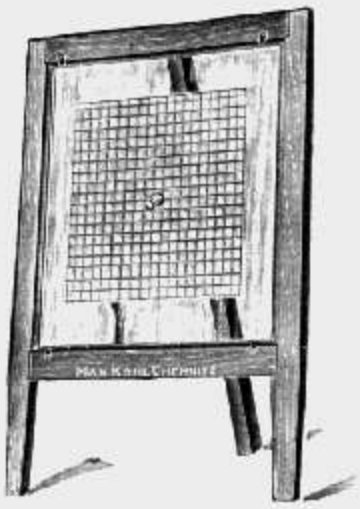
60 632. 1 : 4.



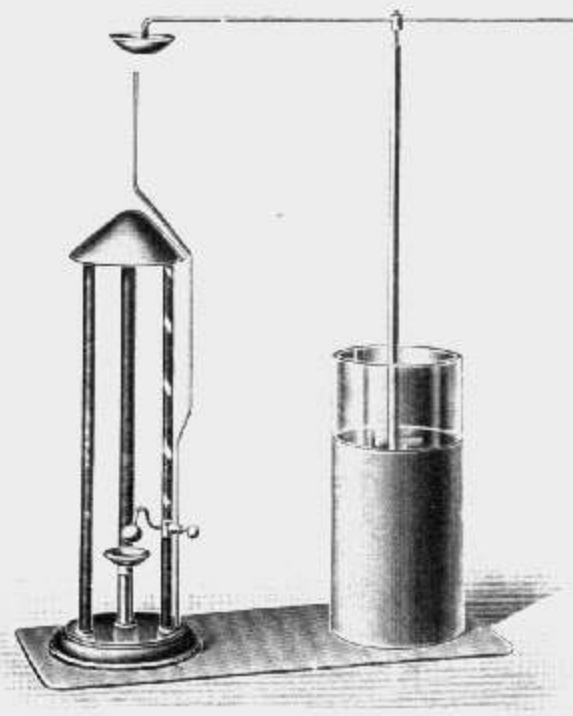
60 629. 1 : 5.



60 627. 1 : 6.



60 628. 1 : 10.



60 633. 1 : 8.

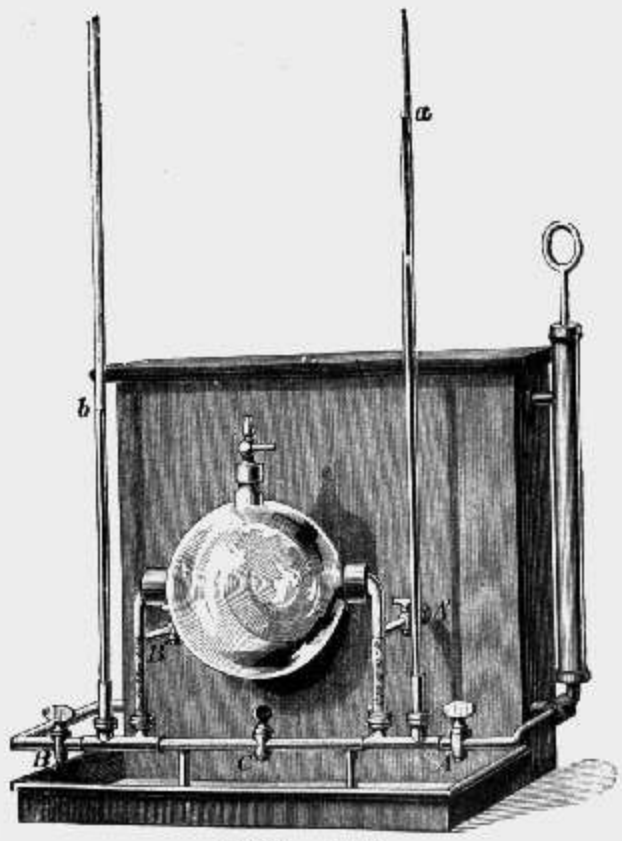
	£ s. d.
60,625. **Henley's Discharger,** Figure (W. D. Fig. 466 [441])	1. 0. 0
60,626. — idem, with interchangeable zinc balls specially given in	1. 2. 0
60,627. **Franklin's Plate,** Figure (M. P. 10th edn., IV, 1, Figs. 178 and 179; 9th edn., III, Figs. 193 and 194; Gan.-Rein. Fig. 764), of glass, on insulating base and with suspended pendulum	0.15. 0
60,628. **Franklin's Fulminating Plate,** Figure (M. P. 9th edn., III, Fig. 237), with a connected coating on one side and a cut out coating on the other	0.18. 0
60,629. **Rosetti's Fulminating Plate,** Figure (W. D. Fig. 460 [435]), with stand . . .	0.18. 0
60,630. **Glass Slab,** with connected coating, for using Rosetti's Fulminating Plate as a Franklin Plate	0. 3. 0
60,631. **Glass Slab,** with cut out coating, for using Rosetti's Fulminating Plate as a Franklin Fulminating Plate	0. 3. 0
60,632. **Tower with Lightning Conductor,** Figure, for igniting ether	0.10. 0
60,633. **Apparatus for Explaining the Action of the Lightning Conductor,** as suggested by Harris, Figure	2. 0. 0



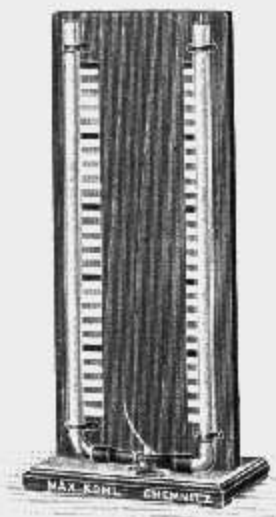
60 634. 1 : 6.



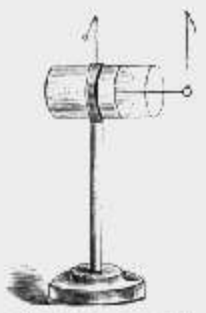
60 635. 1 : 8.



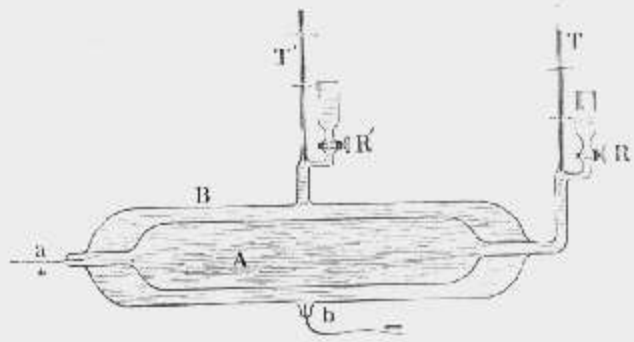
60 638. 1 : 8.



60 640. 1 : 10.



60 637. 1 : 16.



60 639.

£ s. d.

60,634. **House with Tower and Lightning Conductor,** Figure 2. 8. 0

A small vessel, containing spirit, is placed in the tower and the sheet iron vessel placed in the house is filled with a mixture of house gas and air, and well corked. A charged Leyden Jar is placed in the neighbourhood of the sphere of the lightning conductor and discharged. The spirit- and the gas-mixture are then ignited; the former commences to burn and the latter forces the stopper out with a bang: the roof of the house is forced out and the walls collapse.

60,635. **Aluminium Leaf Electroscope,** as suggested by Saussure, **for Atmospheric Electricity,** Figure, with ivory scale and brass conducting rod, 70 cm high: the base can be detached (Gan.-Man. Fig. 871; Gan.-Rein. Fig. 1043) 1. 10. 0

Portable Electrometer and Flame Collector, as suggested by Exner: see Nos. 60,191 and 60,191 a on p. 801.

Electrometer for Atmospheric Electricity, as suggested by Bruno Kolbe: see No. 60,338 on p. 814.

60,637. **Leyden Jar** (Lodge's), Figure, with elder pith pendulums on both coatings (Lodge, Neueste Anschauungen über Elektrizität [Modern Views of Electricity], German by Wachsmuth, Leipzig, 1896, Fig. 9 d) 1. 0. 0

60,638. **Hydraulic Model of a Lodge Leyden Jar,** Figure (loc. cit. Fig. 12) 4. 0. 0

By the aid of this model all phenomena attendant on the charging and discharging of Leyden Jars and the analogous mechanical actions can be clearly explained. A rubber bellows represents the dielectric, and the inner space of the rubber bellows, which is filled with water, corresponds to the internal coating, while the intermediate space between the rubber bellows and the glass bulb visible in the illustration (which, as well as the entire apparatus, is filled with water) represents the outer coating. The two elder pith pendulums of Apparatus No. 60,637 are represented by pressure gauges and the source of electricity by a water pump.

60,639. **Apparatus for showing Electric Constriction** (change of volume of a Leyden Jar when charged), as suggested by Duter, Figure (Fr. phys. Techn. II, 1, p. 100) 1. 5. 0

The internal coating is represented by the liquid in A, and the outer coating by the liquid between A and B. The two conducting liquids in Aa and Bb are electrified by opposite kinds of electri-

Cl. 4098, 2194, 5675, 5254, 5676, 5617.

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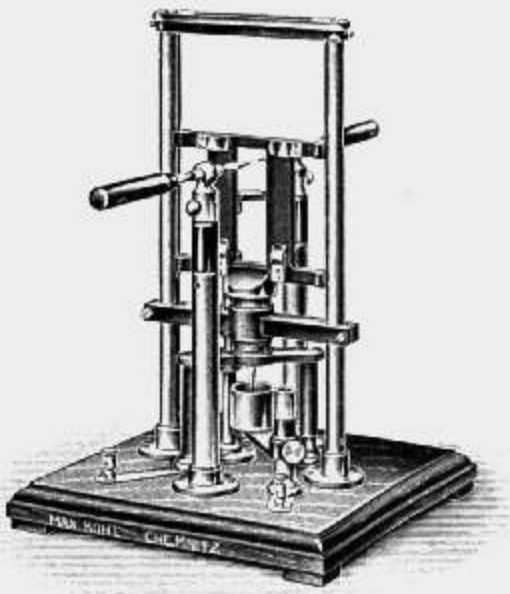
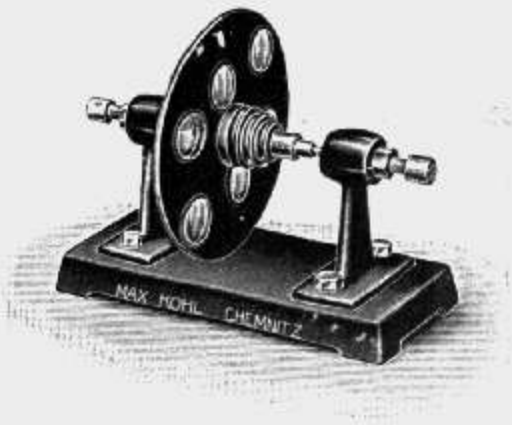
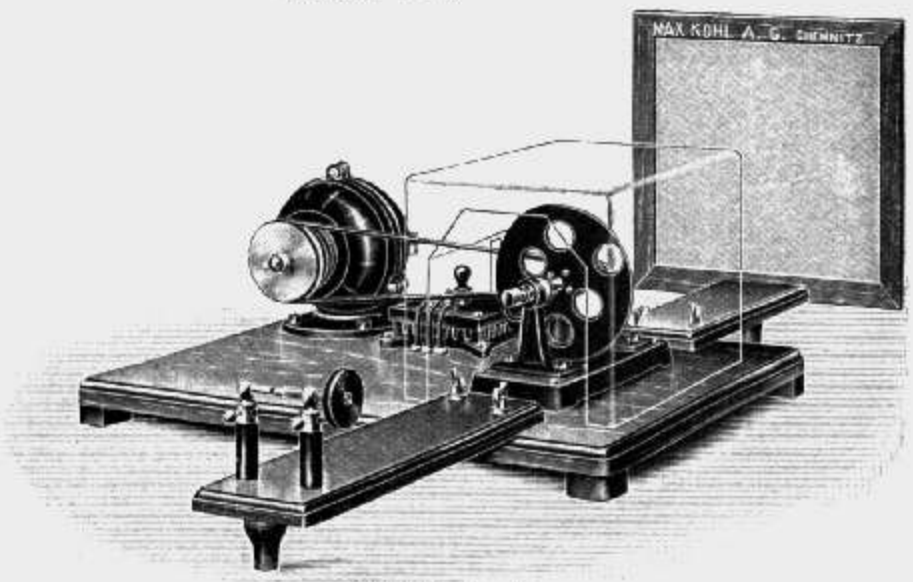


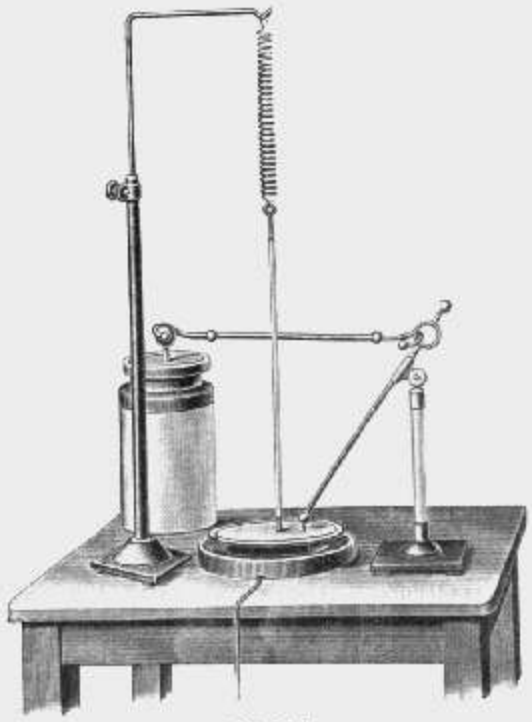
60 641. 1 : 6



60 642. 1 : 7.



60 643. 1 : 10.



60 644.

city when the cocks R and R' are closed. The liquid rises in T' and falls in T. After discharge the difference in level disappears suddenly to the amount corresponding to the residuum. £ s. d.

60,640. **Hydraulic Analogon** of the oscillatory discharge of a Leyden Jar, Figure (Gan.-Rein. Fig. 786) 1. 0. 0

60,641. **Apparatus for Demonstrating the Oscillatory Character of Leyden Jar Discharges.** Figure 4.10. 0

A sheet of cardboard is rapidly passed by the points of a discharger. The secondary coil of an induction coil is connected up at the points, the interrupter of this induction coil being short circuited and replaced by the interrupter fitted on the apparatus, and the latter interrupter interrupting the current at the moment the cardboard sheet begins its motion. A more or less narrow row of holes is produced on the cardboard strips according as whether a large or small capacity is switched on to the points of the discharger.

60,642. **Lens Disc,** as suggested by Boys, for the same purpose, Figure 4. 0. 0

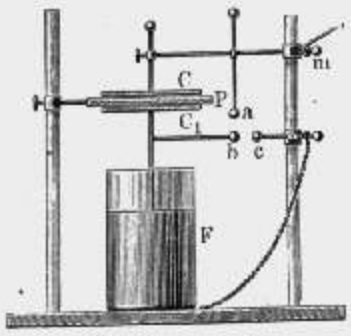
An accurately balanced metal disc carries 6 lenses, of which each two are at the same distance from the axis. Each of these pairs is therefore at a different distance from the axis. If the axis is set rotating quickly and the image of a spark projected on to a screen by the three pairs of lenses the result is a concentric ring of light in which the oscillations can be plainly seen.

60,643. — idem, Figure, with protecting box, D. C. motor for 65, 110—125 or 220 to 240 volts, current regulator, spark gap and screen mounted on a board 12. 0. 0

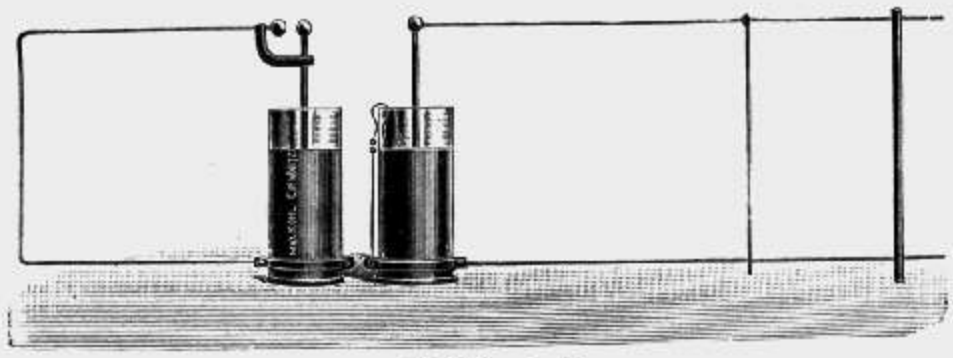
Oscillation Analysing Apparatus, as suggested by Grimsehl: see Section on Mechanics.

Wave Tube, as suggested by Maxwell, for demonstrating the charge and discharge from a Mechanical Point of view: see Section on Mechanics.

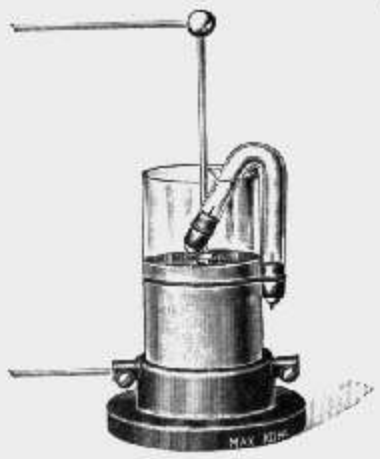
60,644. **Apparatus** (Lippmann's), Figure, for showing that the discharge of a Leyden Jar can produce mechanical motion and that by the same motion the Jar can again receive a charge (Fr. phys. Techn. II, 1, Fig. 187; Gan.-Man. Fig. 668) 3. 0. 0



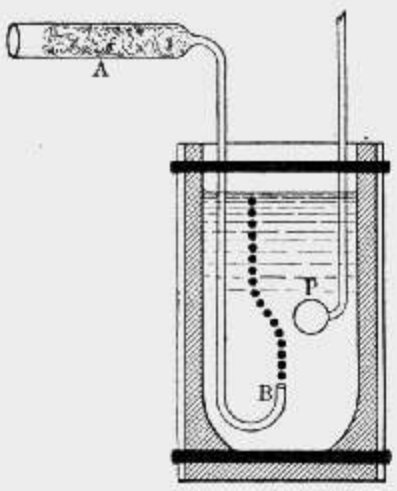
60 645. 1 : 8.



60 646. 1 : 8.



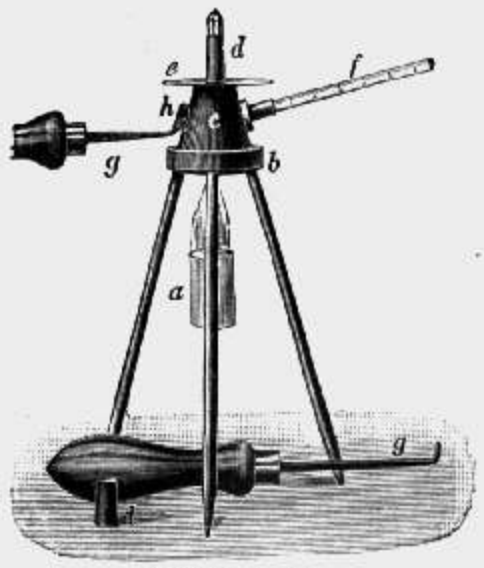
60 648. 1 : 6.



60 649. 1 : 5.



60 651. 1 : 4.



60 652. 1 : 4.

60,645. **Apparatus for approximately determining Dielectric Constants,** as suggested by Mach, Figure (M. P. 10th edn., IV, 1, Fig. 212; 9th edn., III, Fig. 212) . . . . . £ 2. 6. 0

60,646. **2 Lodge Leyden Jars,** Figure, **for demonstrating Electric Resonance** (Ztschr. f. d. phys. u. chem. U. **3,** p. 249), 16 cm high 1. 6. 0

One of the jars is provided with a closing wire which contains a spark gap bounded by 2 brass spheres; the other contains a fully closed circuit, which, however, is variable along its length by a sliding piece of wire. In addition, the inner coating of this latter jar is connected to the outer coating by a closing circuit interrupted only by a small spark gap. Both jars are placed alongside each other in such manner, that the closing circuits run parallel to each other (not as shown in the above figure). If now the first jar is excited with the fixed circuit by means of an induction apparatus, the second jar is also discharged at each passage of the spark by the action of resonance, assuming, of course, that the sliding contact occupies the correct position. Not too slight a motion of the sliding contact disturbs the resonance and stops the secondary discharge. Induction is also avoided by interposing a metal screen between the two jars; glass plates or wood screens have, on the other hand, no influence.

60,647. — idem, 26 cm high 1. 16. 0

60,648. **Indicator (Discharge Tube)** (Noack's), Figure, for demonstrating Resonance Vibrations with the apparatus No. 60,646 and 60,647 (Ztschr. f. d. phys. u. chem. U. **15,** p. 95) 0. 4. 0

The indicator consists of an angular shaped Geissler tube which is fixed to the Lodge Jar with threads instead of the spark gap, in such manner that the tinfoil coatings on both ends make good contact with the metal parts of the jars. The tube is rendered luminous with each discharge.

60,649. **Apparatus,** as suggested by Puccianti, Figure, for the projection lantern (cf. M. P. 10th edn., IV, 1, p. 272) 0. 16. 0

A is a glass tube filled with cotton wool, this tube being continued as a capillary B. If air bubbles are then passed through A into the vessel filled with petroleum, the bubbles are repelled by the metal sphere P when this is electrified, equally so whether the electricity is positive or negative.

60,650. **Rubber Bellows for above** 0. 4. 0

60,651. **Hauy's Apparatus for investigating the Electricity** produced in Minerals by Temperature-changes or by Pressure, Figure, for fluorspar and tourmaline, with insulating stand 0. 18. 0

60,652. **Kundt's Pyro-Electric Apparatus,** Figure (Wiedem. Annal. **20,** p. 592, 1883; 28, p. 145, 1886; Chwolson, IV, 1, p. 253) 2. 0. 0

Cl. 5685, 2195, 2196, 5025, 2058, 5624.

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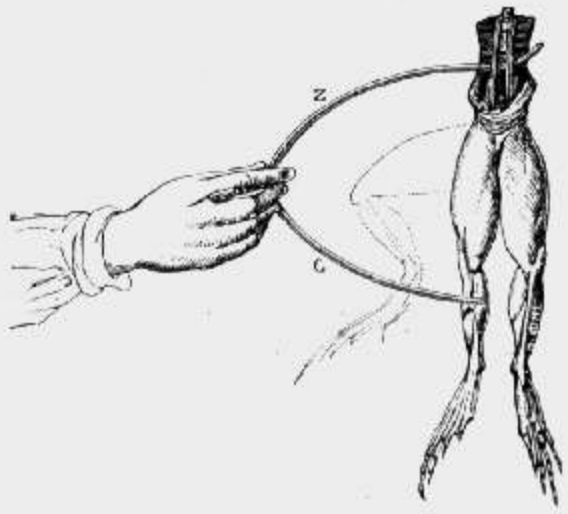
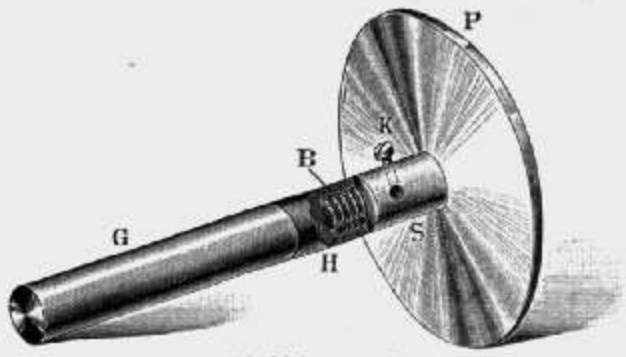


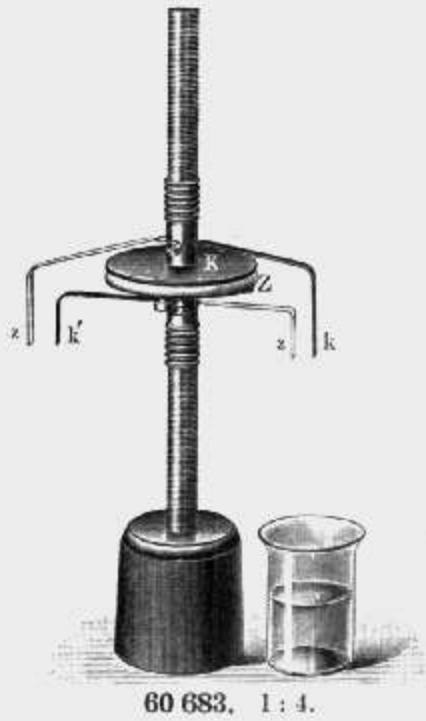
60 680. 1 : 5.



60 682. 1 : 2.



60 684. 1 : 6.



60 683. 1 : 4.

Max Kohl A. G. Chemnitz, Germany.

Voltaic Electricity.

Section 1: Galvanic Sources of Current.

Apparatus for demonstrating Potential Drop along a Conductor traversed by a Current generated by means of an Influence Machine or an Electric Machine: see Nos. 60,541 and 60,542 on p. 826.

	£ s. d.
60,680. **Bow-shaped Joint of Copper and Zinc,** for Galvani's Experiment on the frog's leg, Figure (M. P. 10th edn., IV, 1, p. 315; 9th edn., III, p. 326; Gan.-Man. Fig. 690; Gan.-Rein. Fig. 802)	0. 3. 0

Accessories for the Voltaic Fundamental Experiments as suggested by Noack.

(Ztschr. z. Förd. d. phys. U. **1885,** p. 177, cf. also Gan.-Man., p. 757.)

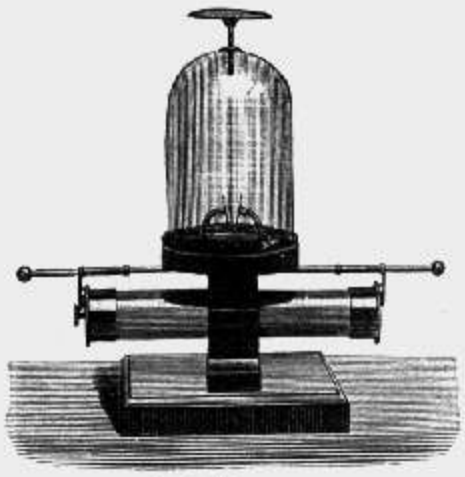
60,681. **2 Zinc Plates,** 80 mm diameter, quite plane, 1 varnished on one side, the other metallic; **2 similar Copper Plates, 2 Handles** for these plates; **1 Flexible, Circular Copper Strip** and **1 Zinc Strip,** with ebonite handles; **1 Mica Disc,** 160 mm diameter, and an 80 mm Cloth Disc. As regards an electrometer for No. 60,681 we can recommend No. 60,704, or, better still, No. 60,705.	1. 8. 0
60,682. **3 Copper and 3 Zinc Plates** and 2 insulating handles **for the Fundamental Voltaic Experiment,** as suggested by Grimsehl, Figure, for use with Grimsehl Electrometer No. 60,202, or any other sensitive leaf electrometer (M. P. 10th edn., IV, 1, p. 320). 2 Copper Plates and 1 Zinc Plate are lacquered, the remaining plates being bare. .	1. 10. 0
60,683. **Lead Base, Copper and Zinc Strips, Leather Disc and Beaker,** for carrying out the experiments as in Fig. 60,683 with plates 60,682 (M. P. 10th edn., IV, 1, Fig. 288) .	1. 0. 0
60,684. **Volta's Pair of Plates** with magnetic needle, Figure	0. 16. 0



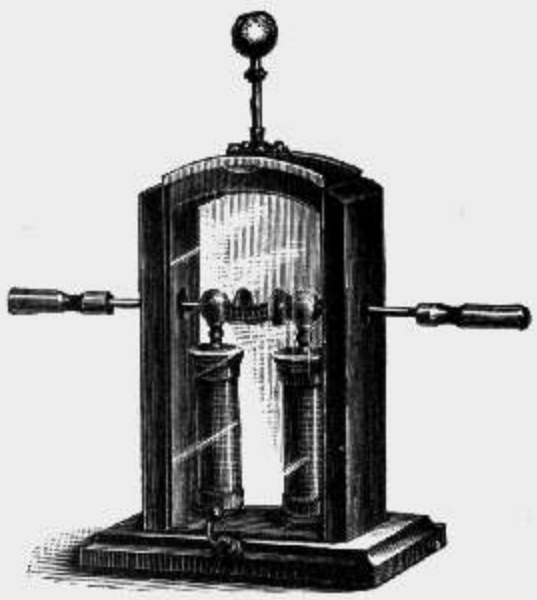
60 693. 1 : 8.



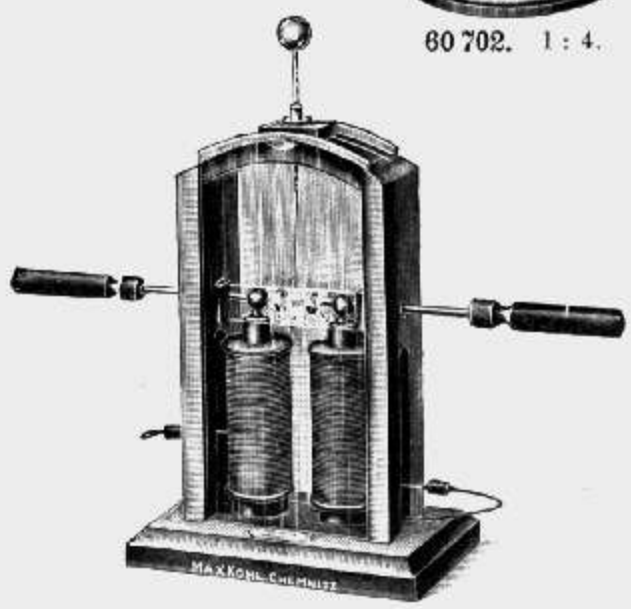
60 685 — 60 688. 1 : 5 — 1 : 12.



60 257. 1 : 6.



60 703. 1 : 5.



60 704. 1 : 5.



60 702. 1 : 4.

Volta's Pile, Figure, of copper and zinc plates with felt between, insulated with ebonite (Gan.-Man., Fig. 687; Gan.-Rein. Fig. 806).

				£ s. d.
List No.	**60,685**	**60,686**	**60,687**	**60,688**
No. of pairs of Plates	20	30	40	50
Diameter of Plates	40	50	60	60 mm
£	**1. 0. 0**	**1. 10. 0**	**2. 0. 0**	**3. 0. 0**

Zambonic Pile, Figure, of gold and silver paper, in glass tube with terminals at the poles.

List No.	**60,689**	**60,690**	**60,691**	**60,692**	**60,693**	**60,694**
No. of pairs of Plates	1000	2000	3000	4000	5000	6000
Diameter of Plates	28	28	35	35	40	50 mm
£	**1. 4. 0**	**1. 10. 0**	**1. 16. 0**	**2. 5. 0**	**3. 10. 0**	**5. 0. 0**

— idem, open, the discs strung on ebonite rod, with terminals at the ends. The internal resistance can be regulated within certain limits by pressing the discs together by means of a screw device. Any pressures can be taken off by the aid of a needle with terminal let into the pile at the side.

List No.	**60,695**	**60,696**	**60,697**	**60,698**	**60,699**	**60,700**
No. of pairs of Plates	1000	2000	3000	4000	5000	6000
Diameter of Plates	28	28	35	35	40	50 mm
£	**0. 18. 0**	**1. 4. 0**	**1. 10. 0**	**1. 16. 0**	**3. 0. 0**	**4. 0. 0**

60,257. **Pile Electrometer** (Bohnenberger-Fechner's), Figure 2. 15. 0

60,702. — idem (Bennet's), Figure (M. P. 9th edn., III, Fig. 292) 2. 0. 0

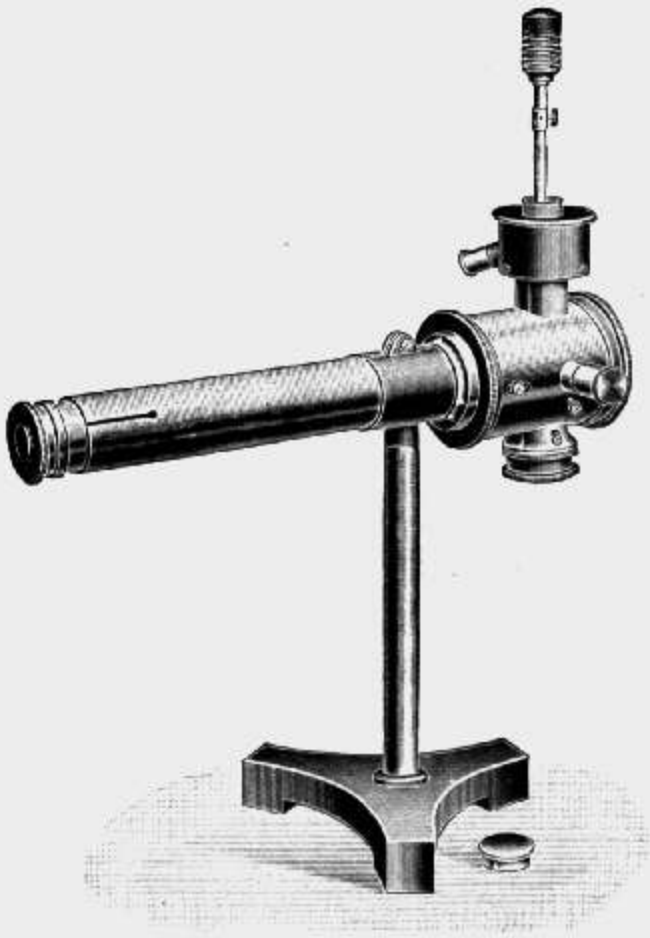
60,703. **Pile Electrometer** (Ztschr. z. Förd. d. phys. U., 1886, p. 119), Figure, **for objective demonstration,** with degree graduation on glass, pile conducted off in the centre . . 3. 5. 0

60,704. — idem, Figure, with open piles, variable sensitivity 3. 15. 0

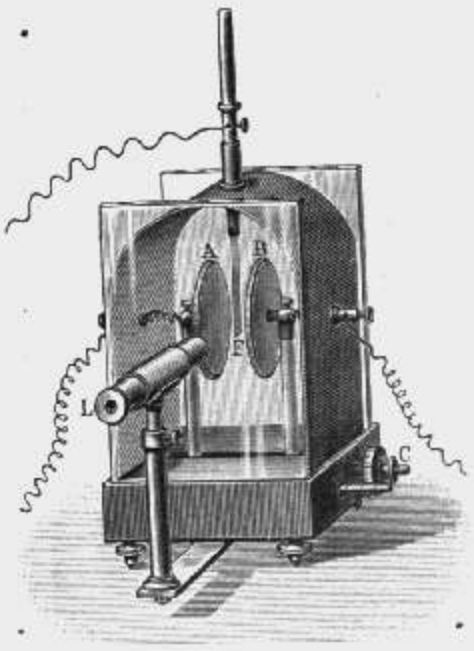
Cl. 2198, 2200, 2201, 2199, 391, 392.

Max Kohl A. G. Chemnitz, Germany.

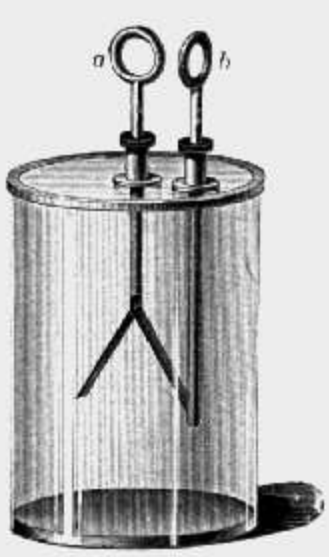
Max Kohl A. G. Chemnitz, Germany.



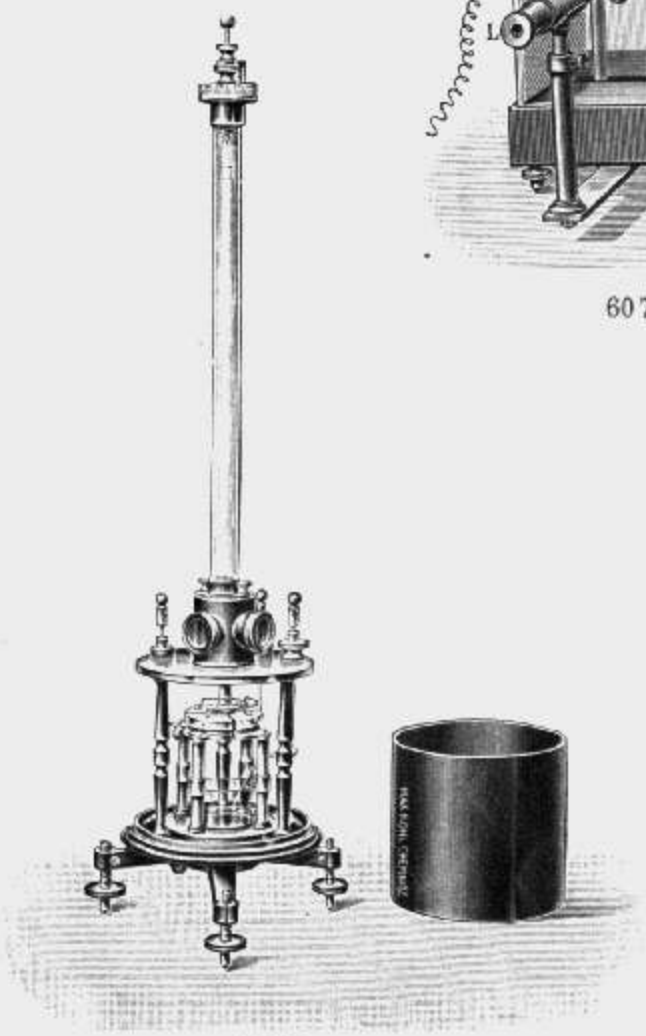
60 708.



60 705.



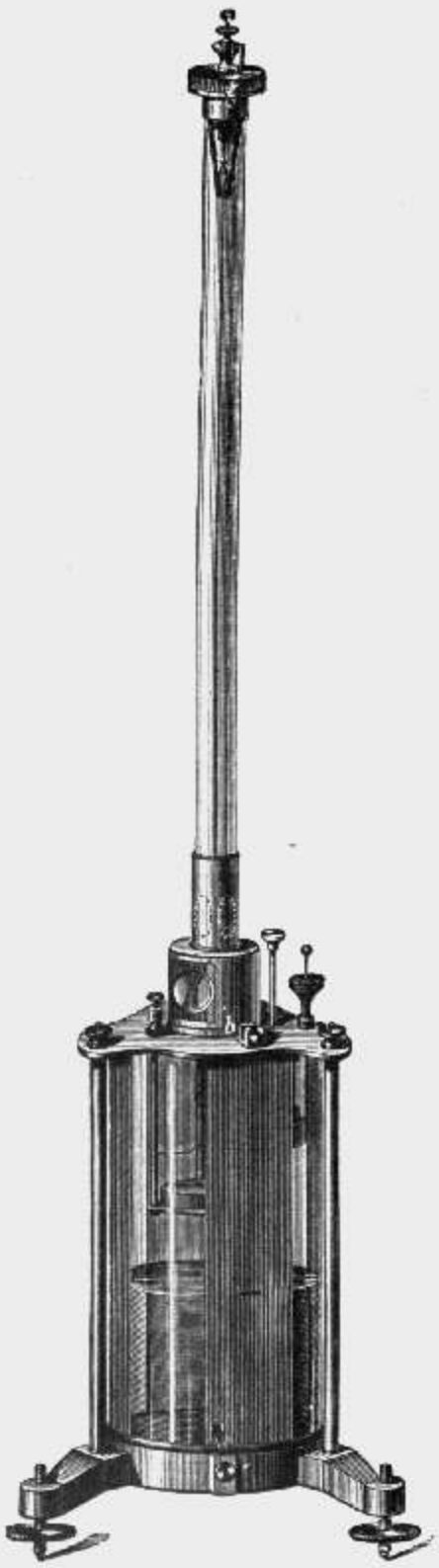
60 709. 1 : 4.



60 710. 1 : 6.

	£ s. d.
60,705. **Electrometer** (Hankel's) (M. P. 10th edn., IV, 1, Fig. 257), Figure, amber-insulated	9. 10. 0
60,258. **Water-Battery** for charging Quadrant Electrometers and the Hankel Electrometer, Figure 60,258 on p. 808, 144 copper-zinc cells on ebonite stand (W. D. p. 759 [700])	3. 0. 0
60,707. **Water Battery** (Rowland's), 400 cells (Ztschr. f. d. phys. u. chem. U. **1**, p. 120; W. D. p. 760)	3. 5. 0
60,708. **Electrometer with Quartz Fibres** and microscopic reading, as suggested by Prof. E. Wichert, Figure, very sensitive and provided with excellent insulation. In case	9. 10. 0
60,709. **Discharge Electrometer** (Weinhold's), Figure (W. D., Fig. 506 [479])	1. 7. 0
60,710. **Quadrant Electrometer** (Thomson-Mascart's), Figure (M. P. 10th edn., IV, 1, Fig. 253; 9th edn., III, Fig. 180), without replenisher, with adjustable bifilar suspension, closed by metal cylinder, Maxwell vane, quadrants heavily gilt, excellent amber-insulation	11. 0. 0

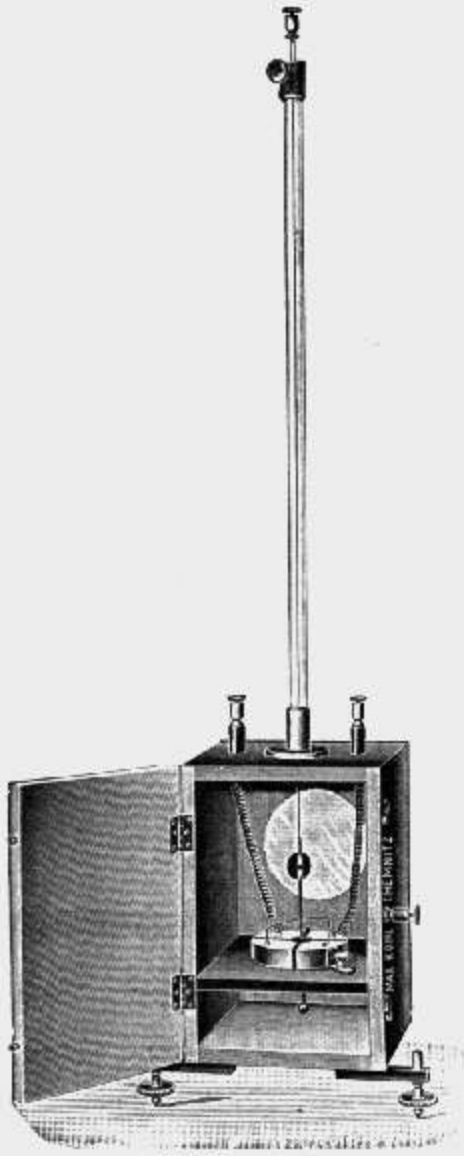
Cl. 5688, 5691, 2204, 4094.



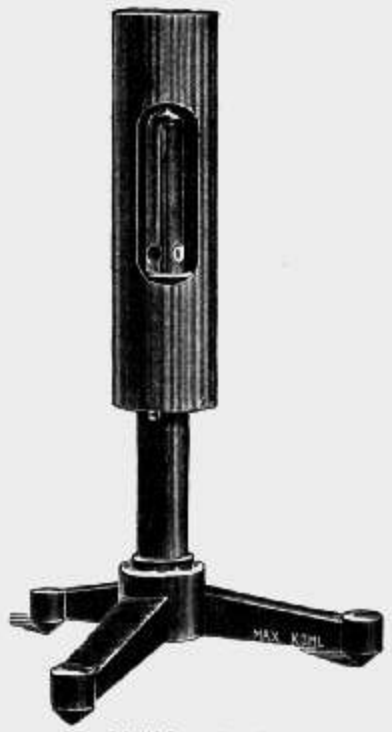
60711. 1 : 5.



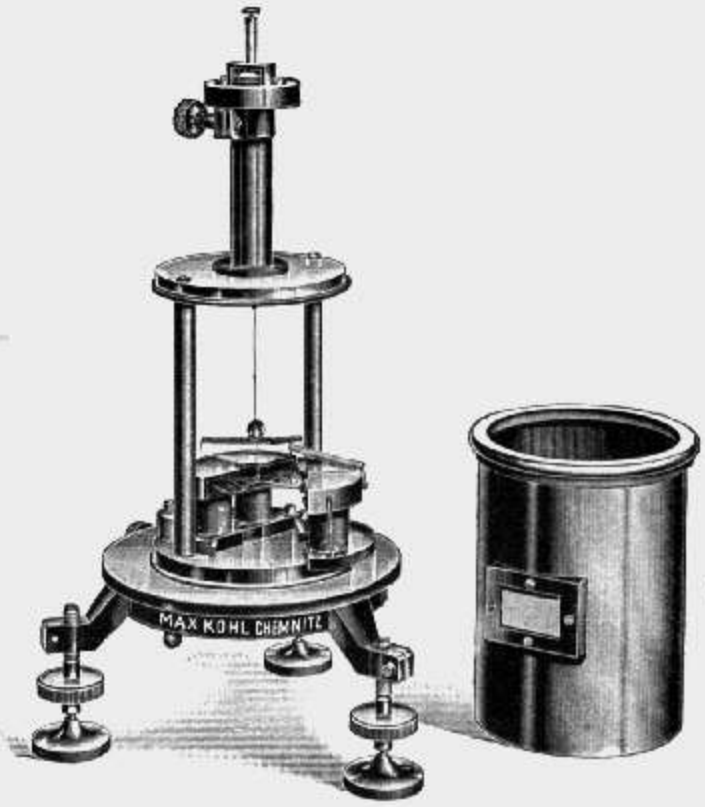
60712. 1 : 4.



60719. 1 : 6.



60718. 1 : 6.



60720. 1 : 3.

60,711. **Quadrant Electrometer** (Thomson-Weinhold's), Figure (W. D. Figs. 499—503 [472—476]; Gan.-Man., Fig. 649), with replenisher; Maxwell vane (M. P. 10th edn., IV, 1, Fig. 254; 9th edn., III, Fig. 182), all internal parts heavily gilt; with mirror, and arranged for subjective as well as objective reading, with excellent amber insulation — £ 12. 0. 0

60,712. **Replenisher** (Thomson's), for explaining the mode of action and for practical use, Figure (cf. Fr. phys. Techn. II, 1, Fig. 65). . . . . — 1. 4. 0

Accessories for Quadrant Electrometers Nos. 60710 and 60711.

60,713. **Wall Bracket and Wall Arm** for a paraffin, gas or incandescent lamp . . . . . — 0. 18. 0

60,714. **Protecting Case** for Quadrant Electrometers Nos. 60,710 and 60,711 . . . . . — 0. 10. 0

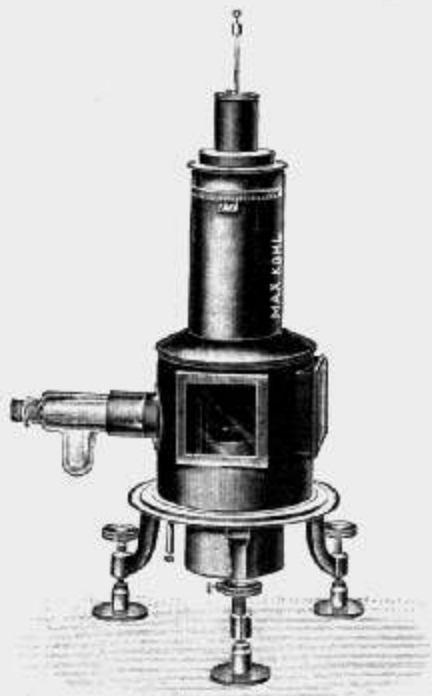
The protecting case is made of pasteboard covered with calico, being suspended from a ceiling pulley. When the electrometer is in use, the case is raised up, and when the electrometer is not in use, the case protects it entirely from dust. The electrometer can thus always maintain one position.

Cl. 5255, 33, 2206, 2214, 2208.

Max Kohl A. G. Chemnitz, Germany.



60 721. 1 : 6.



60 723. 1 : 6.



60 724. 1 : 9.

60,715. **Scale for Objective Reading,** 2 m long, of paper, with wood frame and legs, divided every 5 cm . . . . . £ 0. 8. 0

60,716. **Paraffin Lamp with slotted chimney,** on raised base 0. 8. 0

60,717. **Argand or Auer Burner** with slotted chimney, on adjustabel raised base 0. 15. 0

60,718. **Electric Incandescent Lamp,** on stand and with shielding cylinder, Figure, for quadrant electrometers and mirror galvanometers 0. 18. 0

The glow lamp is of the long filament type. The voltage should be given when ordering. If this is not stated we supply 110-volt lamps.

60,719. **Demonstration Quadrant Electrometer,** Figure, simple pattern, in wood house, well suited for teaching purposes (Stewart & Gee, Practical Physics, Fig. 114) . . . 3. 4. 0

60,720. **Quadrant Electrometer** (Dolezalek's), Figure (Ztschr. für Instrumentenkunde, **21**, p. 345), for measuring small potential differences of approx. 1 to 0.001 volt 8. 0. 0

The needle is of a very light type, its weight with mirror being only 0.2 gram. It is suspended from a quartz fibre rendered conductive by hygroscopic salts and is so formed as to be self-damping. It is charged with 50 to 200 volts.

60,721. — idem, modified by Wien, Figure, with tall base and platinum point, in order to enable the electrometer to be charged from underneath, also with calcium chloride desiccator; for measuring small potential differences of approx. 1 to 0.001 volt; with **amber** insulation and **case of Quartz Fibres** 10. 0. 0

60,722. **Case of Quartz Fibres** for Nos. 60,720 and 60,721 . . . . . 0. 5. 0

60,723. **Quadrant Electrometer** (Elster & Geitel's), Figure, with first quality insulation, also suitable for investigating radio-active substances (Wiedem. Ann. **64**, p. 680) . . 12. 10. 0

The damping, needle adjustment, torsion of the suspension device and the drying arrangement (with sodium) can be regulated independently of each other.

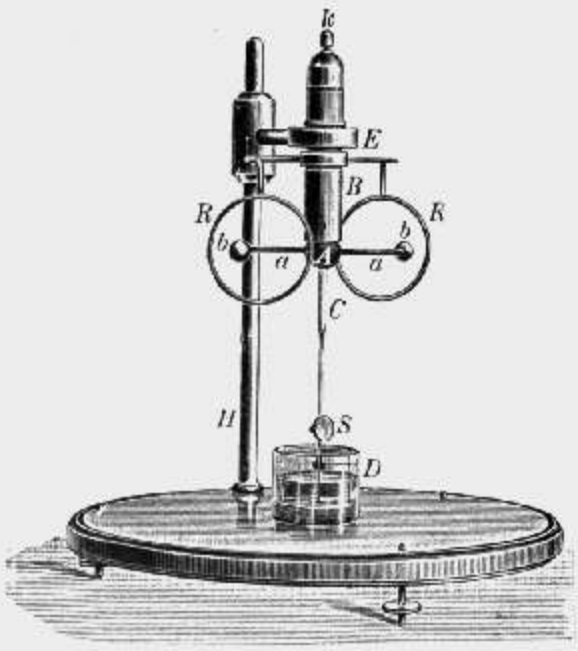
The instrument has variable sensitivity. — A deflection of 1000 scale divisions can be attained with 1 volt.

60,724. **Cylindrical Quadrant Electrometer** (Edelmann's), Figure, with cast zinc wall bracket (Fr. phys. Techn. II, 1, p. 98) 14. 10. 0

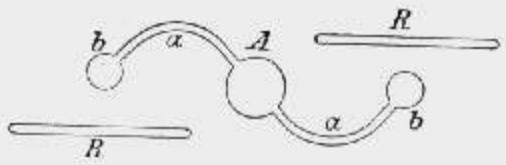
The vane and quadrants consist of elongated cylindrical sections, the vane being adjusted by a small magnet. Raw silk fibre suspension; vane charged by water battery Nos. 60,706 or 60,707. The instrument is very sensitive and easy to manipulate.

For Dry Piles for Charging Needles of Quadrant Electrometers see Nos. 60,689 to 60,700.

Max Kohl A. G. Chemnitz, Germany.



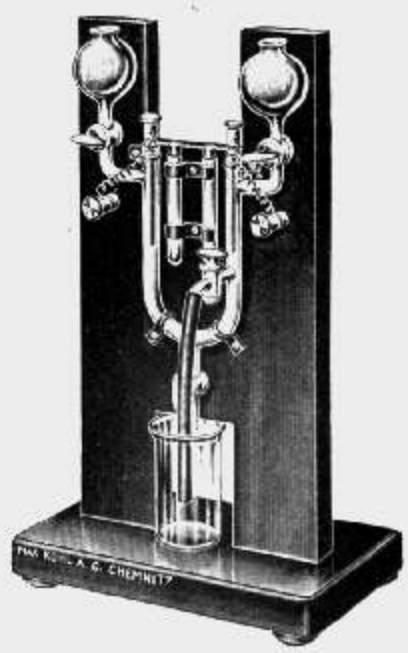
60 725 A. 1 : 8.



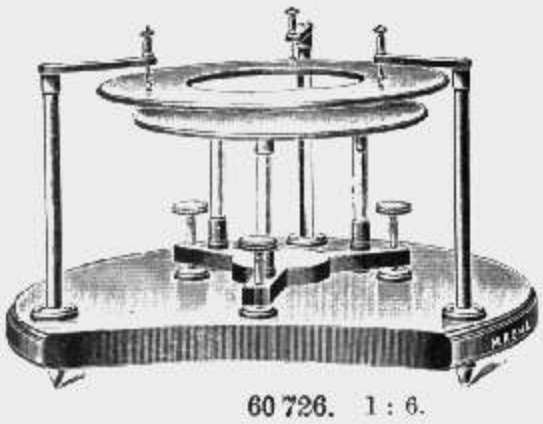
60 725 B. 1 : 4.



60 727. 1 : 6.



60 729. 1 : 4.



60 726. 1 : 6.



60,725. **Mirror Electrometer for High Potentials,** as suggested by Heydweiler, Figs. A and B (Ztschr. f. d. phys. u. chem. U. **6**, p. 255; Ztschr. für Instrumentenkunde **12**, p. 377; Elektrotechnische Ztschr. **1893**, p. 29), with 2 bifilar suspensions, easily interchangeable, for measurements of **3000** to **27,000 volts** and of **6000 to 50,000 volts** . . £ 10. s. 0. d. 0

The instrument is essentially a torsion balance and has the advantage that the potentials to be measured are nearly proportional to the square root of the scale readings. The results are very accurate.

The electrometer has a good damping arrangement.

Subjective and Objective Reading Devices for Electrometers Nos. 60 719 to 60 725: see Mirror Galvanometers.

60,726. **Absolute Electrometer (Electrometer Balance** with protecting ring condenser), as suggested by Thomson-Kirchhoff, Figure, without balance 16. 0. 0

The lower of two circular plane parallel condenser plates of gilt brass is fixed in an insulating material, while the upper is suspended on a sensitive balance in the manner of a balance pan.

The balance suitable for the above is No. 51,542 on p. 234.

Standard Cells.

60,727. **Standard Copper-Zinc Cell** (Weinhold's), Figure (W. D. p. 752 [694]) 0. 10. 0

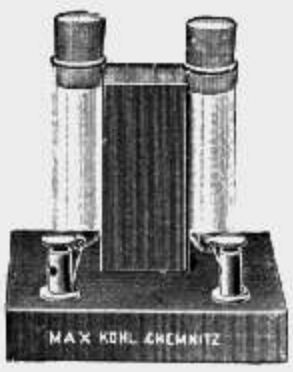
60,728. **Standard Cell** (Kittler's), with chemically pure copper and zinc plates, in polished oak case with handles 2. 10. 0

Sulphuric acid of 1.075 specific gravity at 80° C. and a solution of copper-sulphate of 1.19 sp. gravity is used for charging. E. M. F. 1.182 v. at 15.5° C.

60,729. **Standard Cell** (Fleeming's), Figure (M. P. 9th edn., III, Fig. 304; Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 113; Gan.-Man. Fig. 726) 1. 12. 0

60,730. **Clark Standard Cell,** self-filling type as suggested by Ostwald, Figure, with pole terminals 0. 4. 0

Max Kohl A. G. Chemnitz, Germany.



60 730. 1 : 3.



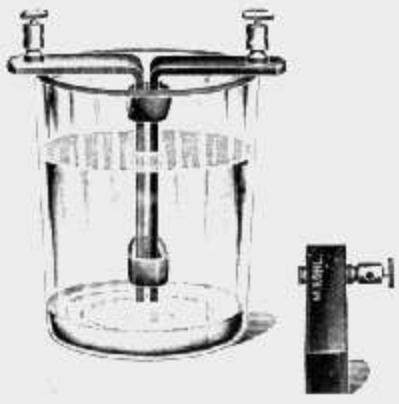
60 731. 1 : 3.



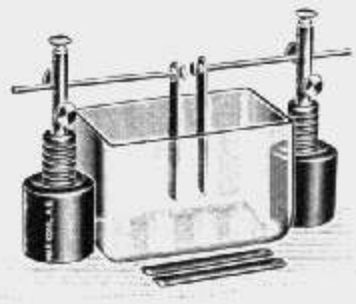
60 732. 1 : 2.



60 734. 1 : 4.



60 737. 1 : 3.



60 737 a. 1 : 6.



60 738. 1 : 6.

60,731. **Standard Cell** (Clark's), Figure, prepared in accordance with the instructions of the Reichsanstalt, with Test Certificate (M. P. 10th edn., IV, 1, Fig. 489; Gan.-Rein., Fig. 817) . . . . . £ 2. 0.0

60,732. **Standard Cell** (Weston's), Figure, with a not fully concentrated solution of cadmium sulphate, **Original Weston Standard Cell,** with low internal resistance, without temperature coefficient, usual type for precision measurements; average value of e. m. f. 1.0190 volt, (M. P. 10th edn., IV, 1, Fig. 490) 2. 0.0

60,733. — idem, double form (2 separate cells in one case) 3. 0.0

60,734. **International Weston Standard Cell,** Figure, prepared in accordance with the specification of the International Congress of Electrical Units and Standards, London, 1908, with saturated cadmium sulphate solution with excess of cadmium sulphate crystals; temperature coefficient: 0.004 per cent per degree, in case suitable for petroleum bath; without thermometer 1.15.0

60,735. — idem, double form (2 separate cells in one case) 2.15.0

60,736. **Thermometer,** suitable for above 0. 5.0

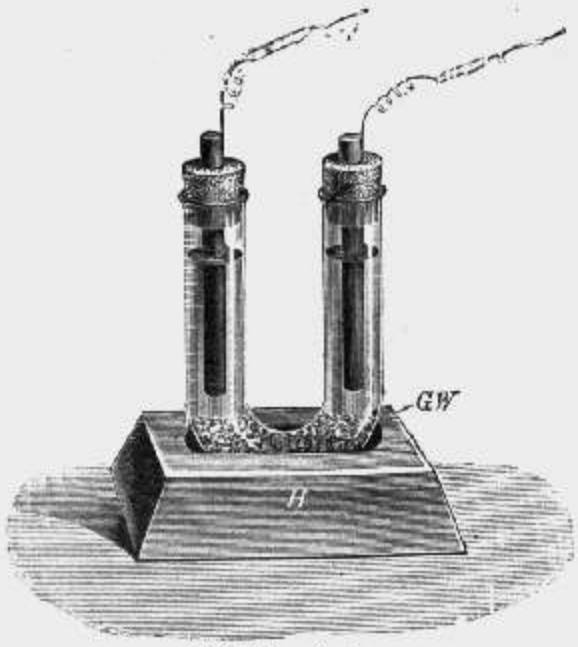
The testing, verification and determination of temperature coefficient of cells Nos. 60,732 to 60,735 by the Reichsanstalt are carried out by the Reichsanstalt at customers' expense.

Galvanic Demonstration-Cells.

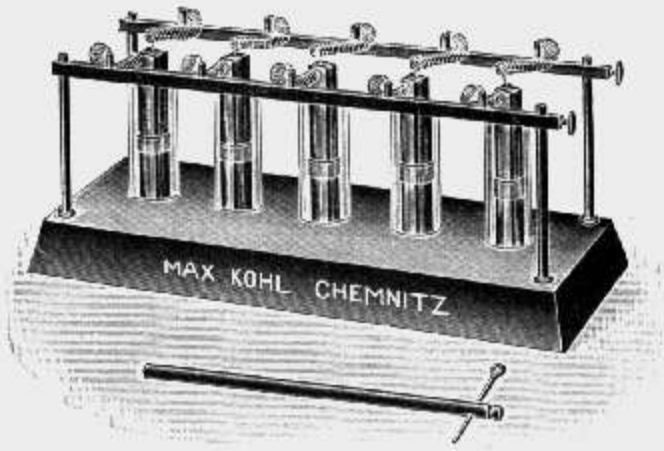
60,737. **Zinc-Copper Cell** with separate **carbon electrode,** Figure (Gan.-Man. Fig. 688; Gan.-Rein. Fig. 803). Dilute sulphuric acid 1 : 10 is used for charging 0. 3.0

60,737 a. **Demonstration Cell,** Figure, for use with Holtz Clamps, without the latter (see No. 60,172, p. 799), with 2 copper plates, 1 zinc and 1 iron plate 0. 8.0

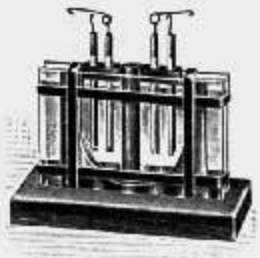
60,738. **Small Voltaic Cell,** as suggested by Kolbe, Figure (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 85), on wood board, for charging with dilute sulphuric acid (1 : 10) 0. 2.0



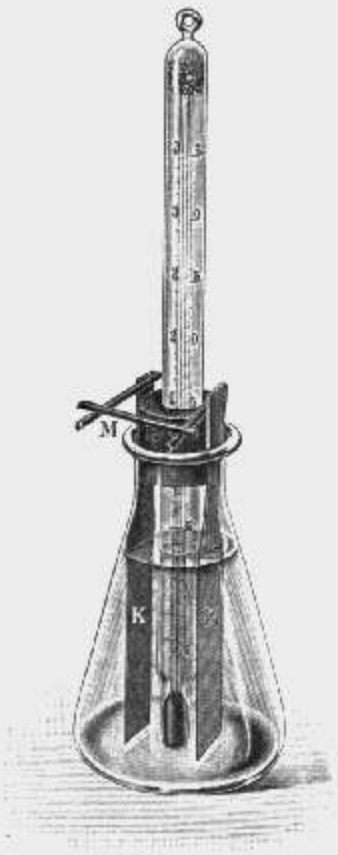
60 740. 3 : 4.



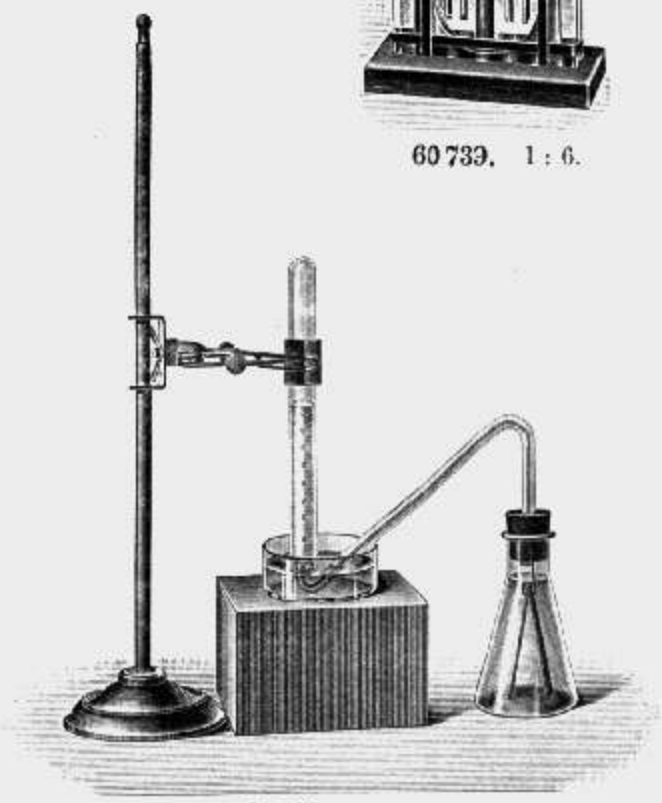
60 741. 1 : 4.



60 739. 1 : 6.



60 743. 1 : 3.



60 744. 1 : 5.

60,739. **Small Projection Cell** (Kolbe's), Figure (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 87), for charging with dilute sulphuric acid (1 : 10). . . . . £ 0. 8. 0

60,740. **Small Constant Cell,** as suggested by Kolbe (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 92), on wood base, Figure 0. 3. 0

The cell is a small U-shaped Daniell cell, the centre part of which — at the bend — is plugged with glass wool so that the liquids slowly ooze through without, however, becoming mixed if the cell is kept still.

60,741. **Small Constant Battery,** Figure, 5 small Daniell cells as per last item mounted on a board 0. 16. 0

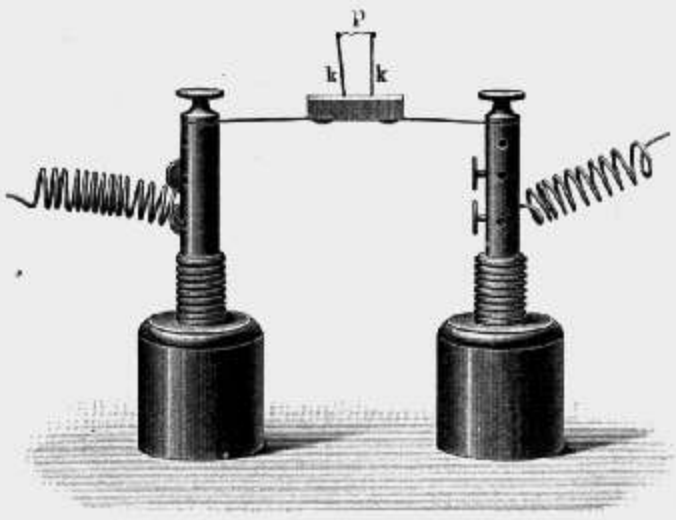
60,742. **10 Batteries of preceding construction,** for high voltages 7. 10. 0

60,743. **Zinc-Copper Cell,** with thermometer between electrodes, Figure, for demonstrating internal heating (M. P. 10th edn., IV, 1, Fig. 298). Dilute sulphuric acid (1 : 10) is used as electrolyte 0. 6. 0

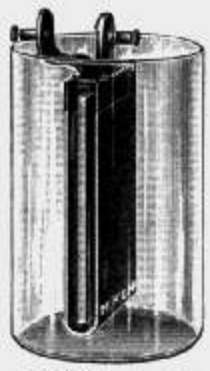
Cl. 2223, 3465, 5793b, 5690, 5689.

Max Kohl A. G. Chemnitz, Germany

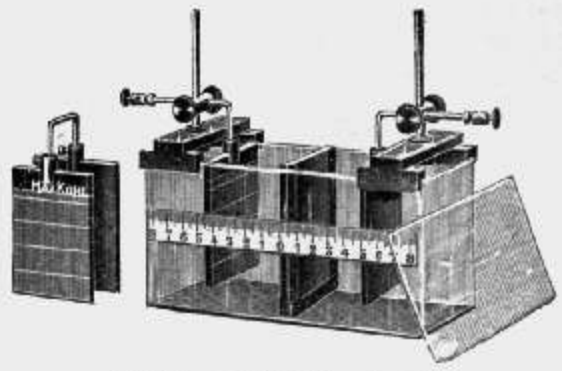
Max Kohl A. G. Chemnitz, Germany.



60745. 1 : 4.



60746. 1 : 5.



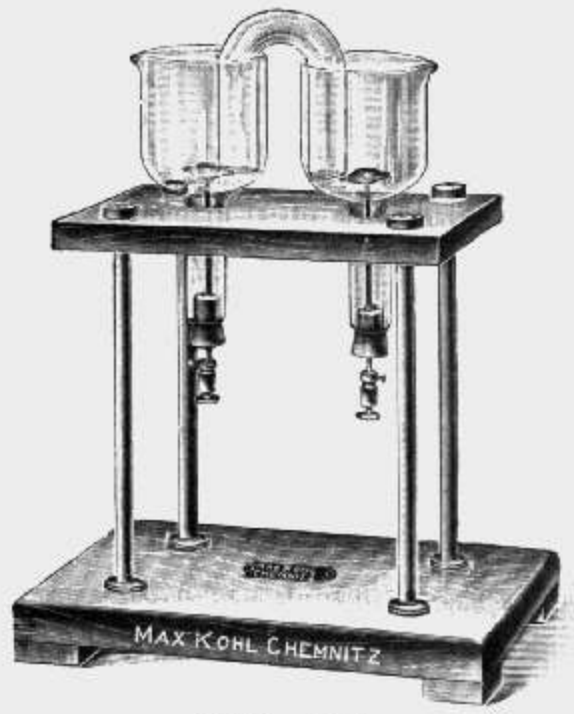
60747 and 60748. 1 : 8.



60750. 1 : 5.



60751.

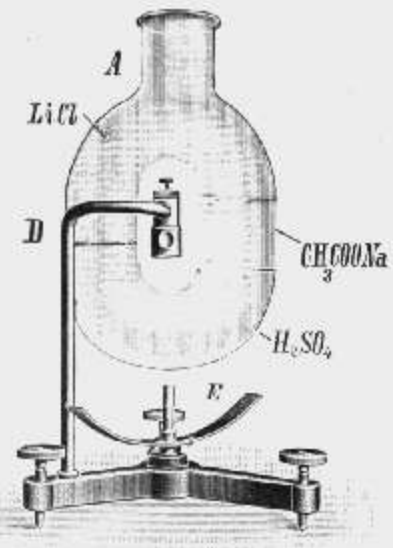


60752. 1 : 4.

	£ s. d.
60,744. **Zinc-Copper Cell,** with gas generating tube, Figure, including stand and seat (M. P. 10th edn., IV, 1, Fig. 299)	0. 12. 0
60,745. **Connecting Piece** with platinum foil, for proving the heating of the external circuit, Figure; price does not include the Holtz Clamps illustrated, No. 60,172 (M. P. 10th edn., IV, 1, Fig. 301). The cell most suitable for this is No. 60,746	0. 3. 0
60,746. **Wollaston Cell,** Figure, with simple carbon plate and U-shaped zinc plate . .	0. 6. 0
60,747. **Trough Cell** (Kolbe's), Figure, with, however, only 1 each zinc and carbon plate, for demonstrating the influence of internal resistance (Kolbe-Skellon, Introduction to Electricity, Part II, Figs. 120 and 121)	1. 10. 0
60,748. — idem, with separating wall and a pair of extra plates, Figure	2. 0. 0
60,749. **Folding Cell** (Grimsehl's) (Ztschr. f. d. phys. u. chem. U. **8**, 1894, p. 209, Fig. 1).	0. 15. 0
60,750. **Zinc-Copper Cell,** as suggested by Friedr. C. G. Müller, Figure, for demonstrating the action of the polarisers (M. T. Fig. 206)	0. 8. 0
60,751. **Apparatus for demonstrating the E. M. F. at the limits of 2 electrolytes,** Figure (Fr. phys. Techn. II, 1, Fig. 503)	0. 4. 0
60,752. **Reduction-Oxidation Cells,** Figure (Lüpke, Rüdorffs Grundriß der Chemie, 12th edn., 1902, p. 286)	1. 5. 0

The two cells of the series contain each 1 platinum electrode connected by wire leads to a galvanometer. 1 cell is charged with a solution of stannic chloride, the other one as well as the syphon connecting the cells containing an acidulated solution of common salt. If a crystal of mercuric chloride is placed on the electrode of the last-named cell, the galvanoscope needle deflects in such manner that this electrode appears as a positive pole.

Cl. 5682, 3504, 2480, 3874, 5010, 3704.



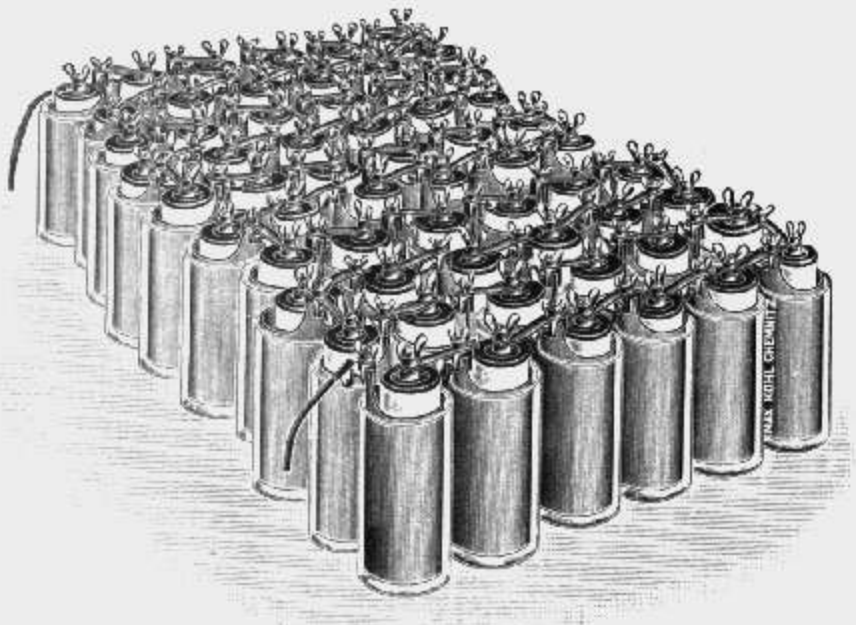
60753.



60754 — 60756. 1 : 5 — 1 : 6.



60759 A. 1 : 4.



60759 B. 1 : 9.



60758 a. 1 : 3.

60,753. **Apparatus as suggested by F. Dolezalek and F. Krüger,** Figure, for demonstrating the current flowing through a circuit consisting of liquids only (M. P. 10th edn., IV, 1, Fig. 495 b) . . . . . £ s. d. 2. 0. 0

The annular vessel is half filled with a 35% solution of sulphuric acid, the surface of this vessel being covered with cork discs. A 30% solution of sodium acetate is introduced above these cork discs, at one side, up to 20 mm, the other side containing a 20% solution of lithiumchloride up to the upper edge of the ring. If the circuit so prepared is placed above the small system of magnets suspended from the stand (the deflections being observed by means of luminous pointer and scale), a deflection of the luminous index is obtained. If the ring is rotated the pointer moves to the other side. If the solution is mixed by shaking no deflection is obtained.

Galvanic Cells for Ordinary Use.

The prices of all cells, with the exception of Nos. 60,785—60,788 are exclusive of electrolyte.

Bunsen Cell, Figure, with heavily amalgamated zinc cylinder, porous pot and natural carbon plate, with zinc and carbon pole terminals (Gan.-Man. Fig. 723; Gan.-Rein. Fig. 813).

List No.	**60,754**	**60,755**	**60,756**
Length of Carbon Plate	160	210	260 mm
£	**0. 7. 0**	**0. 8. 0**	**0. 10. 0**

Electrolyte: Zinc Cylinder in dilute sulphuric acid, 1.06 sp. gr. (about 50 ccm H_2SO_4 to 1 liter water), carbon plate in concentrated nitric acid.

— idem, with tall and wide glass vessel and ebonite cross on bottom, for **continuous working,** charging of accumulators, etc.

List No.	**60,757**	**60,758**
Length of Carbon Plate	210	260 mm
£	**0. 10. 0**	**0. 12. 0**

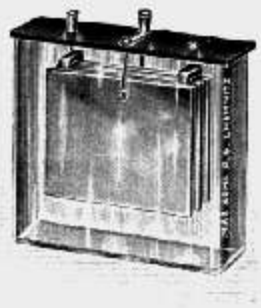
60,758 a. **Celluloid Top** for Bunsen Cells Nos. 60,757 and 60,758 (M. T. Fig. 172), Figure 0. 1. 3

Cl. 5679, 5781², 2226, 2227, 4517.

Max Kohl A. G. Chemnitz, Germany.



60 763. 1 : 6.



60 765. 1 : 6.



60 781. 1 : 6.

£ s. d.

Grove Cell, Fig. 60,759 A, with zinc cylinder and S-shaped platinum sheet.

List No.	**60,759**	**60,760**	**60,761**
Length and width of platinum sheet	160×60	100×50	60×40 mm
£	**2. 0. 0**	**1. 4. 0**	**0. 16. 0**

Fig. B shows a battery consisting of 60 cells.

Electrolyte: as in Bunsen Cell.

Daniell Cells, with copper cylinder and zinc cross, Figure (Gan.-Rein., Fig. 809):

List No.	**60,762**	**60,763**	**60,764**
Height of glass	160	200	250 mm
£	**0. 5. 0**	**0. 6. 6**	**0. 8. 0**

Electrolyte: porous pot with zinc cross in dilute sulphuric acid 1.06 sp. gr. (about 50 ccm pure sulphuric acid to 1 litre water); copper cylinder in saturated solution of sulphate of copper (about 1 part crystallised copper sulphate to 3 parts water).

Cupron Cells, Figure, improved **Lelande Cell, regenerable** (Cupric oxide-alkali-zinc); terminal voltage per cell about 0.8 volts.

Type	I	II	III	IV	
List No.	**60,765**	**60,766**	**60,767**	**60,768**	
Length×Width×Height	190×55×170	190×75×240	200×110×280	250×140×370	mm
Normal Current	1—2	2—4	4—8	8—16	amps.
Approx. capacity	50	100	200	400	amp.-hrs.
Caustic Soda with 1% Sodium Hyposulphite	0.2	0.4	0.8	1.6	kg
Water	1.2	2.3	4.4	7	litres
£	**0. 5. 0**	**0. 9. 0**	**0. 16. 0**	**1. 7. 0**	

60,769. **Caustic Soda** in sheet iron boxes (with 1% soda hyposulphite) . . . . . 1 kg 0. 0. 9

Spare Zinc Plate for Type . .

	I	II	III	IV
List No.	**60,770**	**60,771**	**60,772**	**60,773**
£	**0. 0. 4**	**0. 0. 8**	**0. 0. 8**	**0. 1. 10**

Spare Cupric Oxide Plate.

List No.	**60,774**	**60,775**	**60,776**	**60,777**
£	**0. 3. 0**	**0. 5. 0**	**0. 5. 0**	**0. 8. 0**

Exact instructions for use are supplied.

Smee Cells, consisting of a platinised silver plate between two zinc plates.

List No.	**60,778**	**60,779**
Height	160	200 mm
£	**0. 18. 0**	**1. 4. 0**

Electrolyte: dilute sulphuric acid 1.06 sp. gr. (about 50 ccm pure sulphuric acid to 1 litre water).

Bottle Cell (Grenet's), Figure, with 2 carbon plates and 1 zinc plate (Gan.-Man., Fig. 724; Gan.-Rein., Fig. 815).

List No.	**60,780**	**60,781**	**60,782**	**60,783**
Capacity	1/4	1/2	1	1 1/2 litres
£	**0. 2. 6**	**0. 3. 6**	**0. 5. 0**	**0. 7. 0**

Electrolyte: 92 grams powdered potassium bichromate, or better still, 81 grams sodium bichromate ($K_2Cr_2O_7$ or $Na_2Cr_2O_7$) are worked up together with 94 ccm of pure sulphuric acid to a smooth paste, in a dish. Before hardening 900 ccm water should be added until everything is dissolved.

60,784. **Large Bottle Cell,** 340 mm high, with 3 carbon and 2 zinc plates; very powerful 1. 2. 0

Electrolyte: as in Nos. 60,780—60,783.

Max Kohl A. G. Chemnitz, Germany.



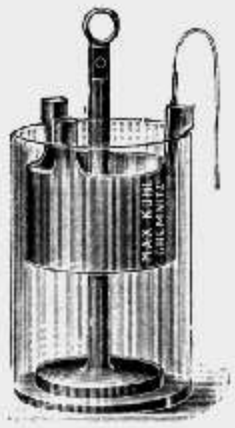
60785. 1 : 6.



60788. 1 : 7.



60789. 1 : 6.



60791. 1 : 5.

£ s. d.

Leclanche Cells, Figure, with manganese dioxide cylinder, zinc rod and electrolyte of sal-ammoniac; used formerly chiefly for house telegraphy and telephony (Gan.-Man., Fig. 725; Gan.-Rein., Fig. 818).

List No.	**60,785**	**60,786**
Height	160	250 mm
£	**0. 2. 6**	**0. 3. 6**

Electrolyte: at a height of 16 cm 50—60 grams and at 25 cm 100 grams of sal-ammoniac are dissolved in water and this is introduced to about 3 cm from the upper edge.

Cells (Fleischer's), Figure, chiefly used at the present time for house telegraphy and telephony; it is also very practicable for physical purposes with feeble currents.

List No.	**60,787**	**60,788**
Height	160	250 mm
£	**0. 3. 0**	**0. 4. 0**

Electrolyte: as No. 60,785 and 60,786.

Meidinger's Cell, Figure, balloon cell, chiefly used for telegraphy with closed circuit current.

List No.	**60,789**	**60,790**
Total Height	240	300 mm
£	**0. 3. 6**	**0. 5. 6**

Electrolyte: the large glass is half filled with water in which is dissolved 20 or 50 grams respectively of magnesium sulphate so that when the globe is inserted the zinc cylinder is entirely immersed in water. The globe should be filled with 650 or 1500 grams respectively of copper sulphate in pieces as large as hazel nuts and should be closed with the plug and glass tube.

60,791. **Cell** as suggested by Callaud-Krüger, Figure, for telegraphy and closed circuit current installations, 160 mm high (Gan.-Man., Fig. 722; Gan.-Rein., Fig. 811) . . . 0. 3. 6

Electrolyte: the cell is filled with water in which 15 grams magnesium sulphate is dissolved, with the subsequent addition of 60—75 grams (**not more**) copper sulphate in small pieces. According as how the cell is used enough copper sulphate should be added until the lead plate rests in a bluish-green coloured stratum.

Helleson Dry Cells, Figure, well adapted, for telegraph and telephone work, bells, measurements, etc.

List No.	**60,792**	**60,793**	**60,794**	**60,795**	**60,796**
Total height, mm	83	122	155	180	195
Base mm	32×32	57×57	63×63	76×76	100×100
Approx. internal resistance ohms	0.35	0.25	0.20	0.15	0.10
£	**0. 1. 0**	**0. 1. 7**	**0. 2. 0**	**0. 2. 9**	**0. 4. 0**

The cell has an e. m. f. of approx. 1.5 volt and is characterised by great durability, high recuperating capacity, good depolarisation, small internal resistance, lack of sensitivity to temperature changes, and by its good capacity. **The most practical sizes are those of 155 mm and 180 mm height.**

Helleson Stock Cells, rechargeable dry cell; it can remain for any length of time before being used and is therefore excellently adapted for over-sea countries.

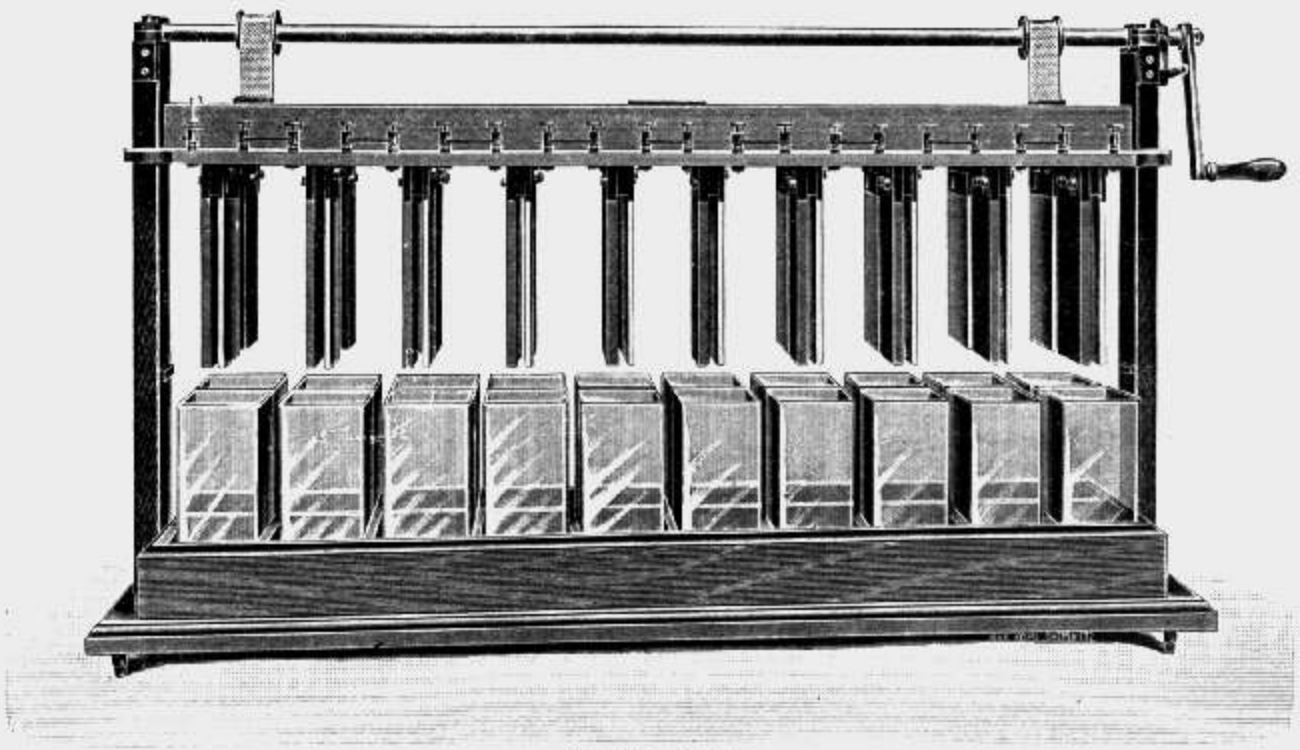
List No.	**60,797**	**60,798**	**60,799**	**60,800**
Total height mm	122	155	180	195
Base mm	57×57	63×63	76×76	100×100
Approx. internal resistance ohms	0.30	0.25	0.20	0.15
£	**0. 2. 0**	**0. 2. 6**	**0. 3. 0**	**0. 4. 6**

This cell can be stored for any length of time before being put in use and is only ready for use when filled with water after screwing off the ebonite closing cap. When filled the cap should be screwed down firmly again.

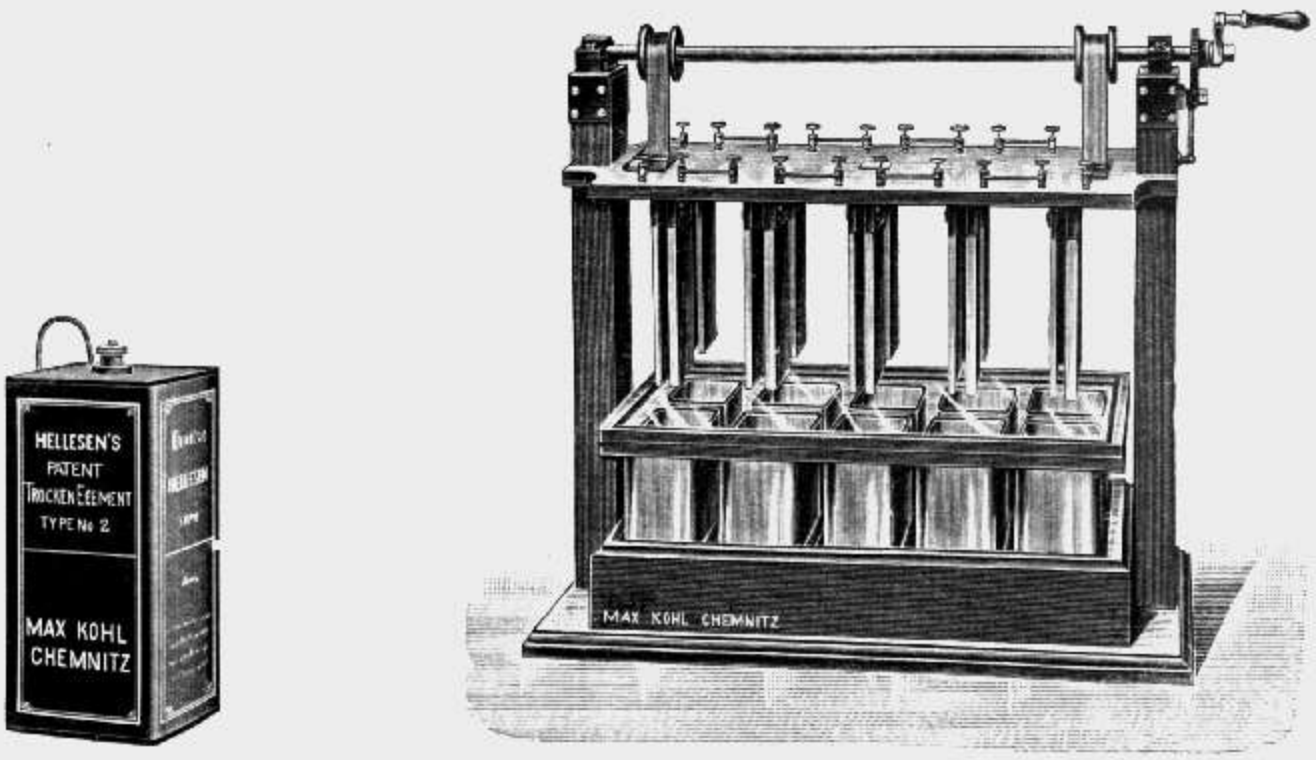
In addition the remarks re the Helleson Dry Cell apply here also.

Max Kohl A. G. Chemnitz. Germany.

Max Kohl A. G. Chemnitz, Germany.



60 806. 1 : 9.



60 809. 1 : 8.

60 795. 1 : 4.

Immersion Batteries for potassium bichromate electrolyte, Figure, size of plates 200 × 100 mm, the plates being raised by means of a handle on stand, with pulleys. £ s. d.

List No.	60,801	60,802	60,803	60,804	60,805	60,806
With	6	8	10	12	16	20 cells
£	**5. 2. 0**	**6. 16. 0**	**8. 5. 0**	**9. 12. 0**	**12. 16. 0**	**16. 0. 0**

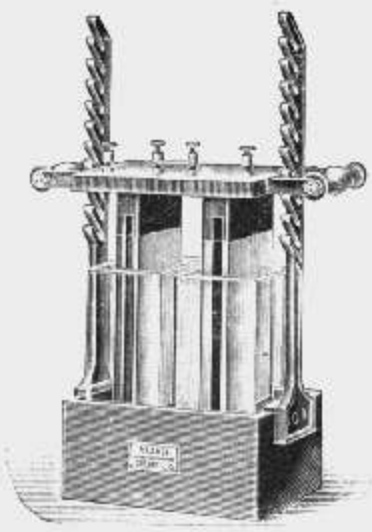
2.5 litres electrolyte as in Nr. 60,780 is necessary for one cell of this size.

The carbon plates of all immersion batteries consist of natural gas carbon, the zinc plates of best quality rolled zinc. The immersion batteries are so arranged that the glass vessels can be easily taken out for cleaning.

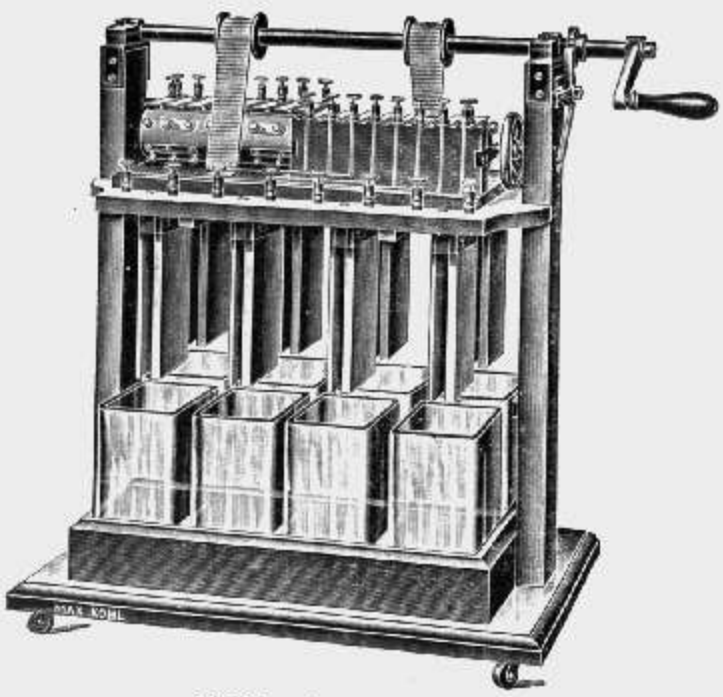
— idem, Figure, size of plates 180 × 90 mm; the plates are raised by means of a handle on stand, with pulleys.

List No.	60,807	60,808	60,809	60,810	60,811	60,812
With	6	8	10	12	16	20 cells
£	**4. 10. 0**	**6. 0. 0**	**7. 5. 0**	**8. 8. 0**	**11. 4. 0**	**14. 0. 0**

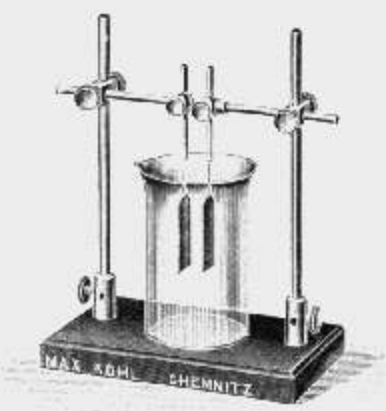
1.4 litre electrolyte as in No. 60,780 is necessary for one cell of this size.



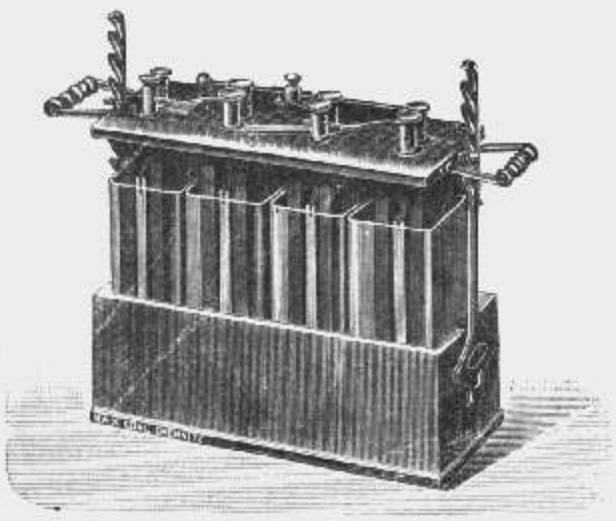
60 813. 1 : 10.



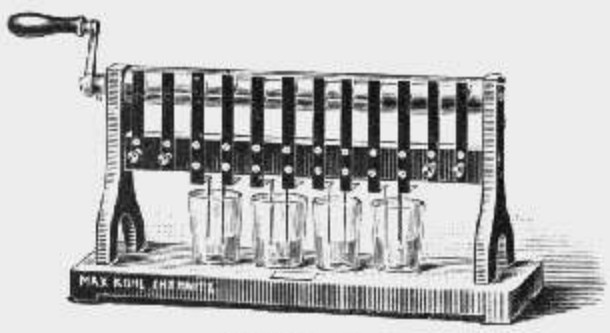
60 825. 1 : 9.



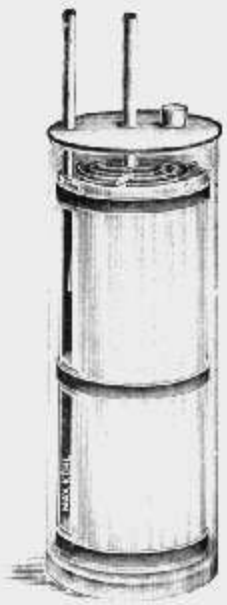
60 840. 1 : 8.



60 820. 1 : 8.



60 841. 1 : 4.

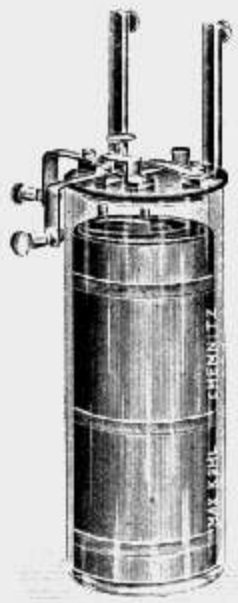


60 844. 1 : 5.

Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
Immersion Batteries, simple construction, Figure, size of plates 200×100 mm. Plates raised by both hands by means of two handles.	
List No. **60,813** **60,814** **60,815** **60,816** **60,817** **60,818**	
With 2 4 6 8 10 12 cells	
£ **1. 18. 0** **2. 16. 0** **4. 4. 0** **5. 12. 0** **7. 0. 0** **8. 8. 0**	
2.5 litres electrolyte as in No. 60,780 are necessary for one cell of this size.	
— idem, Figure, size of plates 180×90 mm. Plates raised by both hands by means of two handles.	
List No. **60,819** **60,820** **60,821** **60,822** **60,823** **60,824**	
With 2 4 6 8 10 12 cells	
£ **1. 14. 0** **2. 8. 0** **3. 12. 0** **4. 16. 0** **6. 0. 0** **7. 4. 0**	
1.4 litre electrolyte as in No. 60,780 is necessary for one cell of this size.	
60,825. **Immersion Battery** No. 60,808 mounted ready with Multiple Commutator, Figure. The multiple commutator permits of putting all 8 cells in parallel or series or in two groups of 4 cells each, or, finally, in 4 groups of 2 cells each.	9. 16. 0
60,826. **Spare Glass Vessel** for Nos. 60,801—60,806 and 60,813—60,818	0. 3. 0
60,827. — idem, for Nos. 60,807—60,812 and 60,819—60,824	0. 2. 0
60,828. **Spare Carbon Plate** for Immersion Batteries, 200×100 mm, for Nos. 60,801—60,806 and 60,813—60,818	0. 2. 6
60,829. — idem, 180×90 mm, for Nos. 60,807—60,812 and Nos. 60,819—60,824 . . .	0. 1. 6
60,830. **Spare Zinc Plate,** 200×100 mm, for Nos. 60,801—60,806 and Nos. 60,813—60,818	0. 2. 0
60,831. — idem, 180×90 mm, for Nos. 60,807—60,812 and Nos. 60,819—60,824. . . .	0. 1. 6

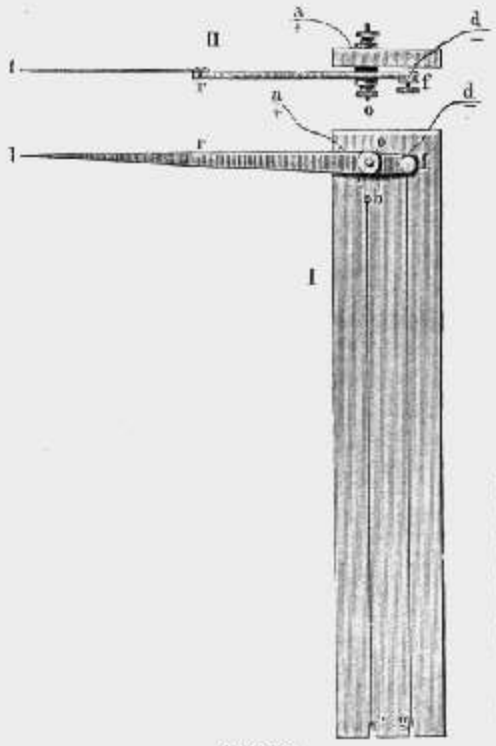
Cf. 2235, 2237, 5106, 2236, 2262, 2263.



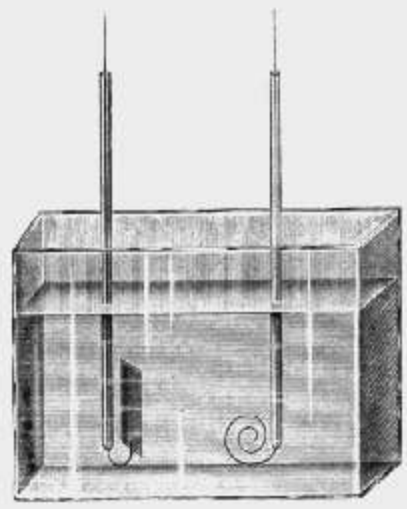
60 846. 1 : 5.



60 848. 1 : 5.



60 850.



60 851.

60,832. **Battery of 30 small Grove Cells** (platinum-zinc cells), for working a projection lantern, in carrying case . . . . . £ 22.10.0

60,833. — i d e m, with 50 cells 37.10.0

For Multiple Commutators (Pachytropes), see Section: Current Conduction and Distribution.

Electrolytes for Cells.

60,835. **Copper Sulphate,** crystallised . . . . . per kg 0. 1. 6

60,836. **Potassium Bichromate** . . . . . per kg 0. 1. 9

60,837. **Sodium Bichromate** . . . . . per kg 0. 1. 6

60,838. **Sal-Ammoniac,** technically pure . . . . . per kg 0. 1. 6

60,839. **Magnesium Sulphate** . . . . . per kg 0. 0. 9

Polarising Cells and Batteries.

60,840. **Polarising Cell** with platinum electrodes, F i g u r e 1. 6. 0

60,841. **Polarising Battery** (Weinhold's), F i g u r e (W. D., Fig. 527 [500]), for decomposing water by means of a single Bunsen or Grove Cell, with four small platinum cells . . 3. 0. 0

60,842. **Polarising Battery** (Poggendorff's) (M. P., 9th edn., III, Figs. 418—420), with 4 cells and with mercury switch 3. 6. 0

60,843. **Poggendorff's Switch,** for 4 cells. Price without cells 1. 4. 0

60,844. **Planté Cell (Secondary Cell),** F i g u r e (Gan.-Rein., Figs. 958 and 959), 26 cm high 1. 4. 0

60,845. — i d e m, 20 cm high 0.18. 0

60,846. — i d e m, with commutator for putting in circuit an incandescent wire while discharging, F i g u r e (Gan.-Man., Fig. 830, without the cells illustrated in the book) 1.16. 0

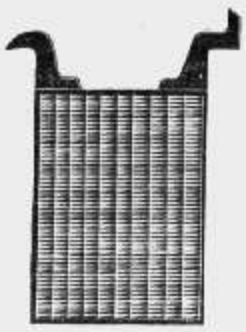
60,848. **Grove's Gas Cell,** F i g u r e (M. P., 10th edn., IV, 1, Fig. 502; 9th edn., III, Fig. 422; Gan.-Rein., Fig. 957) 1. 1. 0

60,849. **Gas Cell** (W. D., Fig. 526 [499]) 0.15. 0

60,850. **v. Babo's Apparatus,** F i g u r e, for showing the elongation of paladium on absorbing hydrogen (Fr. phys. Techn. **II,** 1, Fig. 284) 1. 4. 0

60,851. **Landolt's Apparatus** for the same purpose, F i g u r e, suitable for projection (Fr. phys. Techn. **II,** 1, Fig. 285) 1. 4. 0

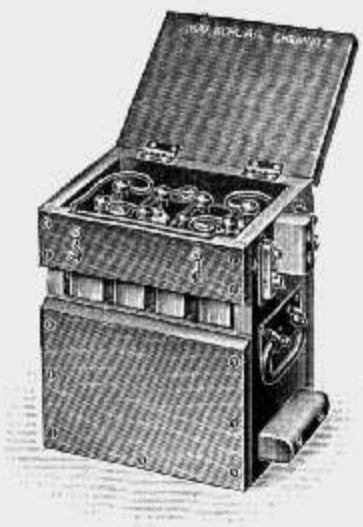
Max Kohl A. G. Chemnitz, Germany.



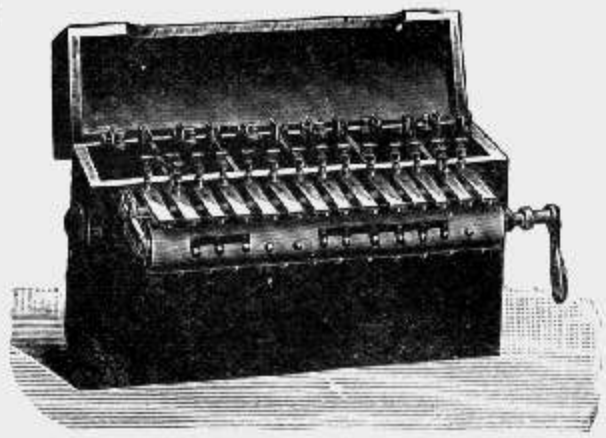
60 854. 1 : 5.



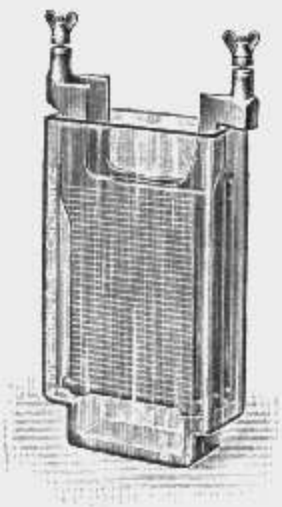
60 859. 1 : 6.



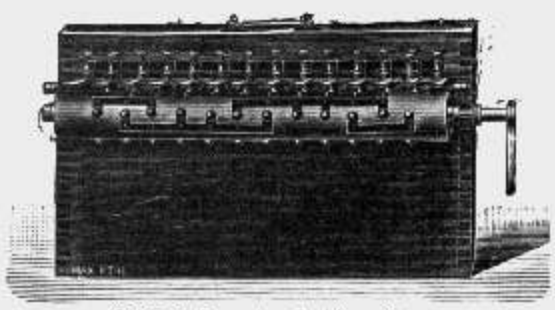
60 878. 1 : 10.



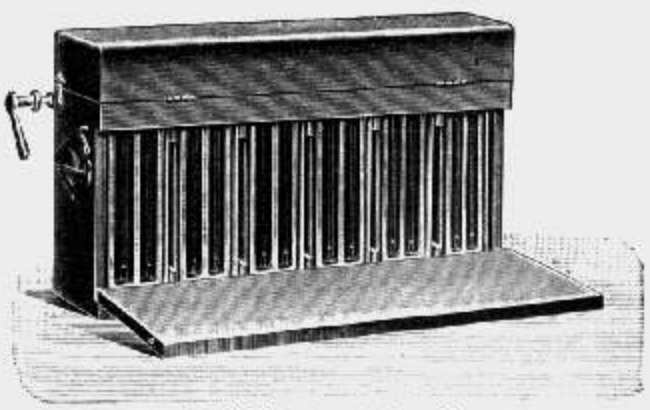
60 953 B. 1 : 8 (6 cells).



60 855. 1 : 6.



60 953 A. 1 : 8 (6 cells).



60 953 C. 1 : 8 (6 cells).

Accumulators and Accessories.

£ s. d.

The use of Accumulators for obtaining a constant and reliable supply of current which is always ready for use cannot be too highly recommended. They are never superfluous in places where a central station is available. The charging of the accumulators is carried out either on any direct current plant, a lamp resistance being in circuit, or by the aid of a switchboard; or supposing that a direct current installation is not available, they can be charged by a thermopile; or, if this is impossible, with 3 or 4 Bunsen cells. If an alternating or a 3-phase current lighting plant is available, it is advisable to employ a rectifier. Precise instructions for the charging and manipulation of the accumulators are supplied with each battery. As a rule the battery can be set up in the lecture table.

The **mean discharge voltage is about 2 volts per cell.**

The batteries supplied by us are excellent in their action even when not in constant use. Repairs are practically excluded if the batteries are used to some extent in an appropriate manner.

60,852. One each Positive and Negative **Accumulator Plate,** for demonstration purposes, **grid plates** 0. 4. 0

60,853. — i d e m, ... 0. 5. 6

60,854. — i d e m, large-surface plates, F i g u r e 0. 6. 0

60,855. **Demonstration Accumulator,** open, F i g u r e, for taking to pieces, also suitable for practical purposes; capacity on 3-hour discharge, 12 ampere-hours 0. 10. 0

Single Accumulators for School use, F i g u r e, portable, built into **glass vessels,** with terminals.

Size	I	II	III	IV	V
Max. charge and discharge current Amps.	1.5	4	8	12	16
Capacity on 3-hour discharge Amp.-hrs.	4.5	12	24	36	48
Capacity on 10-hour discharge Amp.-hr.	6.7	15	30	45	60
List No.	**60,856**	**60,857**	**60 858**	**60,859**	**60,860**
£	**0. 5. 0**	**0. 12. 0**	**0. 16. 0**	**1. 0. 0**	**1. 4. 0**

— i d e m, built into **ebonite cell.**

List No.	**60,862**	**60,863**	**60,864**	**60,865**
£	**0. 16. 0**	**1. 0. 0**	**1. 5. 0**	**1. 10. 0**

Cl. 5204, 5802, 5785, 64, 5560, 65, 66

Max Kohl A. G. Chemnitz, Germany.

Batteries of Accumulators, portable, **without Multiple Commutator,** Figure. The cells are built into glass vessels.

Size	II	III	IV	V
Max. charge and discharge current Amps.	4	8	12	16
Capacity when discharged for 3 hours Ampere hours	12	24	36	48
Capacity when discharged for 10 hours Ampere hours	15	30	45	60

	List No.	£ s.	List No.	£ s.	List No.	£ s.	List No.	£ s.
Price of a 2-cell battery	60 876	1. 16	60 884	2. 5	60 892	2. 10	60 900	3. 0
,, ,, ,, 3 ,, ,, ...	60 877	2. 6	60 885	3. 0	60 893	3. 10	60 901	4. 5
,, ,, ,, 4 ,, ,, ...	60 878	2. 18	60 886	3. 15	60 894	4. 10	60 902	5. 10
,, ,, ,, 6 ,, ,, ...	60 879	4. 0	60 887	5. 10	60 895	7. 5	60 903	8. 10
,, ,, ,, 8 ,, ,, ...	60 880	5. 16	60 888	7. 10	60 896	9. 0	60 904	11. 0
,, ,, ,, 12 ,, ,, ...	60 881	8. 0	60 889	11. 0	60 897	13. 10	60 905	16. 10
,, ,, ,, 16 ,, ,, ...	60 882	11. 12	60 890	15. 0	60 898	18. 0	60 906	22. 0
,, ,, ,, 24 ,, ,, ...	60 883	16. 0	60 891	22. 0	60 899	27. 0	60 907	33. 0

— idem, cells built into ebonite vessels, for purposes where the batteries are exposed to knocks during transit.

Size	II	III	IV	V
Max. charge and discharge current Amps.	4	8	12	16
Capacity when discharged for 3 hours Ampere hours	12	24	36	48
Capacity when discharged for 10 hours Ampere hours	15	30	45	60

	List No.	£ s.	List No.	£ s.	List No.	£ s.	List No.	£ s.
Price of a 2-cell battery	60 908	2. 4	60 916	2. 10	60 924	3. 0	60 932	3. 12
,, ,, ,, 3 ,, ,, ...	60 909	2. 18	60 917	3. 8	60 925	4. 0	60 933	5. 0
,, ,, ,, 4 ,, ,, ...	60 910	3. 15	60 918	4. 8	60 926	5. 10	60 934	6. 10
,, ,, ,, 6 ,, ,, ...	60 911	5. 5	60 919	6. 5	60 927	8. 5	60 935	9. 15
,, ,, ,, 8 ,, ,, ...	60 912	7. 10	60 920	8. 16	60 928	11. 0	60 936	13. 0
,, ,, ,, 12 ,, ,, ...	60 913	10. 10	60 921	12. 10	60 929	16. 10	60 937	19. 10
,, ,, ,, 16 ,, ,, ...	60 914	15. 0	60 922	17. 12	60 930	22. 0	60 938	26. 0
,, ,, ,, 24 ,, ,, ...	60 915	21. 0	60 923	25. 0	60 931	33. 0	60 939	39. 0

Batteries for School Use, with Multiple Commutator, cells in glass vessels fitted in a solid wood box, Figures. Fig. A shows the front closed, Fig. B. the same open. Fig. C shows the back with drop wall.

Size	II	III	IV	V
Max. charge and discharge current Amps.	4	8	12	16
Capacity when discharged for 3 hours Ampere hours	12	24	36	48
Capacity when discharged for 10 hours Ampere hours	15	30	45	60

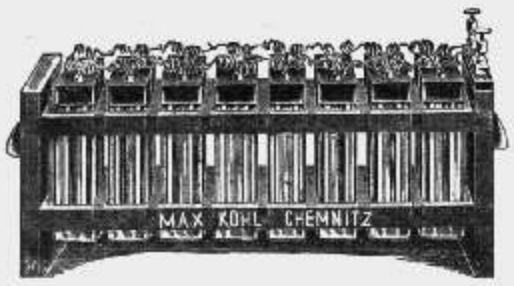
	List No.	£ s.	List No.	£ s.	List No.	£ s.	List No.	£ s.
Price of a 4-cell battery	60 946	4. 18	60 952	5. 15	60 958	6. 10	60 964	7. 10
,, ,, ,, 6 ,, ,, ...	60 947	6. 8	60 953	7. 18	60 959	9. 13	60 965	10. 18
,, ,, ,, 8 ,, ,, ...	60 948	9. 0	60 954	10. 14	60 960	12. 4	60 966	14. 4
,, ,, ,, 12 ,, ,, ...	60 949	13. 8	60 955	16. 18	60 961	18. 18	60 967	21. 18
,, ,, ,, 16 ,, ,, ...	60 950	18. 0	60 956	21. 8	60 962	24. 8	60 968	28. 8
,, ,, ,, 24 ,, ,, ...	60 951	26. 16	60 957	33. 16	60 963	37. 16	60 969	43. 16

A multiple commutator in place of the plug arrangement is somewhat more expensive to use, but it obviates any short circuiting and therefore the resultant ruination of the cells. When put in parallel and in groups the discharge currents and the capacity are increased while the voltage available is smaller.

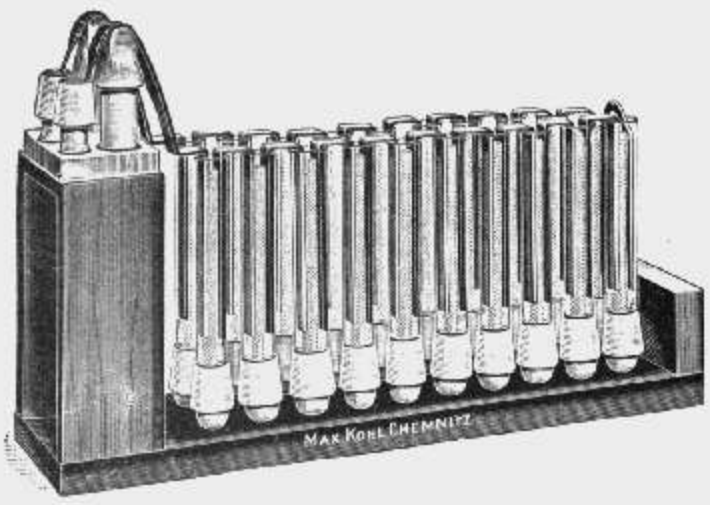
The uses to which the accumulators can be put are very varied. They can be employed, e. g. for feeding the lamp for the mirror galvanometer, for driving an electric motor for colour discs, Geissler tubes, syrens or double syrens; for working an induction coil, etc. etc., and their provision cannot be too highly recommended, as the teacher has always a powerful never failing source of current at his disposal. The accumulators are charged, when a heavy current supply is not available, by means of one of the thermopiles described on the following pages, or by Bunsen Cells. As the thermopiles require no attention, the accumulators can be charged day and night without interruption: the consumption of gas being extremely small.

For following the progress of charging it is advisable to provide a voltmeter, and for the operation of

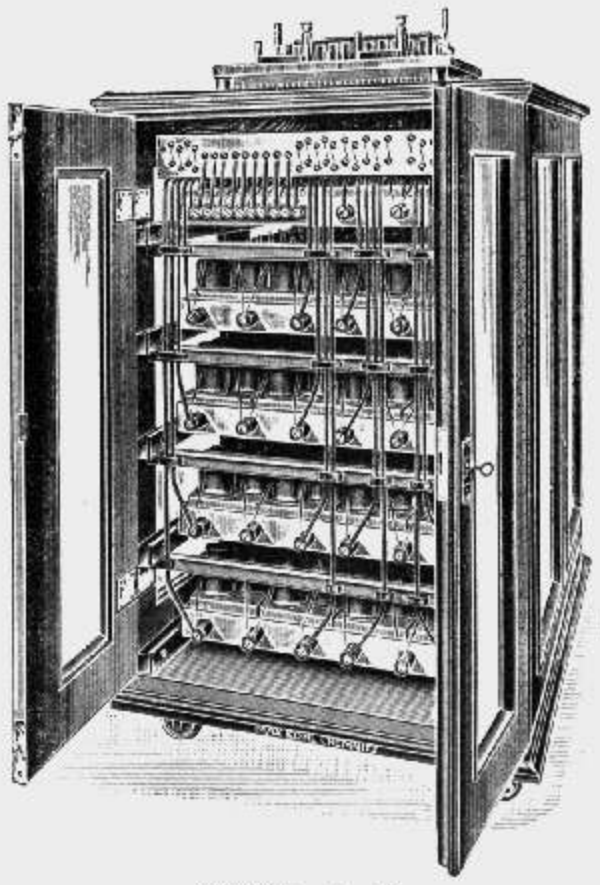
Max Kohl A. G. Chemnitz, Germany.



60 994. 1 : 7.



60 995. 1 : 6.



60 996 A. 1 : 12.

discharging, an ammeter. In addition it is desirable to have a regulating resistance so as to be able to take off current of any current-density according to requirements. The multiple commutator permits of the cells being put in parallel for charging and putting them both in series, in groups and in parallel when discharging. For most purposes an 8-cell battery No. 60,954 at **£ 10. 14. 0** (size III) is sufficient. With reference to the charging of accumulators, *cide* Prof. Friedr. C. G. Müller's work: Über Aufstellung und Betrieb von Akkumulatoren für den Schulgebrauch", Ztschr. f. d. phys. u. chem. U. **11**, p. 124.

Batteries for School Use, with multiple commutator. The cells are built into ebonite vessels.

	Size	II	III	IV	V
Max. charge and discharge current	Amps.	4	8	12	16
Capacity when discharged for 3 hours	Ampere hours	12	24	36	48
Capacity when discharged for 10 hours	Ampere hours	15	30	45	60

	List No.	£ s.	List No.	£ s.	List No.	£ s.	List No.	£ s.
Price of a 4-cell battery	60 970	5. 15	60 976	6. 8	60 982	7. 10	60 988	8. 10
„ „ „ 6 „ „	60 971	7. 13	60 977	8. 13	60 983	10. 8	60 989	12. 8
„ „ „ 8 „ „	60 972	10. 14	60 978	12. 0	60 984	14. 4	60 990	16. 4
„ „ „ 12 „ „	60 973	15. 18	60 979	17. 18	60 985	21. 18	60 991	24. 18
„ „ „ 16 „ „	60 974	20. 18	60 980	24. 0	60 986	28. 8	60 992	32. 8
„ „ „ 24 „ „	60 975	31. 16	60 981	35. 16	60 987	43. 16	60 993	49. 16

Stationary Battery quoted for on application.

60,994. **Battery of Accumulators,** Figure, consisting of 16 small accumulators in an insulated wood stand. These groups of 16 cells each can be combined in any number to form a **High Voltage Battery** . . . . . £ s. d. 3. 12. 0

The max. charge and discharge current of this type of accumulator is 0.6 amp., the capacity being 3.5 ampere-hours. Each cell has 1 positive and 2 negative plates.

60,995. **Battery of Accumulators** (Zehnder's), Figure, consisting of **20 Cells.** The Batteries can be combined in any number to form a **High Voltage Battery** 1. 10. 0

The battery is supplied with formed plates. The maximum charging current is 0.06 ampere, the capacity being 0.3—0.7 ampere-hour according to the time of discharge; 2.5 volts per cell should be taken as the final voltage when charging.

Instructions for use are appended to each battery.

Cl. 2273, 2274, 2275.

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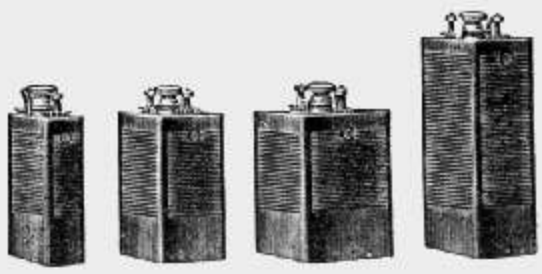


60 998 — 61 003.



61 007. 1 : 5.

60,996. **Battery of Accumulators** (Feussner's), comprising 20 Cells. The Batteries can be combined in any number to form High Voltage Batteries as shown e. g. in Fig. 60,996 A — £ 2. 5. 0

The capacity is about 0.8 ampere-hours, the charging current being 0.1 ampere. The cells are firmly set in with paraffin and soldered together. Terminals are fitted on the end poles of the battery.

60,997. — i d e m, comprising 25 cells . . . . . — £ 2. 15. 0

Cupboards for High Voltage Batteries quoted for on application. Fig. 60,996 A, for example, shows a Battery of 500 Feussner Cells.

Edison Accumulators, F i g u r e, in nickelled sheet steel boxes, imperishable electrically and mechanically.

List No.	Capacity Ampere hours	Mean discharge voltage on abt. 4-hour discharge	Normal Current on Charge Amp.	Normal Current on Discharge Amp.	Duration of charging hours	Overall Dimensions of cell without pole-bolts Length mm	Width mm	Height mm	Weight per cell unpacked Without Caustic Potash kg	With Caustic Potash kg	21 % Caustic Potash required per Cell kg	Price per Cell with Caustic Potash £ s. d.
60 998	8	1,23	3	2	$3^3/_4$	24	85	145	0,45	0,55	0,1	**0. 7. 6.**
60 999	16	1,23	6	4	$3^3/_4$	45	86	160	0,8	1,1	0,3	**0. 9. 0.**
61 000	19	1,23	7,5	5	$3^3/_4$	40	128	158	1,2	1,6	0,4	**0. 12. 6.**
61 001	38	1,23	15	10	$3^3/_4$	71	128	158	1,8	2,6	0,8	**0. 17. 6.**
61 002	58	1,23	22	15	$3^3/_4$	103	128	158	2,7	3,8	1,1	**1. 1. 6.**
61 003	76	1,23	30	20	$3^3/_4$	71	128	234	3	4,4	1,4	**1. 7. 6.**

When putting the cells in series the iron vessels must be insulated from each other. For this purpose the cells are built into wood carriers being insulated from each other in the latter by ebonite.

Complete Batteries quoted for on application.

£ s. d.

61,004. **Syphon with Rubber Ball and Hydrometer** for Edison Accumulators 0. 8. 6

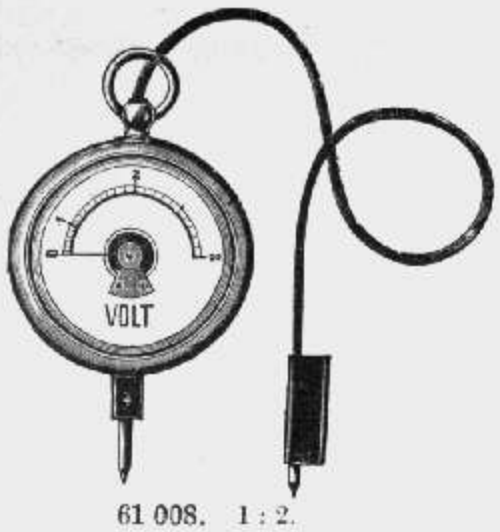
61,005. **Glass Tube** for testing the correct level of the Electrolyte of Edison Accumulators 0. 0. 6

Accessories and Charging Devices for Accumulators.

61,006. **10 Litres Accumulator Acid** of 1.21 specific gravity, in carboy 0. 6. 0

61,007. **Specific Gravity Tester,** F i g u r e, hydrometer with rubber ball, glass case and rubber tubing, for determining the acid density 0. 7. 0

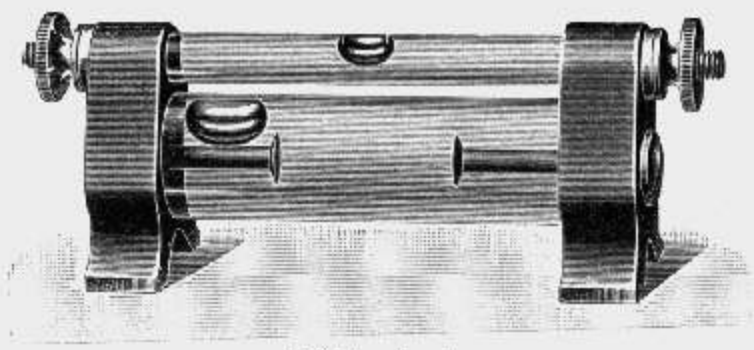
A glass vessel provided at the top and bottom with an open glass tube has a rubber ball fitted to the upper part and a piece of rubber tubing to the lower, while a hydrometer is contained inside. If the lower end of the tubing is introduced into the acid to be tested and the rubber ball squeezed the acid is drawn into the glass vessel owing to the diminution of pressure, and raises the hydrometer in the vessel, the specific gravity of the acid being read from the hydrometer.



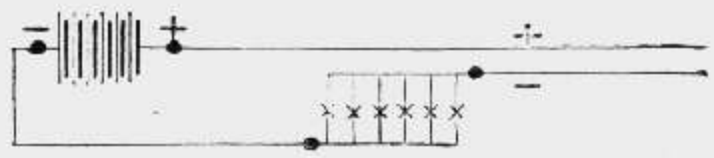
61 008. 1 : 2.



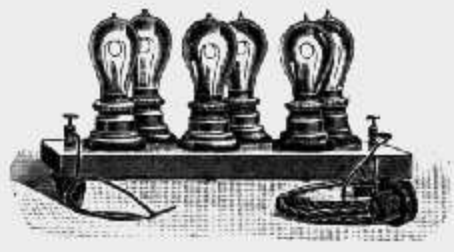
61 011. 1 : 2.



61 014. 1 : 1.



61 016 A.



61 016. 1 : 8.

61,008. **Pocket Voltmeter** for 0—3 volts, Figure, electro-magnetic system with aperiodic adjustment . . . . . £ s. d. 0. 10. 0

A voltmeter — preferably of the pocket form — is used for ascertaining the state of charge of the accumulator. The voltmeter has a spear which is firmly placed on one terminal of the cell, while a second spear attached to the short length of flexible is placed in contact with the other terminal.

61,009. — idem, precision instrument after the Weston type, aperiodic and very accurate, 1.5—3 volts 1. 8. 0

61,010. **Pole-finding Paper,** colouring red at the negative pole. Price per book 0. 0. 6

61,011. **Pole Finder,** can be used up to 20 volts, in case, Figure 0. 9. 0

61,012. — idem, for 20—120 volts 0. 10. 0

61,013. — idem, for 60—250 volts, built into mahogany box 0. 18. 0

61,014. **Pole Finder,** Figure, colouring red at negative pole, in case, with instructions 0. 12. 0

61,015. **Lamp Resistance with 3 Glow Lamps** for charging accumulators from a D. C. plant, cf. Figure 61,016, with 1 screw plug for Edison holders and 2 m lamp flex., for currents **to 3 amperes at 110 volts and to 1.5 ampere at 220 volts** 1. 0. 0

When ordering, the network voltage should be stated. For diagram of connections, see Fig. 61,016 A.

61,016. — idem, **with 6 Lamps,** Figure, for currents **to 6 amperes at 110 volts and to 3 amperes at 220 volts** 1. 8. 0

61,017. **Lamp Resistance with 12 Glow Lamps,** Figure, for fixing to the wall; the holders are fixed on marble: for currents to 12 amperes at 110 volts and to 6 amperes at 220 volts 3. 4. 0

When ordering, the network voltage should be stated.

61,018. — idem, **with 40 Glow Lamps,** Figure, holders being fixed on wood, for currents **to 40 amperes at 110 volts and 20 amperes at 220 volts** 5. 10. 0

Cl. 69, 73, 72, 3516, 71.

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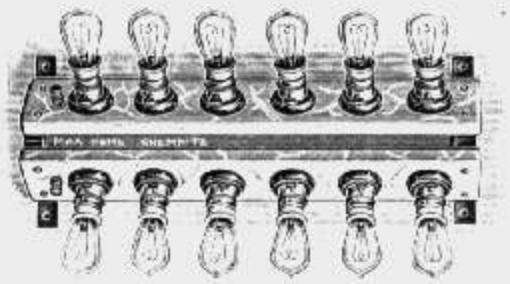
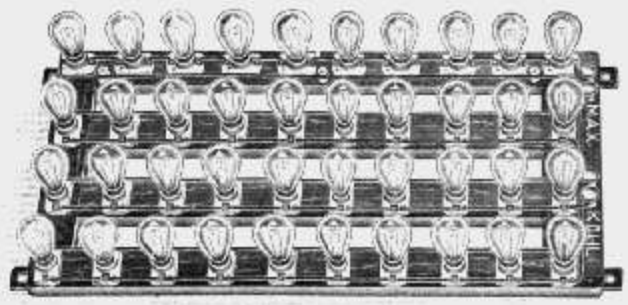


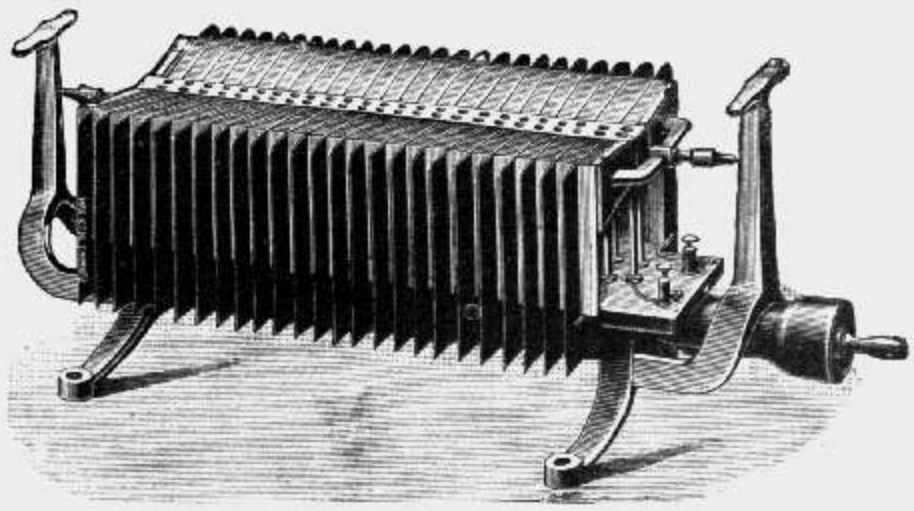
61 017. 1 : 10.



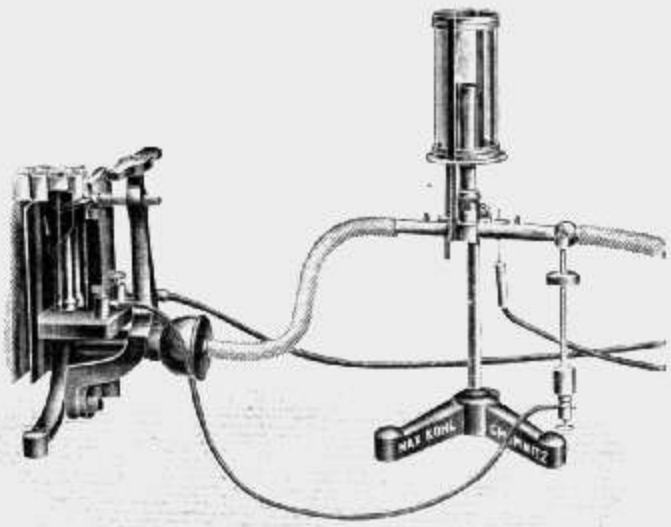
61 018. 1 : 12.



61 019. 1 : 7.



61 021. 1 : 8.



61 022. 1 : 7.

61,019. **Charging Switchboard** on marble slab for a battery of accumulators in conjunction with 65—220 volt Direct Current, charging current to 3 amperes at 110 volts and 1.5 ampere at 220 volts; with precision voltmeter for measuring the battery and network voltage, voltmeter switch, fuses and switch, Figure . . . . . £ 5. 5. 0

61,020. — idem, for charging currents to 6 amperes at 110 volts and 3 amperes at 220 volts 6. 0. 0

61,021. **Gülcher's Thermopile,** Figure, with 66 cells; excellently adapted for continuous work, especially for charging accumulators. Gas consumption, 170 litres per hour; useful terminal voltage, 2 volts; current 2 amperes 11. 10. 0

61,022. **Biernacki's Gas Tap,** Figure (Fr. phys. Techn. I, Fig. 132), turning off automatically and opening an electric circuit when the flow of gas is small 1. 5. 0

Cl. 5261, 5071, 5209, 2279, 3921.

New Thermopiles "Heil's Dynaphor", Figure, for working with gas.

List No.	Guaranteed Efficiency	Grouping of the Cells		Pressure on open Circuit	Approx. size		Gas Consumption per Hour	Weight	Price
					Diam.	Height			
	Watts	Volts	Amps	Volts	mm	mm	Litres	kg	£ s. d.
61 023	1,25	2,5	0,5	3,75	160	200	80	2,3	**1. 9. 0.**
61 024	2,5	5	0,5	6,3	200	250	140	3,8	**2. 15. 0.**
61 025	3	3	1	6	210	380	140	3,7	**4. 18. 0.**
61 026	3	1,5	2	3	210	380	140	3,7	**4 18. 0.**
61 027	6	6	1	12	230	480	220	5,8	**8. 0. 0.**
61 028	6	3	2	6	230	480	220	5,8	**8. 0. 0.**
61 029	12	6	2	12	280	550	530	11,7	**12. 8. 0.**
61 030	12	3	4	6	280	550	530	11,7	**12. 8. 0.**
61 031	12	2	6	4	280	550	530	11,7	**12. 8. 0**
61 032	20	10	2	20	340	630	720	21	**20. 15. 0.**
61 033	20	5	4	10	340	630	720	21	**20. 15. 0.**
61 034	20	2,5	8	5	340	630	720	21	**20. 15. 0.**

The guaranteed efficiencies are based upon a gas pressure of approx. 30 mm water. In places where the gas pressure is higher than 30 or 35 mm water it is necessary to insert pressure regulator No. 61,048 in the gas piping in order that the Dynaphor should not become damaged by overheating. These thermopiles are noiseless and odourless in their action. They are started up in a manner as simple as lighting an ordinary gas stove.

— idem, **for working with Spirit.**

List No.	Guaranteed Efficiency	Grouping of the Cells		Pressure on open Circuit	Approx. size		Spirit Consumption per Hour	Weight	Price
					Diam.	Height			
	Watts	Volts	Amps	Volts	mm	mm	Litres	kg	£ s. d.
61 035	3	3	1	6	210	380	0,16	3,5	**5. 5. 0.**
61 036	3	1,5	2	3	210	380	0,16	3,5	**5. 5. 0.**
61 037	6	6	1	12	230	450	0,25	5,8	**8. 10. 0.**
61 038	6	3	2	6	230	450	0,25	5,8	**8. 10. 0.**
61 039	12	6	2	12	280	510	0,53	11	**13. 0. 0.**
61 040	12	3	4	6	280	510	0,53	11	**13. 0 0.**
61 041	12	2	6	4	280	510	0,53	11	**13. 0. 0.**

Burning spirit of 95% is necessary for working the spirit Dynaphors, this spirit being that generally obtainable. One charge of the basin is sufficient for about 10 hours working. Instructions for starting (this operation being very simple) are appended to each apparatus.

— idem, **for working with Paraffin Oil.**

List No.	Guaranteed Efficiency	Grouping of the Cells		Pressure on open Circuit	Approx. size		Paraffin Consumption per Hour	Weight	Price
					Diam.	Height			
	Watts	Volts	Amps	Volts	mm	mm	Litres	kg	£ s. d.
61 042	12	6	2	12	280	590	0,25	13	**14. 5. 0.**
61 043	12	3	4	6	280	590	0,25	13	**14. 5. 0.**
61 044	12	2	6	4	280	590	0,25	13	**14. 5. 0.**
61 045	20	10	2	20	340	700	0,40	24	**24. 5. 0.**
61 046	20	5	4	10	340	700	0,40	24	**24. 5. 0.**
61 047	20	2,5	8	5	340	700	0,40	24	**24. 5. 0.**

Ordinary lamp oil is used for working above. One filling of the vessel is sufficient for about 10 hours continuous burning. Precise instructions for starting are appended to each apparatus. The paraffin flame, while making a slight amount of noise, burns quite blue and without odour.

	£ s. d.
61,048. **Gas Pressure Regulator,** suitable for all sizes of "Dynaphors"	1. 6. 0
61,049. **Relay** for putting the Dynaphors in circuit when the necessary charging voltage is available (5—10 minutes after starting up), also for cutting out the cells when the heat supply is stopped	1. 3. 0
61,050. **Switchboard** for accumulator with 1 supply-point for 20 amperes maximum, Figure. The switchboard, of polished oak, is fitted with 1 ammeter, 1 voltmeter, 1 current regulator with 21 contacts, and with 4 terminals for conducting and taking off the current. The price of the switchboard is increased by **£ 1. 0. 0** if in marble. If desired the switchboard is fitted with a sliding rheostat in place of the current regulator.	6. 10. 0

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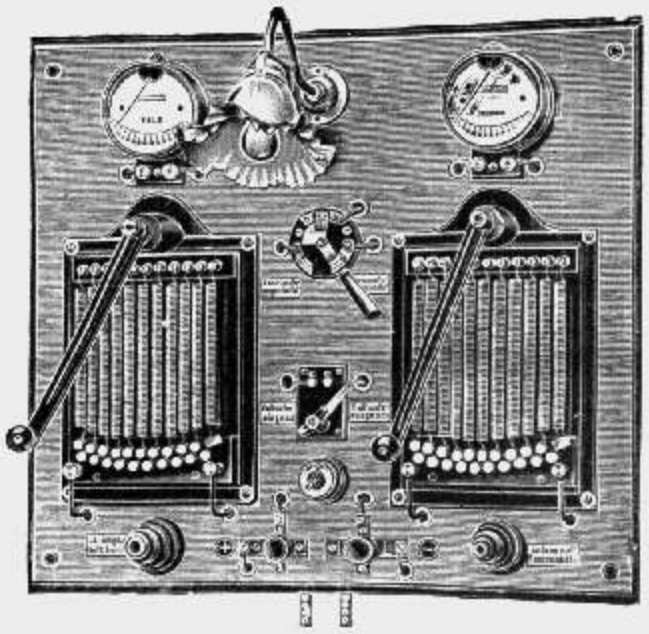
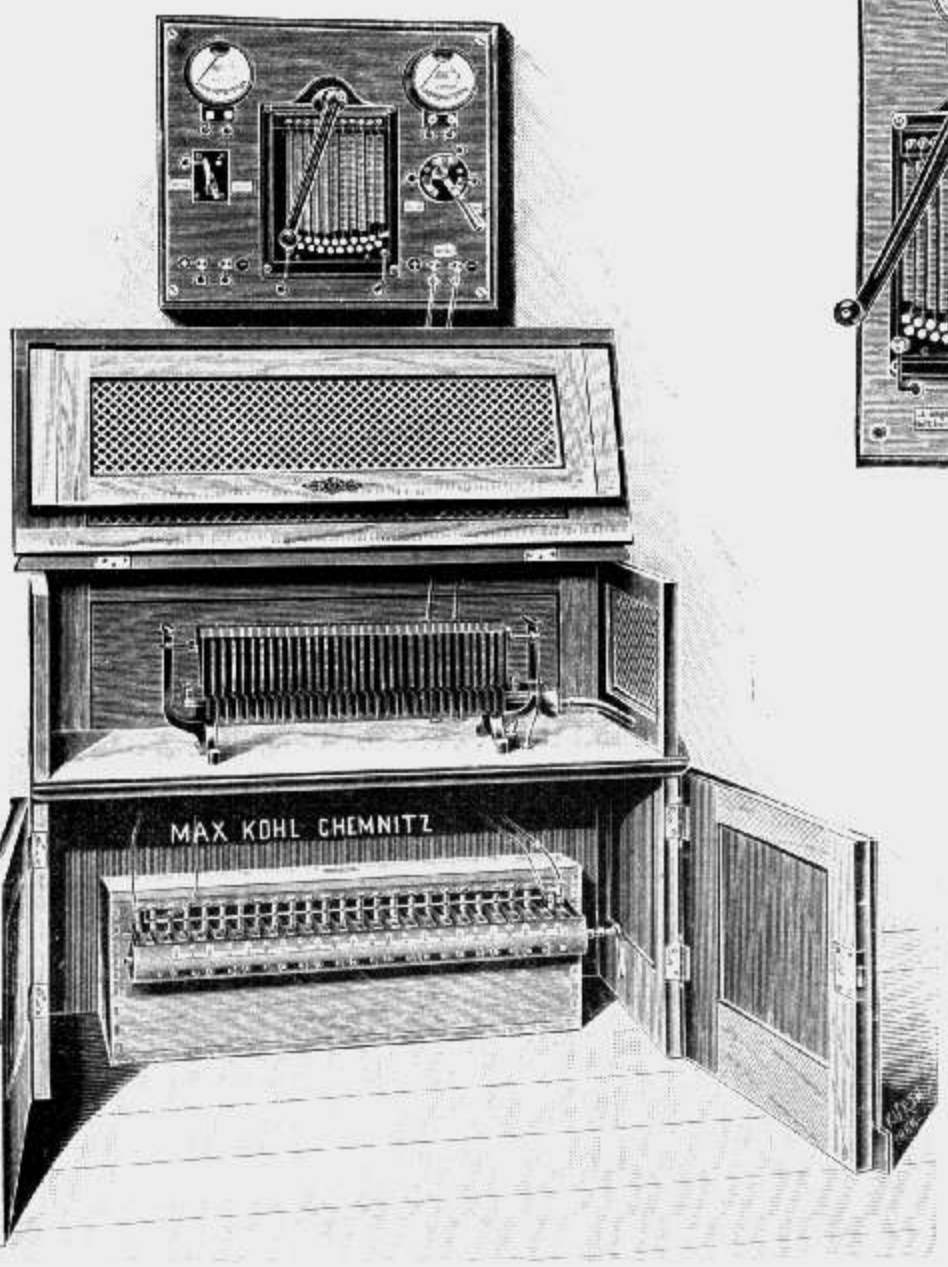
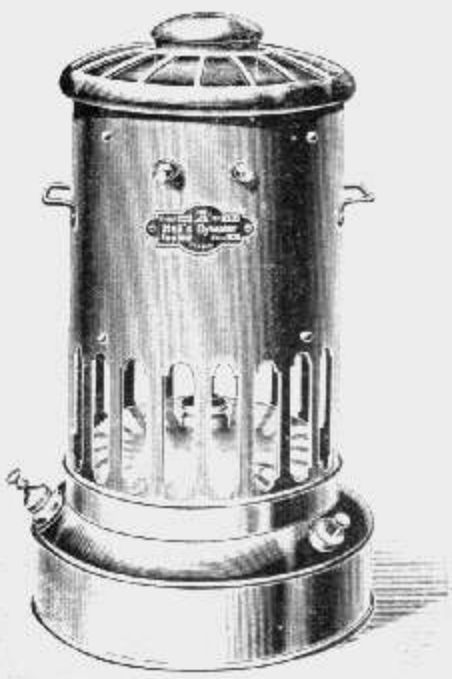


61 051. 1 : 11.



61 050 and 61 052. 1 : 15.



61 027. 1 : 7.

61,051. **Switchboard** for accumulators with 2 supply-points for 20 amperes maximum, Figure . . . . . £ s. d. 12. 0. 0

The switchboard, of polished oak, contains 2 resistances, 1 precision voltmeter and 1 precision ammeter, 2 plug boxes, 1 voltmeter switch, 1 lamp bracket, 1 ammeter switch and 2 fuses. If with marble slab the extra price of switchboard is £ **1. 5. 0**

It is very often desirable to have to branch off two circuits from a battery, the current strengths of which have to be regulated separately. The switchboard is excellently adapted for this purpose.

61,052. **Cupboard for containing the Accumulators and a Thermopile,** Figure, with the necessary connecting leads, but exclusive of thermopiles and accumulators 4. 10. 0

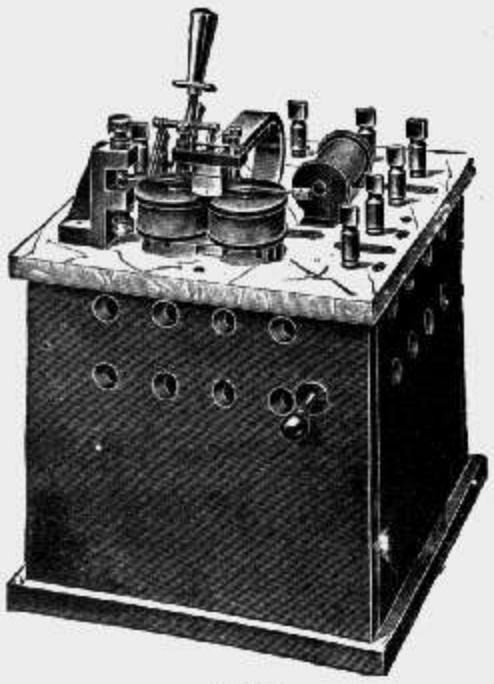
According to the conditions existing relative to space, it will be necessary to settle the question of where to place the accumulators and the thermopile.

Fig. 61,052 shows a cupboard fitted up with the thermopile and a 12-cell battery. The cupboard has a sheet iron grating at the upper part; the accumulators can therefore be charged with the cupboard completely closed without the latter becoming appreciably heated. The cupboard is provided with locks and keys in order to prevent any tampering with the contents. The length of the cupboard is 1.2 m, the height 0.8 m. and the depth 0.45 m, assuming that only 1 Gülcher thermopile is to be installed therein. If it is intended to contain 2 thermopiles the depth is then 0.6 m.

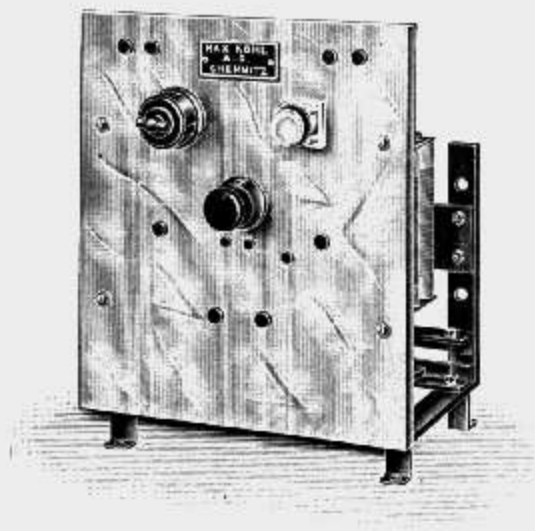
61,053. — idem, for 2 thermopiles 5. 10. 0

Experimental Switchboards for charging purposes and for use in connection with Accumulators: see Vol. I of this Price List, pp. 107—125; Resistances: see pp. 125—128, also following section on Apparatus for Current Conduction and Distribution.

Cl. 74, 75, 33*.



61 054.



61 056.

Rectifiers for Charging Accumulators with Alternating or Three-phase Current.

£ s. d.

61,054. **Single Phase Alternating Current Rectifier,** Koch system, for charging from 1—12 cells with 5 amperes maximum inclusive of charging resistance; without measuring instruments, as Fig. 61,054, but for fixing to the wall, also for connecting to one phase of a 3-phase system 12. 10. 0

61,055. — i d e m, for charging 25—40 cells with 15 amperes maximum, with voltmeter and ammeter 22. 10. 0

The following is the mode of action of this Rectifier: The armature of a polarised interrupter oscillates synchronously in the exciter circuit and in phase with the alternating current, by the appropriate employment of self-induction and capacity. Influenced by the voltage of the battery to be charged, this armature puts a contact into the main circuit in such manner that only current impulses in the same direction are admitted and the closing and opening take place exactly at the times of voltage equalisation between battery and alternating current. The contact thus works sparklessly and current losses are excluded.

The apparatus can be used for all practical A. C. voltages to 240. When ordering, precise information should be given as to number of cells, charging current, voltage and periodicity of the Alternating Current.

61,056. **Mercury Vapour Rectifier,** F i g u r e, high efficiency, for charging Accumulators with single phase A. C., also for connecting up to **one** phase of a 3-phase system, for A. C. pressures from 105—120 or 200—240 volts and 50 cycles, for 6—14 cells; charging current 3—5 amperes, including a regulating resistance 13. 0. 0

61,056 a. — i d e m, for 15—26 cells, 3—5 amps. 14. 0. 0

61,057. — i d e m, for 6—14 cells, charging current 4—10 amps., for connecting up to 105—120 volts A. C., 50 cycles 17. 10. 0

61,058. — i d e m, for connecting up to 200—240 volts A. C., 50 cycles, 4—10 amps. . . 17. 15. 0

61,059. — i d e m, for 15—26 cells, charging current 4—10 amps., for connecting up to 105—120 volts A. C., 50 cycles 19. 0. 0

61,060. — i d e m, for connecting up to 200—240 volts A. C., 50 cycles, 4—10 amps. . . 18. 10. 0

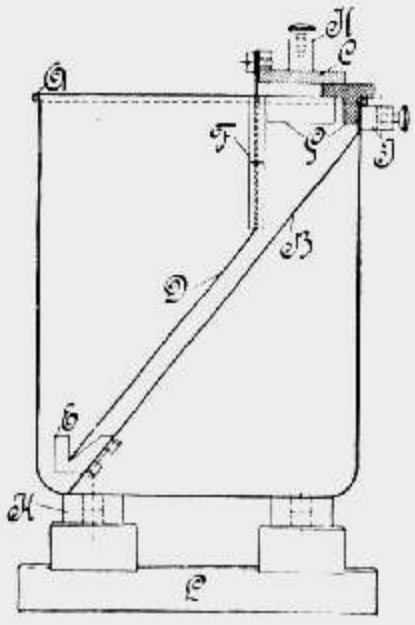
61,061. — i d e m, for 27—44 cells, charging current 4—10 amps., for connecting up to 105—120 volts A. C., 50 cycles 22. 5. 0

61,062. — i d e m, for connecting up to 200—240 volts A. C., 50 cycles, 4—10 amps. . . 20. 15. 0

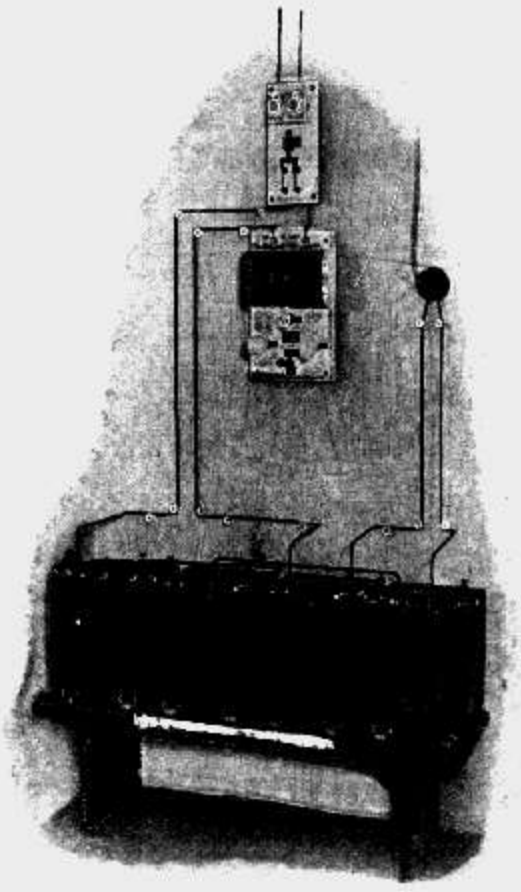
Mercury Vapour Rectifiers for heavier Currents quoted for on application.

The action of the mercury vapour rectifier is based on the valvular action which takes place at the electrodes in a glass vessel filled with mercury vapour. Its advantages consist in the high efficiency, the lack of actuated parts and in the fact that it is always ready for use. **The number of cells, periodicity and voltage of the A. C. should be given when ordering.**

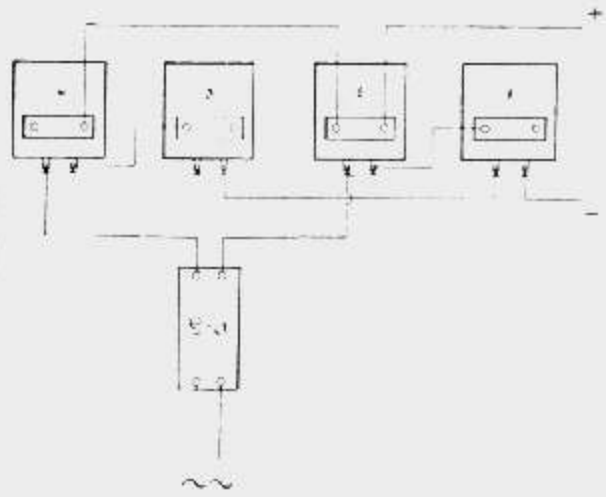
Max Kohl A. G. Chemnitz, Germany.



61 065 B.



61 065 A.



61 065 C.

Single-Phase Alternating Current Electrolytic Rectifiers. Figs. A—C, for converting single phase alternating current up to 120 volts into Direct Current; also for connecting up to **one** phase of a 3-phase system: comprising 4 cells, 1 insulating stool, 1 starter and electrolytic salt sufficient for one charge. Fig. 61,065 A shows the complete rectifier, 61,065 B the arrangement of a cell, and 61,065 C the method of connecting up. £ s. d.

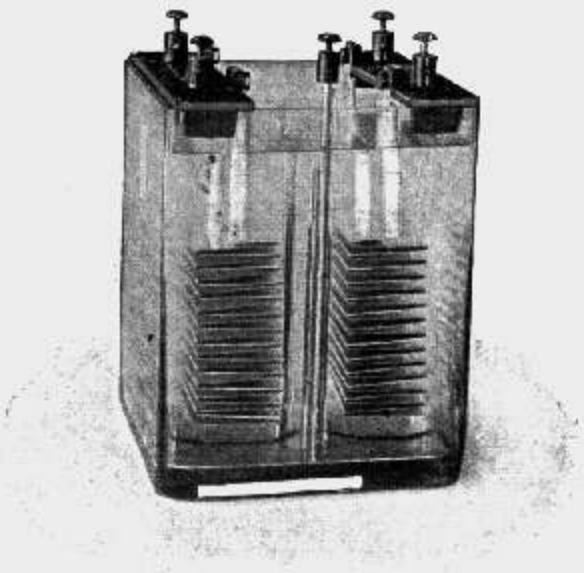
List No.	61,063	61,064	61,065	61,066	61,067
Max. load Amps.	5	10	25	50	100
Constant load Amps.	1	2	5	10	20
£	**3. 15. 0**	**5. 0. 0**	**8. 15. 0**	**11. 5. 0**	**18. 15. 0**

Each rectifier for A. C. consists of 4 cells each with an aluminium electrode in a solution of electrolyte salt, these cells allowing the current to flow in one direction only. By a suitable system of connections all current rushes flow to the supply terminals in the same direction; a Direct Current is thus obtained. The method of connecting up for monophase A. C. is shown in Fig. 61,065 C for 120 volts. Each cell is suitable for rectifying 60 volts, so that the connections shown in Fig. 61,065 C are thus arranged for 120 volts, as only two cells are in series. By putting more cells in series a proportionately higher voltage is obtained and by connecting in parallel a higher current. A controller-starter is used for working the rectifier, this device consisting of a number of glow lamps, a short circuit switch and 2 connecting terminals for the A. C. lead. The A. C. switch should be closed when the short circuiting switch is open; the lamps then burn brightly until the cells have formed. As soon as the lamps become dim the forming is finished, the short circuit switch is closed and Direct Current can then be taken off. The D. C. thus obtained can be used forthwith for most purposes, e. g. for charging accumulators, exciting magnets, working X-ray apparatus with Wehnelt interrupters, etc. The use of a Condenser Cell, Fig. 61,084, is only necessary where a Direct Current of absolutely regular voltage is required. In conjunction with a cell of this kind the rectifier can be used with advantage for working a D. C. Arc Lamp in conjunction with an A. C. Network.

The D. C. voltages are approximately as follows for the sizes for 25 amps. maximum load:

Direct Current Supply	Amperes	0	1	5	10	25
Alternating Current, 110 volts 50 cycles:						
D. C. Pressure	Volts	135	112	96	92	86
3-Phase Current, 120 volts, 50 cycles:						
D. C. Pressure	Volts	167	152	141.5	139	134

For charging accumulators a proportionate number of resistances should be put in series when the number of cells is smaller (e. g. Nos. 61,015—61,018).



61 084. 1 : 6.

Single-Phase Alternating Current Electrolytic Rectifiers, for Single-Phase A. C. to 240 volts; also for connecting up to **one** phase of a 3-phase system: comprising 8 cells, 2 insulating stools, 1 starter and electrolyte salt for one charge. £ s. d.

List No.	**61,068**	**61,069**	**61,070**	**61,071**	**61,072**
Max. load Amps.	5	10	25	50	100
Constant load Amps.	1	2	5	10	20
£	**5. 15. 0**	**8. 5. 0**	**13. 15. 0**	**18. 15. 0**	**32. 10. 0**

The 240 volt A. C. can, however, be transformed down to 120 volts by means of an A. C. transformer and rectifier No. 61,063—61,067, D. C. of about 110 volts being obtained with a smaller load while the D. C. obtained with Nos. 61.068—61,072 has a pressure of approx. 220 volts.

61,073. **Alternating Current Transformer 240/120 volts,** secondary current 25 amps. maximum 5. 0. 0

Three-Phase Electrolytic Rectifiers for converting Three Phase Current to 100 volts into Direct Current: compirisng 6 cells, 1 insulating stool, 2 starters and electrolyte salt for one charge.

List No.	**61,074**	**61,075**	**61,076**	**61,077**	**61,078**
Max. load Amps.	5	10	25	50	100
Constant load Amps.	1	2	5	10	20
£	**6. 15. 0**	**8. 5. 0**	**13. 15. 0**	**18. 15. 0**	**31. 5. 0**

The cells are the same as in the previously listed rectifiers for A. C., but they are a correspondingly larger number, and 2 starters instead of 1 are necessary.

— i d e m, **for Three-Phase Current to 220 volts:** comprising 12 cells, insulating stool, 2 starters and electrolyte salt for one charge.

List No.	**61,079**	**61,080**	**61,081**	**61,082**	**61,083**
Max. load Amps.	5	10	25	50	100
Constant load Amps.	1	2	5	10	20
£	**9. 10. 0**	**13. 5. 0**	**22. 10. 0**	**30. 0. 0**	**50. 0. 0**

As regards voltage, cf. remark in connection with Nos. 61,068—61,072.

61,084. **Electrolytic Condenser,** can be used for D. C. or A. C. to 120 volts, F i g u r e, approx. 250 microfarads 1. 10. 0

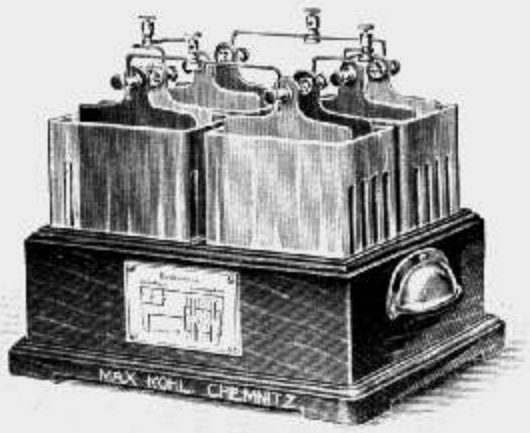
61,085. — i d e m, approx. 500 microfarads 2. 10. 0

61,086. **Electrolyte Salt,** box containing 1.25 kg 0. 2. 6

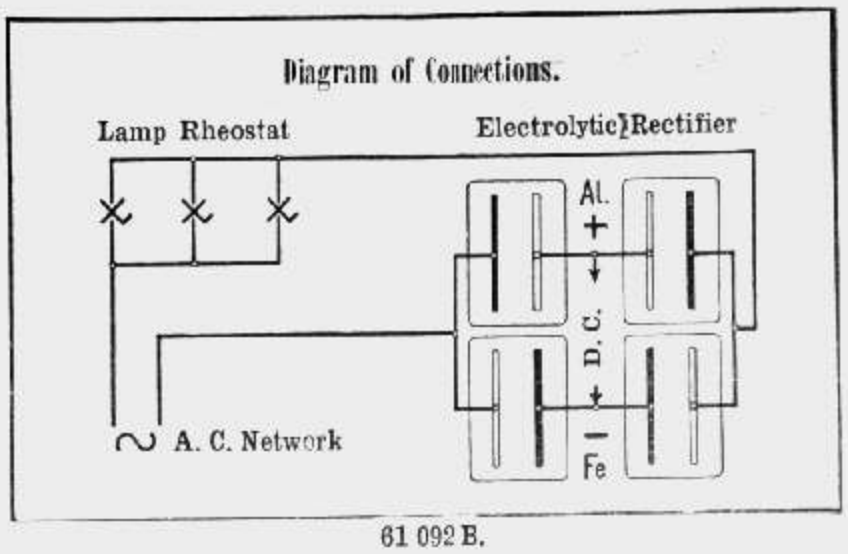
Spare Electrodes.

For max. load Amps.	5	10	25	50	100
List No.	**61,087**	**61,088**	**61,089**	**61,090**	**61,091**
Each £	**0. 1. 3**	**0. 1. 10**	**0. 3. 8**	**0. 6. 0**	**0. 12. 0**

Max Kohl A. G. Chemnitz, Germany.



61 092 A. 1 : 10.



61 092 B.



61093. 61094 96. 61097. 61098. 61099. 61100. 61101. 61102 7. 61114. 61108, 13.

61,092. **Demonstration Electrolytic Rectifier,** Figs. A and B, for connecting up to single phase A. C. to 120 volts, for constant currents to 0.5 amp., max. load for short periods 2.5 amps., including salt for charging. Price without lamp resistance . . . . . £ s. d. 2. 8. 0

A Lamp Resistance No. 61,015 is necessary for use in conjunction with above.

Section 2: Current Conduction and Distribution.

Leads and Wires: see Vol. I of this Price List, pp. 206 and 207, Nos. 51,154 to 51,162. £ s. d.

61,093. **Terminal,** Figure, for connecting two wires 0. 0. 4

Terminals, Figure (W. D., Figs. 191 and 492 [466 and 467]), for connecting 2, 3 and 4 wires.

List No.	61,094	61,095	61,096
For	2	3	4 wires
£	0. 0. 10	0. 1. 2	0. 1. 5

61,097. **Terminal,** Figure, simpler, for 4 wires 0. 0. 10

61,098. — idem, Figure, for strip and wires 0. 0. 7

61,099. — idem, Figure, for strip and wires 0. 0. 7

61,100. **Carbon Terminal,** for Bunsen Cells, Figure, 35 mm wide 0. 1. 3

61,101. — idem, Figure, for Leclanché Cells, 25 mm wide 0. 0. 4

Terminals, Figures, for screwing in a board, with lock nut, finely lacquered, in three sizes.

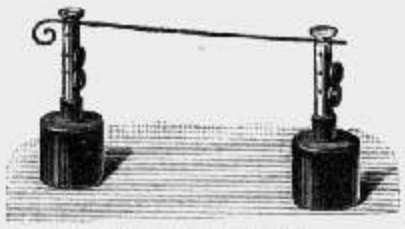
Length	25	30	35 mm
List No.	61,102	61,103	61,104
With 1 Screw £	0. 0. 5	0. 0. 6	0. 0. 7
List No.	61,105	61,106	61,107
With 2 Screws £	0. 0. 6	0. 0. 7	0. 0. 8

Terminals, Figure, as preceding, screwed in a brass block which can be screwed on to a board by two wood screws.

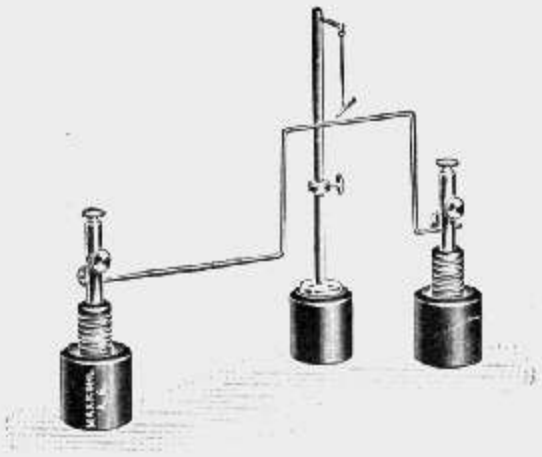
Length	25	30	35 mm
List No.	61,108	61,109	61,110
With 1 Screw £	0. 0. 6	0. 0. 7	0. 0. 8
List No.	61,111	61,112	61,113
With 2 Screws £	0. 0. 7	0. 0. 8	0. 0. 10

61,114. **Table Terminal,** Figure, for screwing on: a) with 2 milled screws 0. 1. 0
b) with 1 milled and 1 grub screw 0. 1. 0

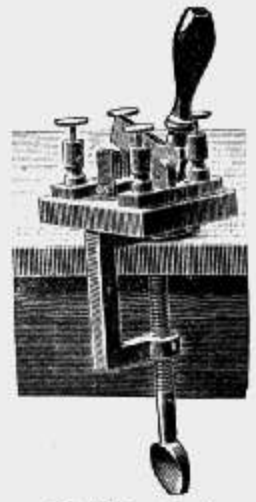
Max Kohl A. G. Chemnitz, Germany.



60172B. 1 : 6.



60172C.



61121. 1 : 5.



61115. 1 : 3.



61116. 1 : 1.



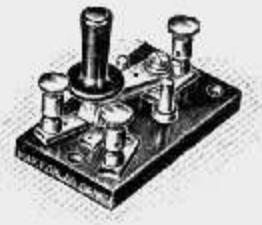
61117. 1 : 1.



61118. 1 : 1.



61119. 1 : 10.



61120. 1 : 5.

60,172. **Foot or Stand Terminal** (Holtz's), Figure on p. 799, with grooved ebonite insulation (Ztschr. f. d. phys. u. chem. U. **2**, p. 55) . . . . . £ 0. 6. 0

The terminals have heavy lead feet and are very useful for the greatest variety of experiments. Figs. 61,072 B and C show some adaptations.

61,115. **Clip for Branches,** Figure (M. T., Fig. 200) 0. 4. 0

61,116. **Pressure Terminal** as suggested by Kolbe, nickelled, Figure, with 1 screw head, for screwing in wood, ebonite or the like 0. 0. 10

61,117. **Double Pressure Terminal** (Kolbe's), nickelled, Figure (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 117 K) 0. 1. 0

61,118. **Triple Pressure Terminal** (Kolbe's), nickelled, Figure, with screw nut for fixing 0. 1. 3

61,119. **Ebonite Rod,** 60 cm long, with 2 brass terminals having crossed holes, Figure (W. D., Fig. 504 [477]) 0. 12. 0

61,120. **Single-pole Interrupter** for Battery Currents, Figure (W. D., Fig. 489 [464]), on slate base, can also be used as a single-pole commutator 0. 12. 0

61,121. **Single-pole Interrupter** (Du Bois-Reymond's), Figure, on slate base and with screw clamp, very convenient to manipulate (M. P., 10th edn., **IV**, 1, Fig. 329; 9th edn., **III**, Fig. 334) 0. 18. 0

Quick-Break Lever Switches, Figure, for Heavy Currents, on slate, for voltages up to 550.

Amperes	35	60	100	200
Single-pole, List No.	**61,122**	**61,123**	**61,124**	**61,125**
£	**0. 3. 6**	**0. 5. 0**	**0. 6. 6**	**0. 9. 6**
Double-pole, List No.	**61,126**	**61,127**	**61,128**	**61,129**
£	**0. 6. 6**	**0. 9. 6**	**0. 12. 6**	**0. 19. 0**
Triple-pole, List No.	**61,130**	**61,131**	**61,132**	**61,133**
£	**0. 10. 0**	**0. 14. 0**	**0. 19. 0**	**1. 8. 0**

61,134. **Commutator,** Ruhmkorff's, Figure (M. P., 10th edn., **IV**, 1, Fig. 338; 9th edn., **III**, Fig. 335) 0. 16. 0

61,135. **Commutator,** Ruhmkorff's, with Kolbe automatic current-direction indicator, Figure (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 95) 1. 5. 0

Cl. 2253, 5758, 4191, 3877, 4175, 5833, 2255.

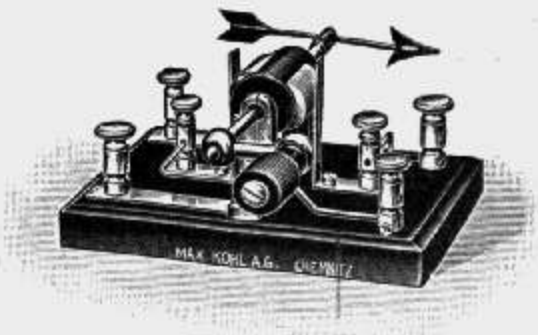
Max Kohl A. G. Chemnitz, Germany.



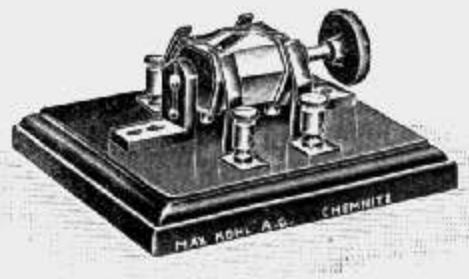
61 126. 1 : 6.



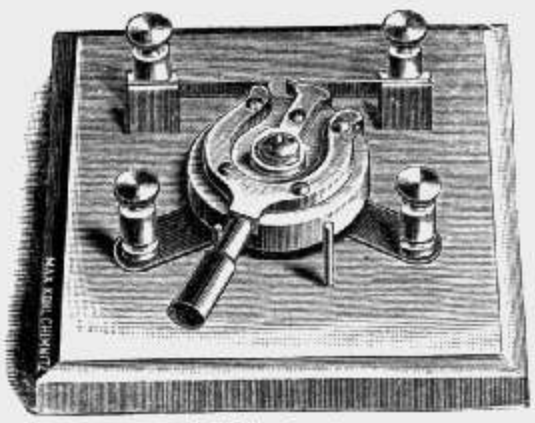
61 134. 1 : 4.



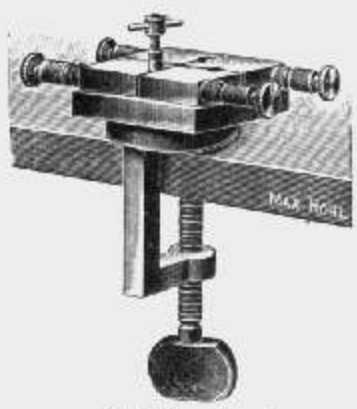
61 135. 1 : 4.



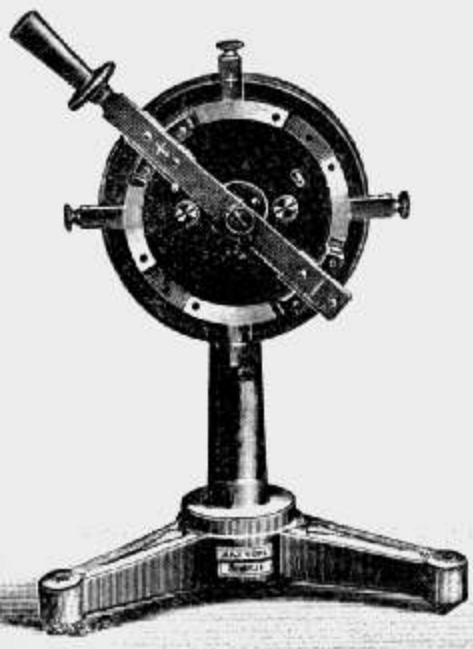
61 136. 1 : 6.



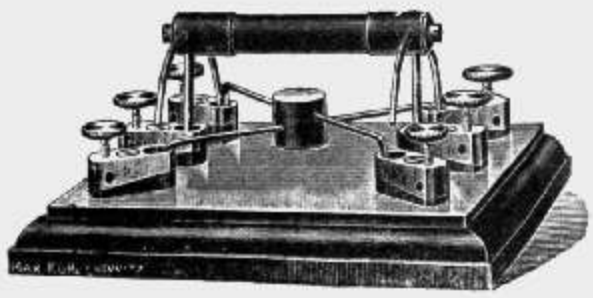
61 137. 1 : 4.



61 139. 1 : 5.



61 140. 1 : 6.



61 138. 1 : 3.

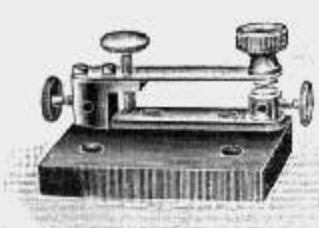


61 141. 1 : 6.

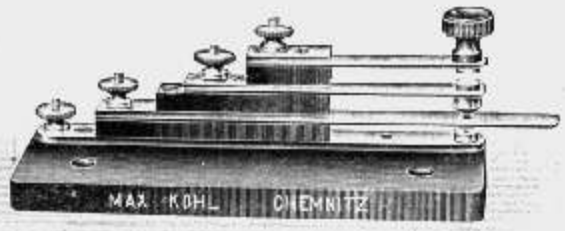


61 142. 1 : 4.

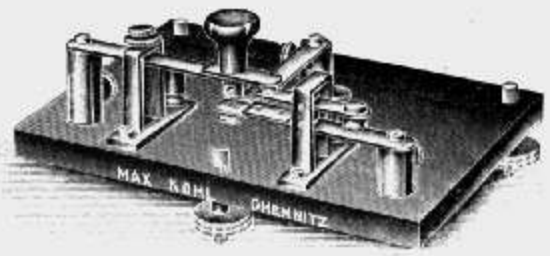
	£ s. d.
61,136. **Commutator** (Hormann's), Figure (W. D., Fig. 490 [465]), very neat type . .	1. 0. 0
61,137. **Commutator** (Bertin's), Figure, easily understandable and very neat (Gan.-Man., Fig. 741)	1. 4. 0
61,138. **Mercury Switch** (Pohl's), Figure, can be used both as a commutator and a reversing switch (M. P., 10th edn., **IV**, 1, Fig. 339 b; 9th edn., **III**, Fig. 337)	1. 4. 0
61,139. **Plug Commutator,** Figure, on ebonite slab and with screw clamp	1. 2. 0
61,140. **Commutator** (Hartl's), for Heavy Currents . . . . . The apparatus is mounted on a stand on round slate base; the connections made can be easily followed by the audience.	3. 0. 0
61,141. **Press Contact on wood board,** with terminals, Figure (M. P., 10th edn., **IV**, 1, Fig. 334)	0. 5. 0
61,142. **Key with Mercury Contact** (Kolbe's), Figure (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 102)	0. 6. 0



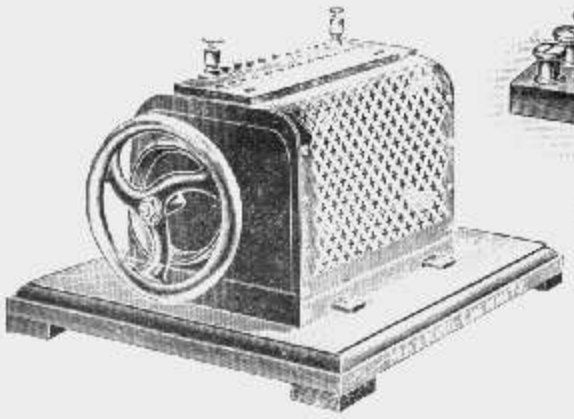
61 143. 1 : 3.



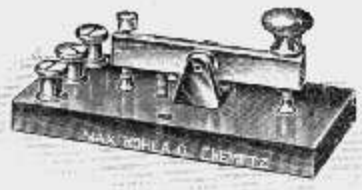
61 144. 1 : 3.



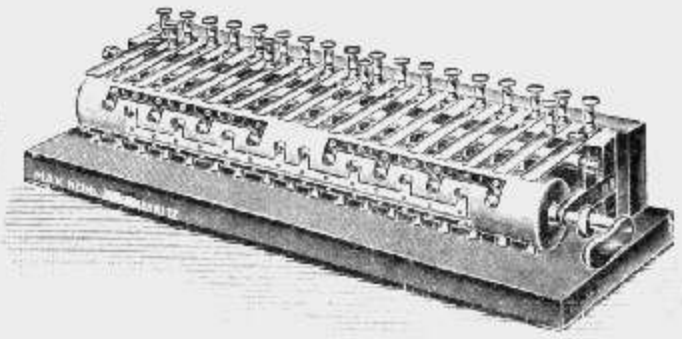
61 146. 1 : 6.



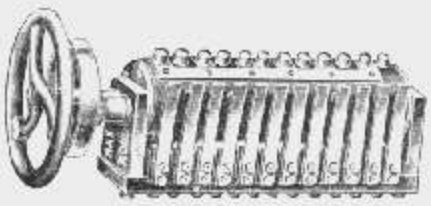
61 153 A. 1 : 5.



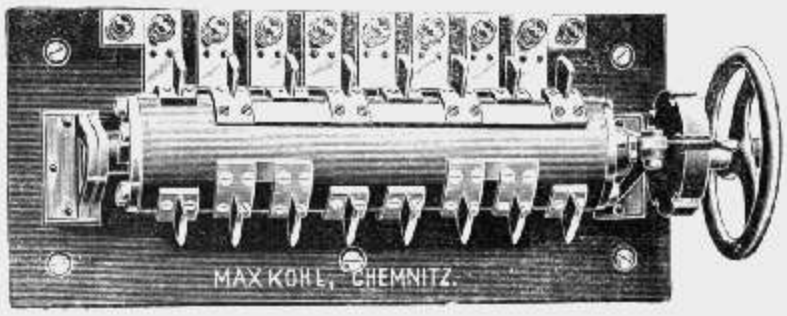
61 147. 1 : 4.



61 150. 1 : 8.



61 153 B. 1 : 5.



61 156. 1 : 5.

	£ s. d.
61,143. **Key,** Figure, for temporary or permanent closing of a circuit	0. 10. 0
The key is mounted on ebonite and can be fixed to the table by two screws.	
61,144. **Double Key (Successive Key),** for the Wheatstone Bridge, Figure	1. 5. 0
One circuit is closed first by pressing the knob, stronger pressure closing a second.	
61,145. — idem, with galvanometer Back Key, specially for moving-coil galvanometers	1. 10. 0
61,146. **Discharge Key** (Heim's), Figure, for capacity determination (E. T. Z. **11**, 1890, p. 556)	2. 10. 0
61,147. **Morse Key,** Figure, with platinum contact, for weak currents	0. 10. 0

Multiple Commutators, Figure (W. D., Fig. 486 [461]), arranged so that the cells or accumulators to be connected up can be put in series, in groups or in parallel, with wood cylinder.

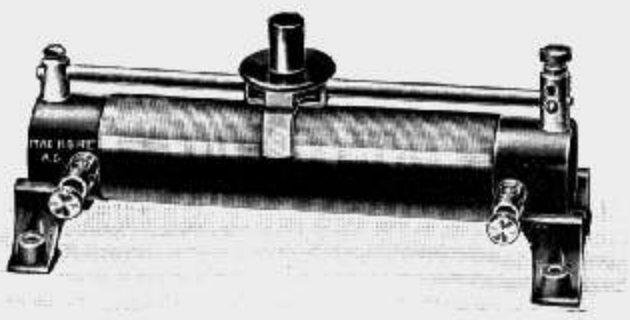
List No.	**61,148**	**61,149**	**61,150**	**61,151**
For	4	6	8	12 cells
Voltage available on connecting up single accumulators . . . volts	2, 4, 8	2, 4, 6, 12	2, 4, 8, 16	2, 4, 6, 8, 12, 24
£	**2. 0. 0**	**2. 8. 0**	**3. 4. 0**	**5. 8. 0**

Multiple Commutators with Stabilit Cylinder and Slate Insulation, for currents to 10 amperes, Figs. A and B.

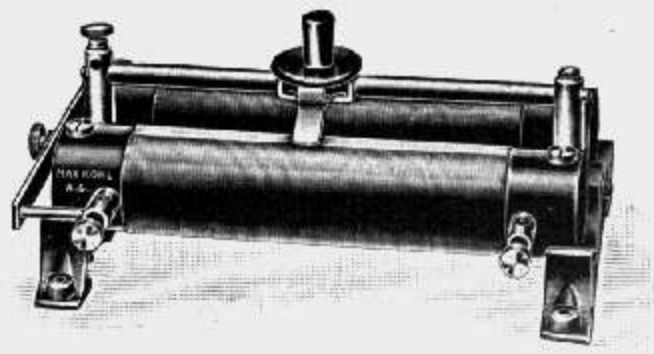
List No.	**61,152**	**61,153**	**61,154**	**61,155**
For	4	6	8	12 cells
Voltage available on connecting up single accumulators . . . . volts	2, 4, 8	2, 4, 6, 12	2, 4, 8, 16	2, 4, 6, 8, 12, 24
£	**4. 16. 0**	**6. 0. 0**	**7. 4. 0**	**9. 0. 0**

Cl. 4676, 4540, 5832, 2239, 5866, 2240, 2241.

Max Kohl A. G. Chemnitz. Germany.



61174. 1 : 3.



61206. 1 : 3.

£ s. d.

61,156. **Multiple Commutator** for Heavy Currents, Figure, for **4 groups** of **20 amperes** each 7. 0. 0

The commutator is used for connecting up 4 groups of primary or secondary cells in three different ways according to requirements: (1) all 4 in series (20 amps. with quadruple the voltage of a group); (2) 2 groups in parallel (40 amps. with double the voltage of one group); (3) all 4 groups in parallel (80 amps. with the voltage of one group).

61,157. — idem, larger, **for 4×80 amperes** 11. 0. 0

Sliding Resistances, Figure, for table use and for firmly fixing, of constantan wire wound on an insulating weldless steel tube.

Max. load	Model A: Appr. weight 0.4 kg, Diam. 30 mm, Length 128 mm			Model B: Appr. weight 0.6 kg, Diam. 35 mm, Length 168 mm			Model C: Appr. weight 0.9 kg, Diam. 40 mm, Length 208 mm			Model D: Appr. weight 1.5 kg, Diam. 50 mm, Length 308 mm			Model E: Appr. weight 1.8 kg, Diam. 55 mm, Length 408 mm			Model F: Appr. weight 2.2 kg, Diam. 60 mm, Length 458 mm		
Amp.	Ohms	List No.	s. d.	Ohms	List No.	s. d.	Ohms	List No.	s. d.	Ohms	List No.	s. d.	Ohms	List No.	s. d.	Ohms	List No.	s. d.
0,3	400	**61158**	**11. 0**	740	**61166**	**13. 0**	1150	**61174**	**15. 6**	2070	**61182**	**19. 0**	3375	**61190**	**21. 0**	4130	**61198**	**25. 6**
1,0	80	**61159**	**11. 0**	150	**61167**	**13. 0**	235	**61175**	**15. 6**	425	**61183**	**19. 0**	680	**61191**	**21. 0**	865	**61199**	**25. 6**
2,0	28	**61160**	**11. 0**	62	**61168**	**13. 0**	85	**61176**	**15. 6**	158	**61184**	**20. 0**	250	**61192**	**22. 0**	315	**61200**	**26. 6**
3,0	17	**61161**	**11. 0**	32	**61169**	**13. 0**	48	**61177**	**15. 6**	87	**61185**	**20. 0**	140	**61193**	**22. 0**	172	**61201**	**26. 6**
4,0	7	**61162**	**11. 0**	14	**61170**	**13. 0**	21	**61178**	**15. 6**	47	**61186**	**20. 0**	60	**61194**	**22. 0**	75	**61202**	**26. 6**
5,0	2,6	**61163**	**12. 0**	5	**61171**	**13. 6**	7,5	**61179**	**16. 6**	13	**61187**	**21. 0**	19	**61195**	**23. 0**	26,5	**61203**	**27. 6**
10,0	0,9	**61164**	**12. 0**	1,6	**61172**	**13. 6**	2,6	**61180**	**16. 6**	4,7	**61188**	**22. 0**	7,3	**61196**	**23. 0**	9,2	**61204**	**27. 6**
20,0	0,4	**61165**	**12. 0**	0,8	**61173**	**14. 6**	1,3	**61181**	**17. 6**	2,3	**61189**	**23. 0**	3,6	**61197**	**25. 6**	4,6	**61205**	**30. 0**

If specially ordered, all the above listed Resistances can be supplied without sliding bar and sliding brush, but with feet for using as fixed series resistances. In this case the prices are decreased by

	in Model A	Model B	Model C	Model D	Model E	Model F
About £	**0. 3. 0**	**0. 3. 6**	**0. 4. 0**	**0. 4. 6**	**0. 5. 0**	**0. 6. 0**

Double Sliding Resistances, Figure, consisting of 2 sliding resistances as above, which can be put in series or parallel.

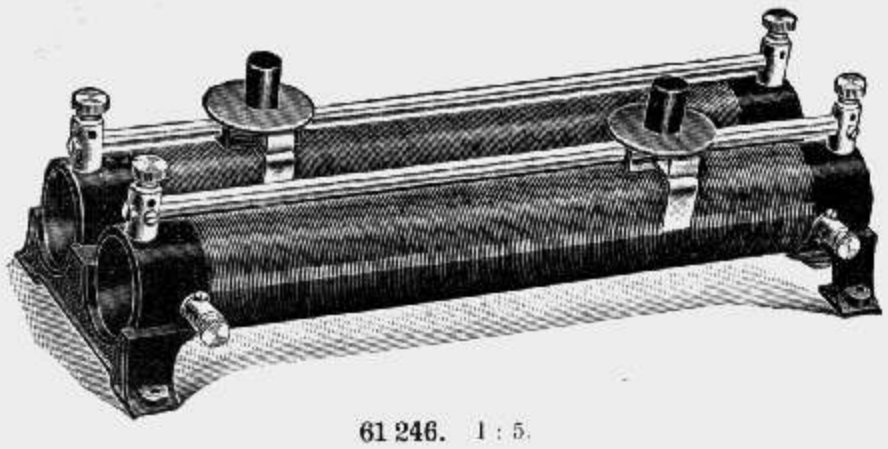
Max. Load in Series	Max. Load in Parallel	Resistance in Series	Resistance in Parallel	Model G: Appr. Wt. 1.2 kg, Length 208 mm			Resistance in Series	Resistance in Parallel	Model H: Appr. Wt. 3.6 kg, Length 308 mm			Resistance in Series	Resistance in Parallel	Model J: Appr. Wt. 3.0 kg, Length 408 mm			Resistance in Series	Resistance in Parallel	Model K: Appr. Wt. 3.5 kg, Length 458 mm		
Amperes		Ohms		List No.	s.	d.	Ohms		List No.	s.	d.	Ohms		List No.	s.	d.	Ohms		List No.	s.	d.
0,3	0,6	2300	575	**61206**	**26.**	**6**	4140	1030	**61214**	**33**	**0**	6750	1610	**61222**	**38.**	**6**	8260	2060	**61230**	**46.**	**6**
1,0	2,0	570	142	**61207**	**26.**	**6**	850	212	**61215**	**33.**	**0**	1360	340	**61223**	**38.**	**6**	1730	435	**61231**	**46.**	**6**
2,0	4,0	170	43	**61208**	**26.**	**6**	316	80	**61216**	**33.**	**0**	500	125	**61224**	**38.**	**6**	630	158	**61232**	**46.**	**6**
3,0	6,0	96	24	**61209**	**26.**	**6**	174	43	**61217**	**33.**	**0**	280	70	**61225**	**38.**	**6**	340	85	**61233**	**46.**	**6**
4,0	8,0	42	10	**61210**	**26.**	**6**	94	23	**61218**	**33.**	**0**	120	30	**61226**	**38.**	**6**	150	38	**61234**	**46.**	**6**
5,0	10,0	15	4	**61211**	**27.**	**6**	26	6,5	**61219**	**35.**	**6**	38	9,5	**61227**	**41.**	**0**	52	13	**61235**	**48.**	**6**
10,0	20,0	5,2	1,3	**61212**	**27.**	**6**	9,4	2,4	**61220**	**35.**	**6**	14,5	3,8	**61228**	**41.**	**0**	18,5	4,6	**61236**	**50.**	**0**
20,0	40,0	2,6	0,6	**61213**	**30.**	**0**	4,6	1,2	**61221**	**40.**	**0**	7,2	1,8	**61229**	**44.**	**0**	9,0	2,2	**61237**	**55.**	**0**

Ohm Scale for reading the resistance inserted, per scale

Model	G	H	J	K
£	**0. 2. 6**	**0. 3. 0**	**0. 3. 0**	**0. 3. 6**

Cl. 5848, 5847.

Max Kohl A. G. Chemnitz, Germany.



61 246. 1 : 5.

Universal Sliding Resistances. Figure, comprising a combination of 2 sliding resistances whose resistances are of different magnitude and varying loading capacity, it being possible to use these as required in series, parallel, or singly by means of a connecting strap. An extremely complete range of fine adjustment of the current-value to be regulated is possible with these resistances and in consequence they can be highly recommended both for this reason and by virtue of their many-sided uses for practical and scientific purposes.

Max. Load	Model L Approx. weigth 1.4 kg Length 208 mm			Model M Approx. weigth 3.0 kg Length 308 mm			Model N Approx. weigth 3.5 kg Length 408 mm			Model O Approx. weigth 4.5 kg Length 458 mm		
Amps.	Ohms	List No.	s. d.	Ohms	List No.	s. d.	Ohms	List No	s. d.	Ohms	List No.	s. d.
0,3 1,5	1150 112	61 238	36. 0	2070 210	61 242	41. 0	3375 330	61 246	47. 0	4130 415	61 250	53. 0
1,0 4,0	235 21	61 239	36. 0	425 47	61 243	41. 0	680 60	61 247	47. 0	865 75	61 251	53. 0
2,0 7,0	85 4,5	61 240	37. 0	158 8,2	61 244	42. 0	250 13,2	61 248	48. 0	315 16,5	61 252	54. 0
5,0 20,0	7,5 1,3	61 241	38. 0	13 2,3	61 245	43. 0	19 3,6	61 249	49. 0	26,5 4.6	61 253	55. 0

61,254. **Stepped Sliding Resistance,** Fig. 61,174. p. 869, wound with wire of different thicknesses, for taking current from cells and accumulators. The range of regulation is extremely wide . . . . . £ s. d. 2. 0. 0

Connected to	With minimum external resistance of	Capable of Regulation from
2 Volts	0.1 Ohm	5 Milli-Amps. to 20 Amps.
4 „	0.2 „	10 „ „ 20 „
6 „	0.3 „	15 „ „ 20 „
10 „	0.5 „	25 „ „ 20 „

61,255. **Stepped Double Sliding Resistance,** has the above-mentioned loading capacity and double the resistance when in series; when in parallel the resistance is half as much with double the loading capacity 4. 0. 0

The Constant Load with maximum current applies when the Sliding Resistances are arranged vertically.

Nickelin Wire for Series Resistances, bare.

Diam. mm	0.5	0.75	1	1.1	1.3	1.5	2	2.5	3
Approx. resistance per m, Ohms	2	0.9	0.5	0.42	0.3	0,22	0.12	0.081	0.057
List No.	61,256	61,257	61,258	61,259	61,260	61,231	61,262	61,263	61,264
Price per kg £	0. 7. 0	0. 7. 0	0. 7. 0	0. 7. 0	0. 7. 0	0. 7. 0	0. 6. 6	0. 6. 6	0. 6. 6

61,265. **Nickelin Wire** of various thicknesses, bare, altogether 500 grams 0. 4. 6

Max Kohl A. G. Chemnitz, Germany.

Notice No. 18.

Experimental Resistances with 2 Switch Contacts,

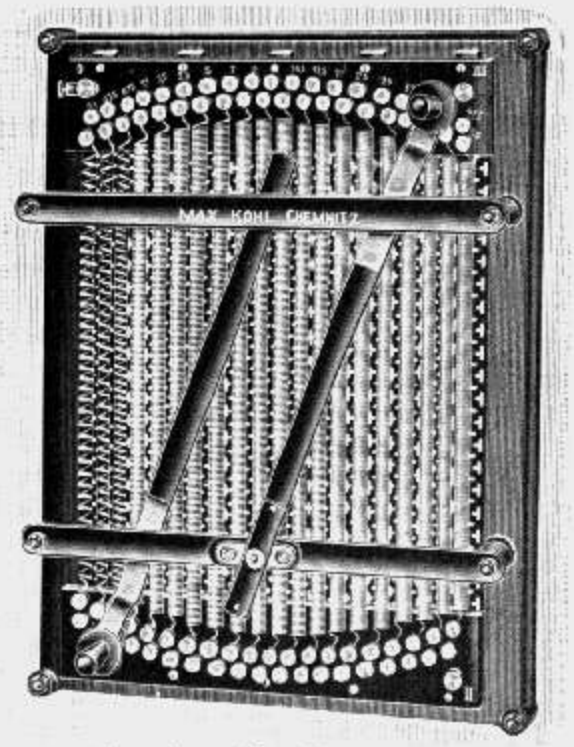
as suggested by Dr. W. **Brüsch**, Lübeck, constructed by **Max Kohl**, Ltd., Chemnitz.

We have, at the instigation of Dr. W. Brüsch of Lübeck, constructed the Experimental Resistances with 2 Switch Contacts, described below. This type of resistance admits of a variety of adaptations, being particularly suitable for taking from heavy current supplies any large or small currents at low terminal voltage.

Type *A*, *Fig. 1*, with 39 contacts — Resistance, 36 ohms — maximum permissible load, 5 to 30 Amps. according to the position of the contact handles — for taking currents of from 0.03 to 30 Amps. and pressures of 0.3 to 110 Volts from the network.

Type *B*, *Fig. 1*, with 39 contacts — 48 ohms resistance — max. permissible load 5 to 20 Amps. according to the position of the switch handle — for taking currents of 0.08 to 20 Amps. and pressures of 0.8 to 220 Volts from the network.

Type *C*, *Fig. 2*, — with 21 contacts — 24 ohms resistance — max. permissible load 5 to 20 Amps. according to the position of the switch handles — for taking currents of from 0.08 to 20 Amps. and pressures of 0.8 to 110 Volts from the network.



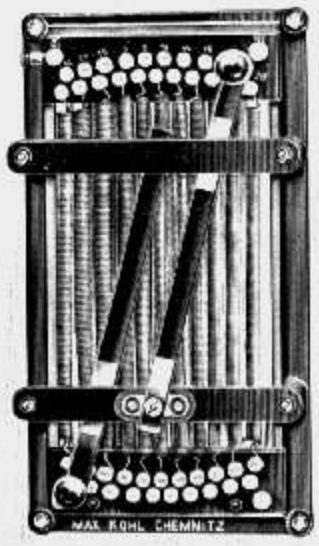
Type A and B. Fig. 1. 1:8.

The terminal designated *"O"* is connected up to the zero end of the resistance, while that designated *III.* is connected with the other end of the same; terminal *I.* is connected up to Switch Contact *I.* and terminal *II.* to Switch Contact *II.*

The resistances can be used in three different manners.

Grouping No. I. **As a Series Resistance,** *Fig. 3.*

This method of using the resistances can be recommended in the case of apparatus where there is no interruption of the current, for taking heavy currents where the terminal voltage at the apparatus is fairly high (e. g., for working an arc lamp). Coarse regulation is obtained by Switch Contact No. *I.*, while finer steps can be had by employing No. *II.* In this connection, the following current-strengths should **not** be exceeded in the case of each type: —



Type C. Fig. 2. 1:8.

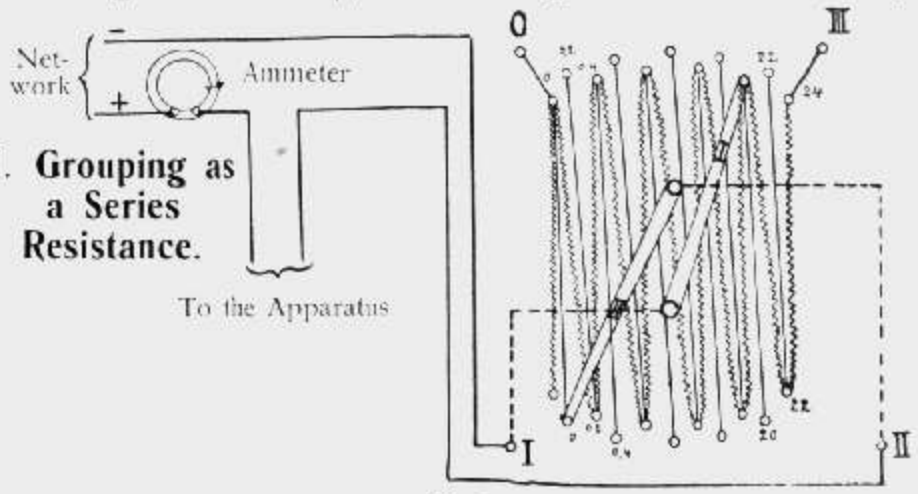


Fig. 3.

Type *A*. Large Pattern with 39 contacts: Resistance 36 Ohms, for connecting up to 110 Volts.		Type *B*. Large Pattern with 39 contacts: Resistance 48 Ohms, for connecting up to 220 Volts.		Type *C*. Small Pattern with 21 contacts: Resistance 24 Ohms, for connecting up to 110 Volts.	
Resistance Ohms	Permissible Current Amps.	Resistance Ohms	Permissible Current Amps.	Resistance Ohms	Permissible Current Amps.
0 to 0,4	30	0 to 1	20	0 to 0,4	20
0,65 „ 1	25	1,4 „ 5	15	0,7 „ 1	15
1,25 „ 2	20	6 „ 14	10	1,5 „ 3	12,5
2,4 „ 6	15	16 „ 36	6,5	4 „ 6	8,5
7 „ 12	10	40 „ 48	5	8 „ 24	5
14 „ 24	6,5				
27 „ 36	5				

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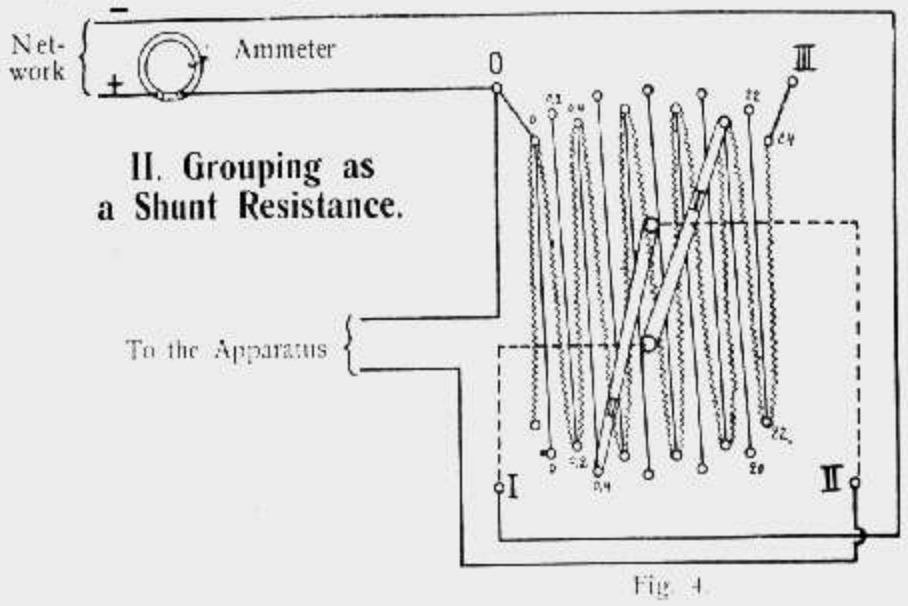
Cl. 3769, 3770, 4719.

Grouping No. II. **As a Shunt Resistance,** *Fig. 4,* for taking off any Currents (within the limits of load) at low Pressure.

It is advisable first of all to place Switch Contact *I.* on the highest resistance-value and Contact *II,* on *"O"*, the latter being moved forward until the desired current-density is reached.

If Switch Contact *II.* is still near to *"O"* and should a further slight increase in the current still be necessary, it is better to move Switch Handle *I.* back than No. *II.* forward. In feeding apparatus which work with an interrupted current (e. g. induction coils with platinum interrupters) too high a tension should not predominate when the current is admitted otherwise there is danger of the contacts getting burned. When heavy currents are being used, Switch Contact No. *II.* should be left near to *O* and Contact *I.* moved back cautiously. The pressure at the apparatus when the current is being admitted is to the working voltage as the resistance-values given alongside the contact studs on which the Handles are placed are to each other. The maximum permissible currents given under (1) should in no case be exceeded.



II. Grouping as a Shunt Resistance.

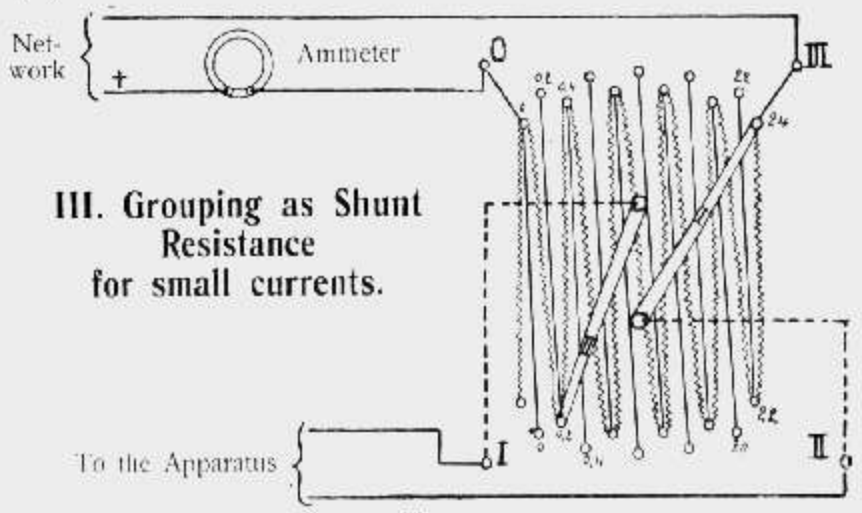
Fig. 4.

Grouping No. III. **As a Shunt Resistance,** *Fig. 5,* for taking off **small** Currents up to 2 Amps.

As a rule both Switch Contact Handles are first of all placed on the zero contacts, the current in the apparatus being slowly increased by adjusting one of the Contact Handles.

If Handle No. *II.* is placed on the spot where No. *I.* previously stood, and **vice-versa,** this changes the poles at the apparatus.

Under no circumstances whatever must this method of grouping be used for taking off higher current-densities than 2 Amps. A too heavy current — with consequent burning out of the resistances — is particularly liable to take place when one Handle is **near** the highest resistance-value and the other close to the zero-value and the resistance of the apparatus itself is small. The latter would cause most of the spirals to short-circuit and the thin spirals, in series, near to the maximum resistance-value would then be charged with a current exceeding that prescribed.



III. Grouping as Shunt Resistance for small currents.

Fig. 5.

It is always advisable (as also in the case of other methods of employing the resistances) to connect up a reliable ammeter for protecting the resistance and the apparatus connected up. The total current flowing through the resistance, when connected up in accordance with Scheme No. *III.* should not exceed 5 Amps.

PRICES.

50 516. **Experimental Resistance, Type *A,*** *Fig. 1,* with 2 Switch Handles, 39 Contacts; Resistance 36 Ohms; maximum permissible load, 5 to 30 Amps., according to position of Contact Handles; for taking currents of 0.03 to 30 Amps. and pressures of 0.3 to 110 Volts from the supply line . . . . . £ 6.15.0.

50 517. **Experimental Resistance, Type *B,*** *Fig. 1,* with 2 Switch Handles, 39 Contacts; Resistance 48 Ohms; maximum permissible load 5 to 20 Amps., according to the position of the Switch Handles; for taking currents of 0.08 to 20 Amps. and pressures of 0.8 to 220 Volts from the supply line . . . . . „ 6.15.0.

50 518. **Experimental Resistance, Type *C,*** *Fig. 2,* with 2 Switch Handles, 39 Contacts; Resistance 24 Ohms; maximum permissible load, 5 to 20 Amps. according to the position of the Switch Handles; for taking currents of 0.08 to 20 Amps. and pressures of 0.8 to 110 Volts from the supply line . . . . . „ 4.10.0.

HUGO WILISCH, CHEMNITZ.

Cl 4720
4721

Supplement to Notice No. 18.

Simple Experimental Switchboards.

In addition to being makers of the most complete patterns of experimental switchboards, we also manufacture those of a lighter and simpler pattern, which, however, permit of being used in a multiplicity of ways.

On the one hand they permit of connecting up the apparatus which are being used for teaching purposes (and which are usually intended for working on low pressure) to the heavy current from electricity works; while on the other hand they permit of carrying out those experiments which imply the use of a heavy current, e. g., demonstrating the electric arc.

The switchboards are accordingly arranged in such manner that it is possible to work with small or large current-densities at high or low pressures when the supply is obtained from a heavy current system. The condition as regards low voltage, which is rendered possible by a shunt method of connecting (division of pressure), is particulary important in the case of apparatus working with interruption of the current, the contact parts of which are burnt out when a high voltage is applied or even when a large series resistance is employed, since the full supply voltage prevails at the contact parts at the moment of interruption of the current.

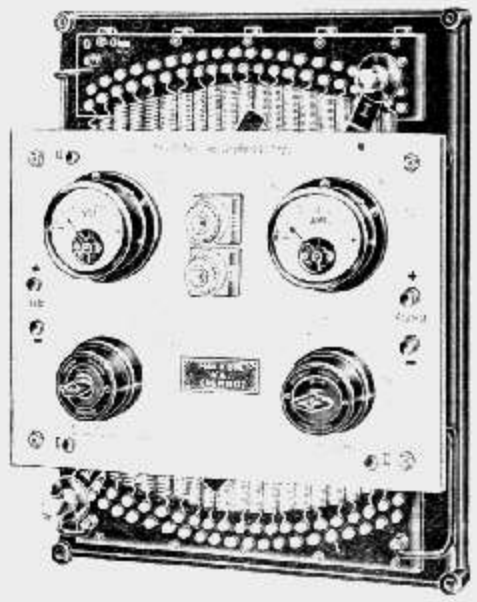


Fig. 6. 1 : 10.

The switchboards are fitted either with Deprez-d'Arsonval precision measuring instruments or with air-damped electromagnetic instruments, as desired. The former are rather advisable, as they have a uniform scale and are dead-beat. They are only applicable for direct current. The electromagnetic instruments possess a scale which commences only at approx. 1/5 of the maximum deflection. Smaller currents and voltages can thus only be read approximately. On the other hand, however, these instruments can be used both on direct and alternating current. Alternating current, however, is only directly applicable for a few experiments, so that it is usually necessary to transform it into direct current.

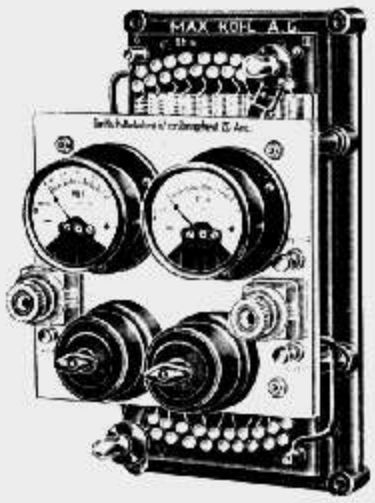


Fig. 7. 1 : 9.

The construction of the switchboards may be seen on reference to Figs. 6 and 7. A marble slab is placed on one of the Double Switch Contact Resistances already described, this slab containing the necessary fuses, switches and measuring instruments. The method of connecting is generally in accordance with that described on pp. 111 and 112 of our Price List No. 50, with the exception that the measuring instruments cannot be commutated, and that they give the voltage and current in the apparatus direct.

The switchboards are designed for fixing on the wall. Directions for use and a diagram of connections are appended to each switchboard.

The metering instruments have an approx. base diameter of 130 mm.

Prices.

7086. **Simple Experimental Switchboard, Type EA_1,** for connecting up to **110 volts D. C.**, Fig. 6, with Double Switch Contact Resistance, **39 contacts**, 36 ohms; max. permissible load **5 to 30 amps.** according to position of Switch Contacts; for taking currents of **0.03 to 30 amps.** and pressures of **0.3 to 110** volts from the supply; **with Precision Instruments** . . . . . £ 13. 0. 0

The marble slab contains: 2 terminals for the supply current; 2 fuses; 1 main switch; 1 switch for the shunt; 1 Precision Ammeter; 1 Precision Voltmeter; 2 terminals for connecting up the apparatus.

7087. — idem, **Type EB_1,** Fig. 6, style as No. 7086, but for connecting up to **220 volts D. C.**, with 2 Switch Contacts, **39 contacts**, 48 ohms; max. permissible load, **5 to 20 amps.** according to position of switch contacts; for taking currents of **0.08 to 20 amps.** and pressures of **0.8 to 220 volts** from the supply . . . . . £ 13. 5. 0

7088. — idem, **Type** EC_1, Fig. 7, Fittings as No. 7086, for connecting up to **110 volts D. C.,** with Double Switch Contact Resistance, **21 contacts,** 24 ohms; max. permissible load, **5 to 20 amps.** according to position of switch contacts; for taking currents of **0.08 to 20 amps.** and pressures of **0.8 to 110 volts** from the supply . . . . . £ 10. 5. 0

7089. **Simple Experimental Switchboard, Type** EA_2, Fig. 6; fittings and load-limits as No. 7086, but **with electromagnetic Measuring Instruments,** can be used for D. C. and A. C. £ 11. 15. 0

7090. — idem, **Type** EB_2, Fig. 6, fittings and load-limits as No. 7087, but **with electromagnetic Measuring Instruments,** can be used for D. C. and A. C. . . . . £ 12. 0. 0

7091. — idem, **Type** EC_2, Fig. 7; fittings and load-limits as No. 7088, but **with electromagnetic Measuring Instruments,** can be used for D. C. or A. C. . . . . £ 9. 0. 0

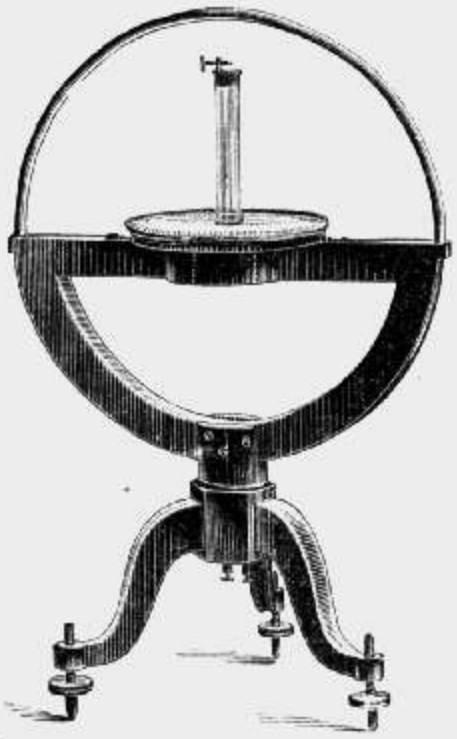
The remarks apply for temporary loading. When ordering, kindly state precisely the network voltage, and, in the case of A. C., the frequency.

HUGO WILISCH, CHEMNITZ

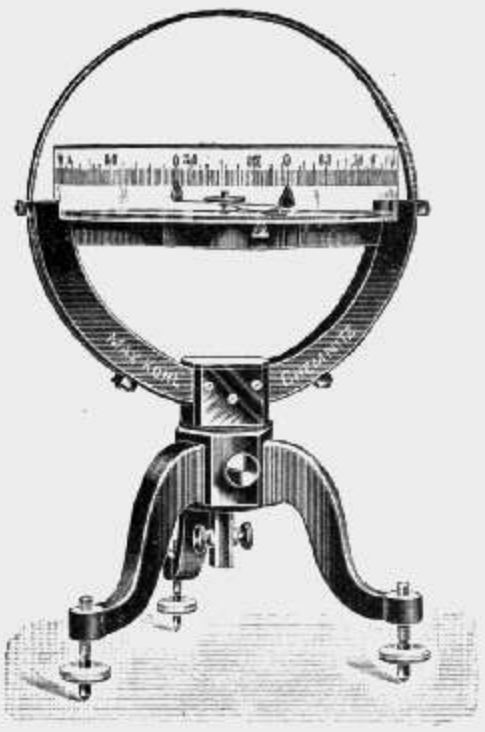
Max Kohl A. G. Chemnitz, Germany.



61 266. 1 : 6.



61 267. 1 : 6



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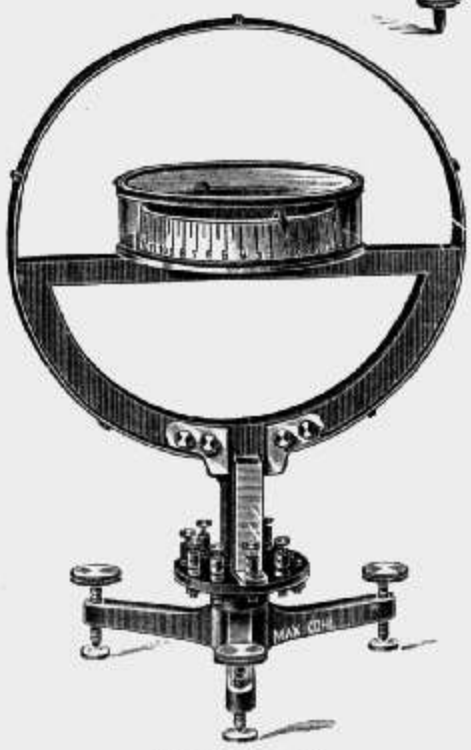
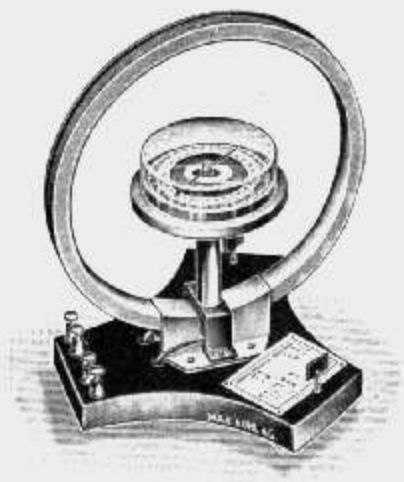


61 269. 1 : 6.



61 270. 1 : 7.

Section 3: Electro-Magnetic Current Measurements.

Tangent Galvanometers.

£ s. d.

The needles, caps and pivots of the galvanometers are most carefully constructed and the magnets are very accurately balanced.

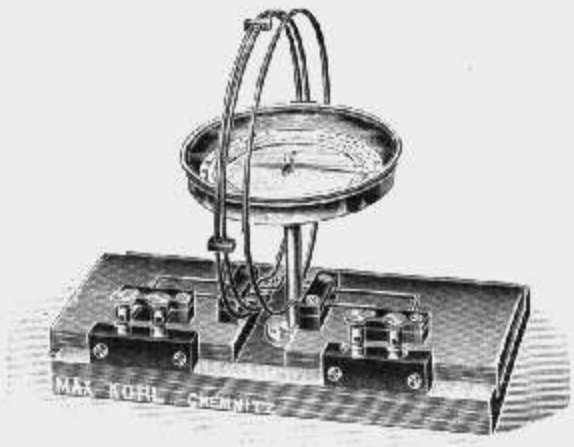
61,266. **Tangent Galvanometer,** Figure (W. D., Fig. 507 [480]), very suitable for school use, needle with agate cap working on steel pivot; reading facilitated by a mirror; with arrestment, brass tripod, brass box, copper ring 300 mm diameter 2. 10. 0

61,267. **Tangent Galvanometer,** Figure, needle suspended on raw silk fibre; with air damping; graduation on silvered brass; reading facilitated by an inlaid mirror (Gan.-Rein., Fig. 825) 6. 10. 0

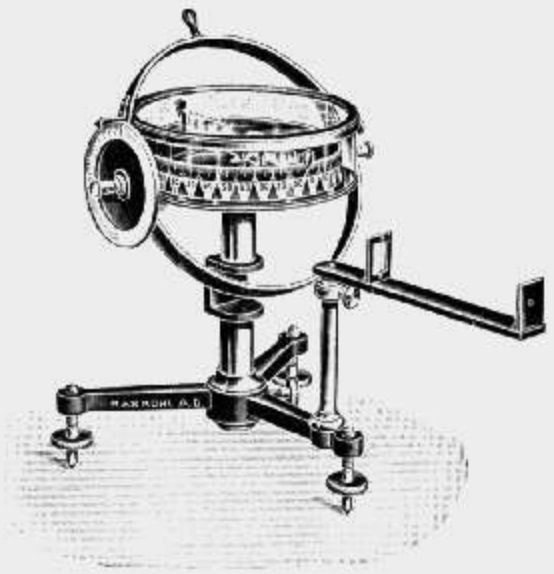
61,268. **Tangent Galvanometer** (Poske's), Figure (Ztschr. f. d. phys. u. chem. U. **3**, p. 103), with vertical transparent scale on a 270 mm diameter glass ring, needle resting on pivot 7. 0. 0

61,269. **Tangent Galvanometer,** Figure, with vertical scale for demonstration purposes and with horizontal scale for measurements, with group winding 10. 0. 0

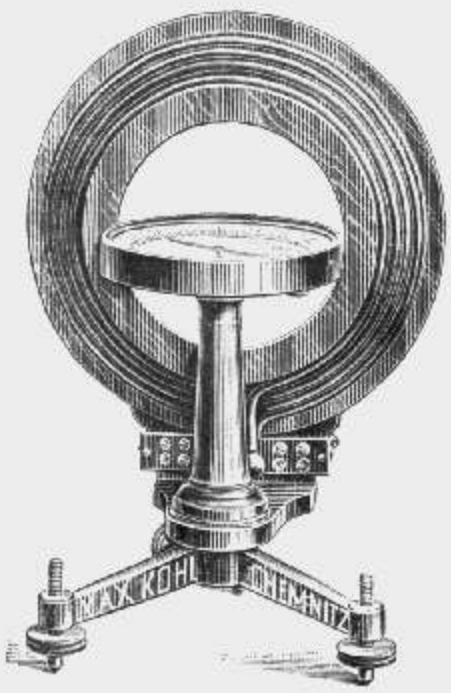
61,270. **Tangent Galvanometer,** student's pattern as suggested by Hahn, Figure (Hahn, Handbuch f. Schülerübungen, 1909, Fig. 257), with 3 groups of windings (500, 50 and 4 turns) 1. 10. 0



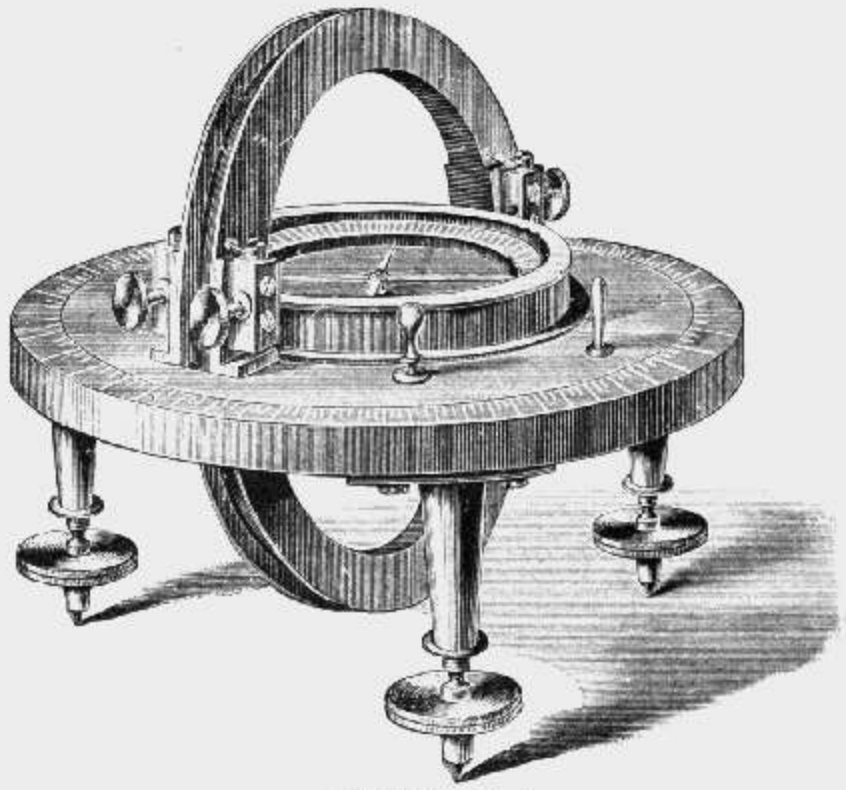
61 271. 1 : 6.



61 272. 1 : 5.



61 273. 1 : 6.



61 274 A. 1 : 3.

61,271. **Detachable Tangent Galvanometer** (Grimschl's), Figure (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 159), specially adapted for practical use by students (Unterrichtsblätter f. Math. u. Naturw. **8**, 1902, p. 104; Physikal. Ztschr. **3**, 1902, p. 462; Ztschr. f. d. phys. u. chem. U. **15**, 1902, p. 292) . . . . . £ 3. 0.0

61,272. **Tangent Galvanometer** (Kolbe's), student's pattern, can also be used as a Sine-Tangent Galvanometer, Figure (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 112; Ztschr. f. d. phys. u. chem. U. **4**, p. 31), with Obach movable copper ring and vertical scale and sight-vane . . . . . £ 7. 0.0

The Galvanometer has a degree and tangent scale, the diameter of scale ring being 160 mm. The needle is provided with mica vane for air damping.

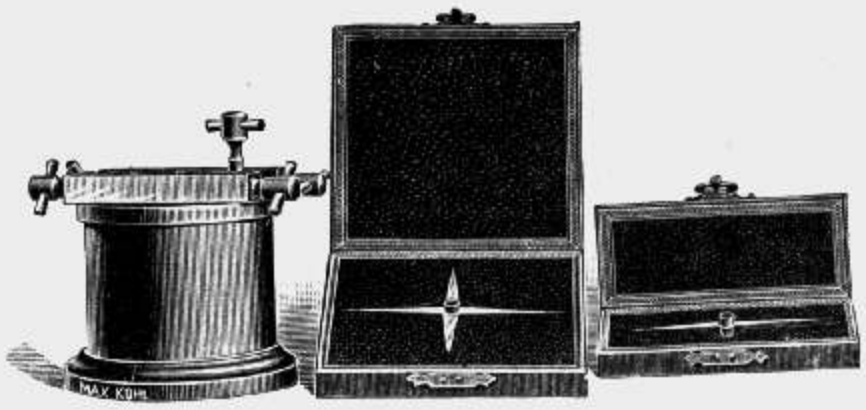
Luminous Index as suggested by Friedr. C. G. Müller: see No. 60,132, p. 795.

Tangent Galvanometer Ring for School Galvanometer: see p. 877, No. 61,300.

61,273. **Tangent Galvanometer** (Gaugain's), Figure (M. P., 9th edn., **III**, Fig. 486), with 4 laterally arranged windings for putting in parallel or series . . . . . £ 7. 10. 0

Cl. 5976, 5841, 2314, 2317.

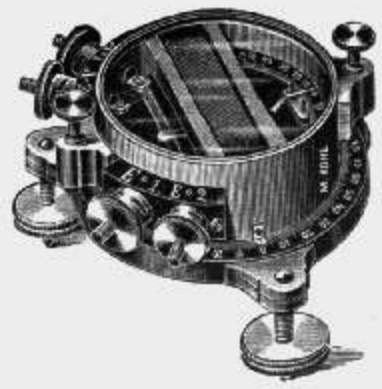
Max Kohl A. G. Chemnitz, Germany.



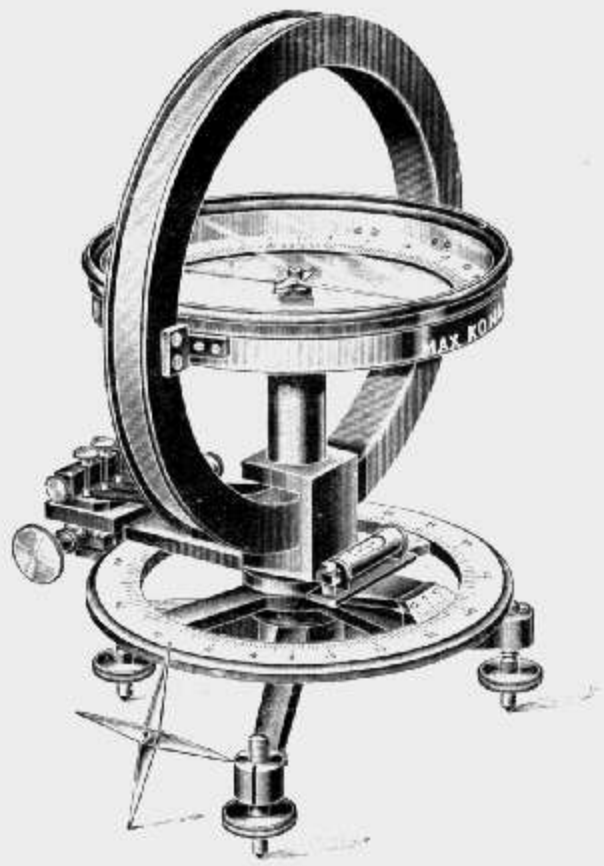
61 274 B.
1 : 5.

61 274 C.
1 : 5.

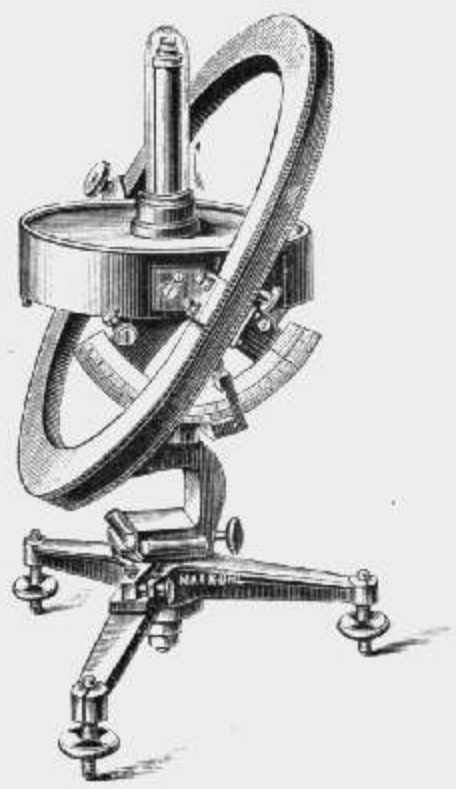
61 274 D.
1 : 5.



61 279.
1 : 4.

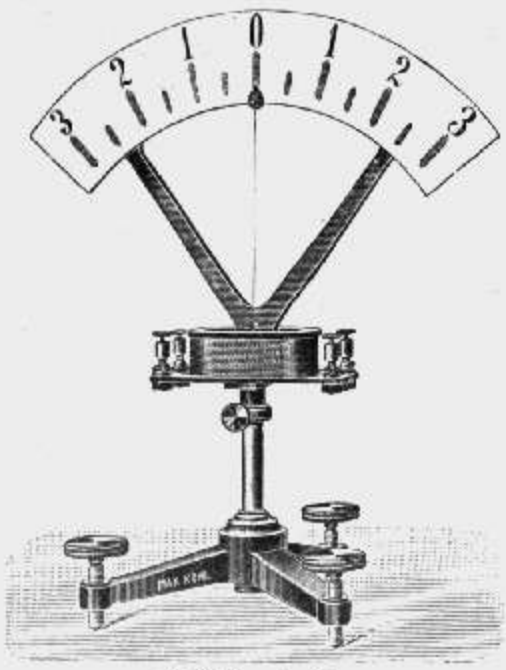


61 277. 1 : 4.

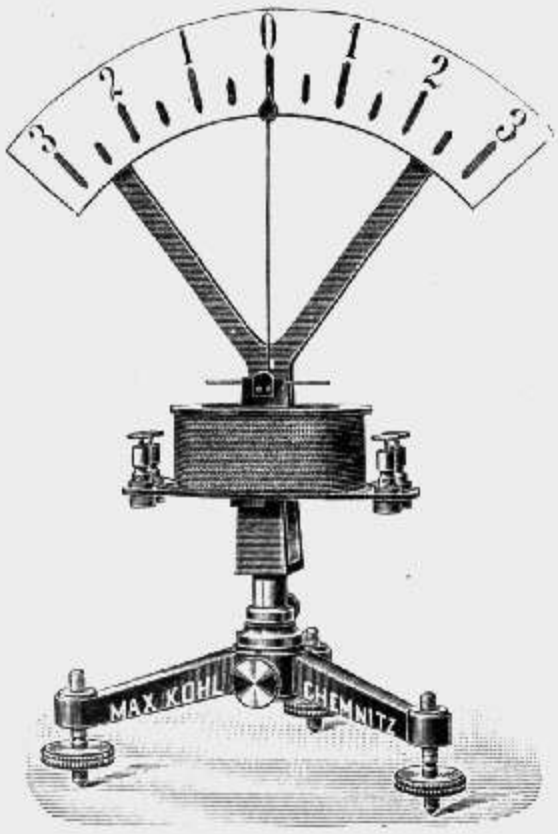


61 278. 1 : 5.

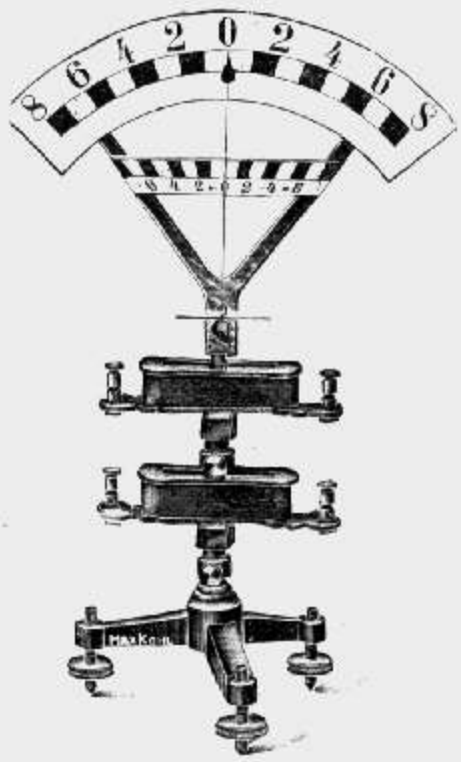
	£ s. d.
61,274. **Sine and Tangent Galvanometer,** Siemens type, Figs. A—D (M. P., **III**, 9th edn., Fig. 488), with 2 windings, with shunt (Fig. B) of three sections ($^1/_9$, $^1/_1$ and $^1/_1$ for the thinner winding, needles set up in elegant case (Figs. C and D), diameter of galvanometer 120 mm	12. 10. 0
The needles with sapphires rest on pivots; the winding ring together with the compass can be rotated in the graduated circle. The winding ring has two different windings of 0.1 and 150 ohms resistance. All parts are most carefully constructed.	
61,275. — idem, smaller, diameter of compass 100 mm, with shunt	11. 0. 0
61,276. **Shunt,** separately, Figure 61,274 B	1. 15. 0
61,277. **Sine and Tangent Galvanometer,** Pouillet's Model, Figure (M. P., 9th edn., **III**, Fig. 487; Gan.-Rein., Fig. 827), with two different windings and two needles, movable on horizontal graduated circle; with mircometer and vernier; box 200 mm	14. 0. 0
61,278. **Tangent Galvanometer** (Trowbridge's), Figure, with movable wire spiral, needle on raw silk fibre suspension	11. 0. 0
61,279. **Sine Galvanometer;** also at same time a Differential Galvanometer, Figure . .	6. 10. 0



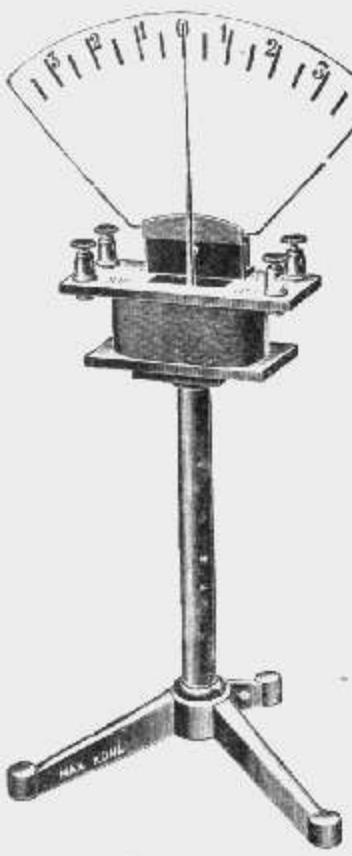
61 280. 1 : 6.



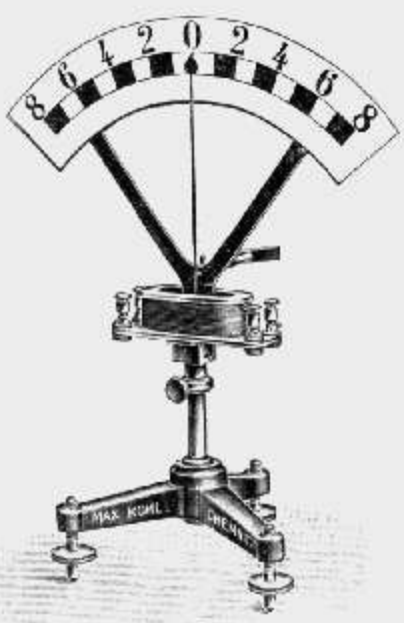
61 281. 1 : 6.



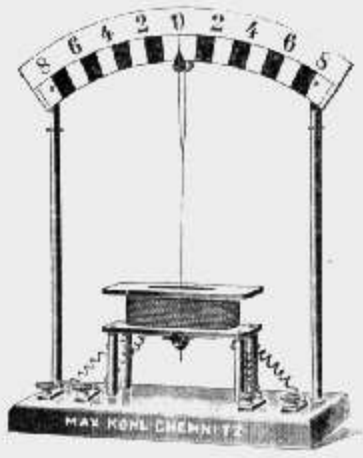
61 282. 1 : 6.



61 283. 1 : 4.



61 284 A. 1 : 7.



61 285. 1 : 6.

Moving Magnet Galvanometers.

£ s. d.

All mirror galvanometers are fitted with simple plane mirror unless otherwise specified. If specially ordered, and at an extra cost, we can insert a polished plane mirror or a concave mirror for scale-reading apparatus for 1 or 2 metres distance. In the latter case the distance desired should be stated.

61,280. **Vertical Galvanometer,** Figure, with massive magnet working on steel knife edge, adjustable coil with coarse and fine winding; well adapted for induction and thermo-electric experiments 2. 10. 0

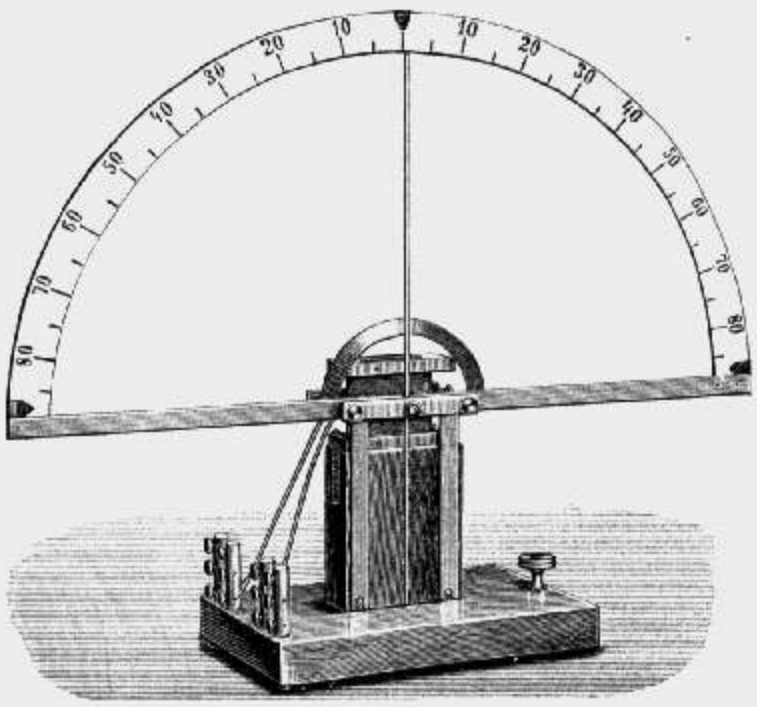
61,281. — idem, larger, turning on tripod and with greater sensitivity, Figure . . . 3. 12. 0

61,282. **Vertical Galvanometer** with 2 interchangeable coils and with circular and tangent graduation, Figure 2. 14. 0

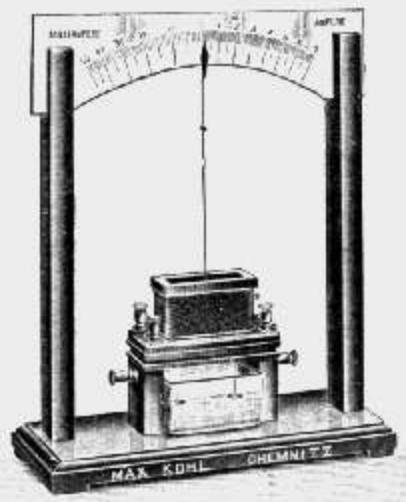
61,283. **Vertical Galvanometer,** Figure, with fixed coil having a coarse and fine winding, with arrestment and controlling magnet 1. 10. 0

Cl. 2349, 2343, 2350, 2351, 3881, 2352.

Max Kohl A. G. Chemnitz, Germany.



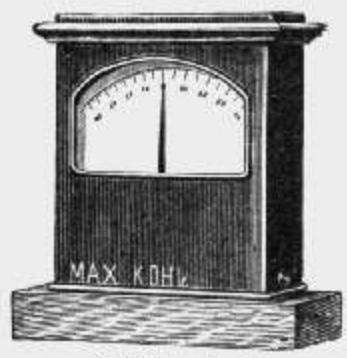
61 287. 1 : 6.



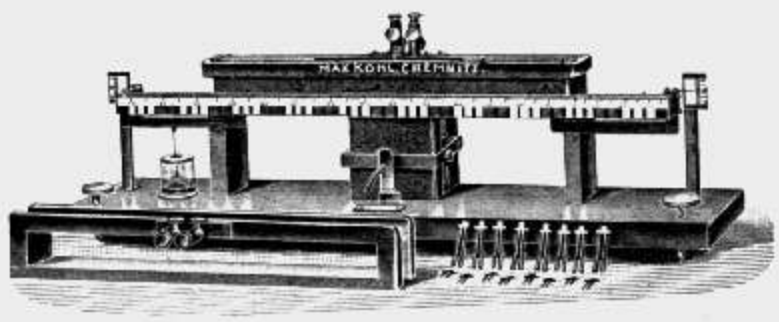
61 288. 1 : 8.



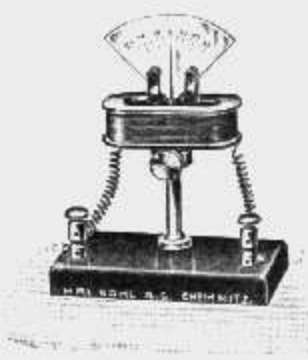
61 290. 1 : 3.



61 291. 1 : 3.



61 289. 1 : 8.



61 293. 1 : 4.

61,284. **Galvanometers Nos. 61,280—61,282 can be fitted with a Directing Magnet for increasing the Sensitivity,** cf. Fig. No. 61,284 A . . . . . **Extra Price** — £ 0. s. 5. d. 0

61,285. **Simple Vertical Galvanometer,** Figure, with a coil having a fine and coarse winding — 1. 10. 0

61,286. — idem, with oil damping, similar to No. 61,288 . . . . . — 1. 15. 0

61,287. **Demonstration Galvanometer** (Holtz's), Figure (Ztschr. f. d. phys. u. chem. U. **2,** p. 222), with coarse and fine winding. . . . . — 4. 5. 0

The instrument is of high sensitivity and has a good damping arrangement. The graduated arc is very large, being divided on both sides.

61,288. **Vertical Galvanometer** (Friedr. C. G. Müller's), Figure, with liquid damping (Ztschr. f. d. phys. u. chem. U. **20,** 1907, p. 142; M. T., Figs. 189 a and 189 b) . . . — 3. 10. 0

The galvanometer has two windings and can be used as a vertical galvanoscope of medium sensitivity and for approximate current measurements from 0—50 milliamperes and 0—7 amperes.

61,289. **Balance Galvanometer** (Friedr. C. G. Müller's), Figure (Ztschr. f. d. phys. u. chem. U. **10,** 1897, p. 5) . . . . . — 9. 0. 0

The balance galvanometer is a practical instrument for measuring direct currents of widely differing densities. The range is from 0.01—20 amps. Currents to 0.001 ampere can even be estimated. The balance galvanometer can also be used as a voltmeter, being provided for this purpose with a fine-wire coil. The instrument is also provided with oil damping.

61,290. **Vertical Galvanoscope,** Figure, with glass scale, Reichspost model . . . . . — 1. 2. 0

61,291. **Vertical Galvanoscope,** Figure, in lacquered zinc case . . . . . — 0. 15. 0

Vertical Galvanoscope; also for use as **Dip Circle;** for projection: see No. 60,096, p. 790.

61,293. **Vertical Galvanoscope** suitable for projection, Figure (M. P., 9th edn., **III,** Fig. 482) — 1. 13. 0

Cl. 2347, 4057, 2354, 2355, 2353, 5806.



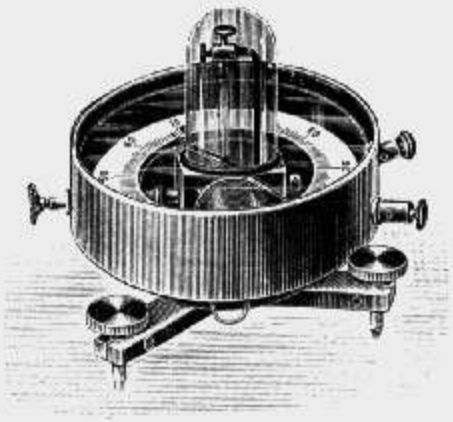
61 294. 1 : 5.



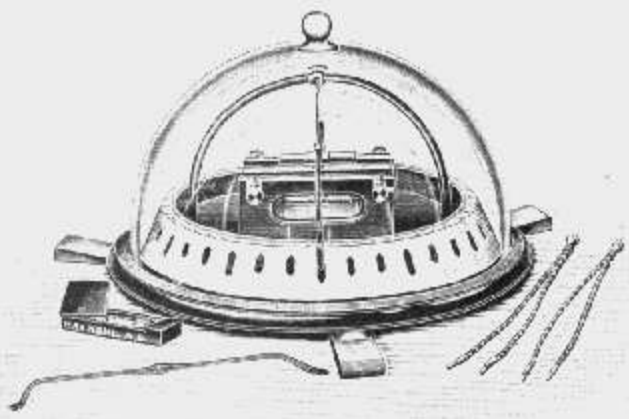
61 295. 1 : 5.



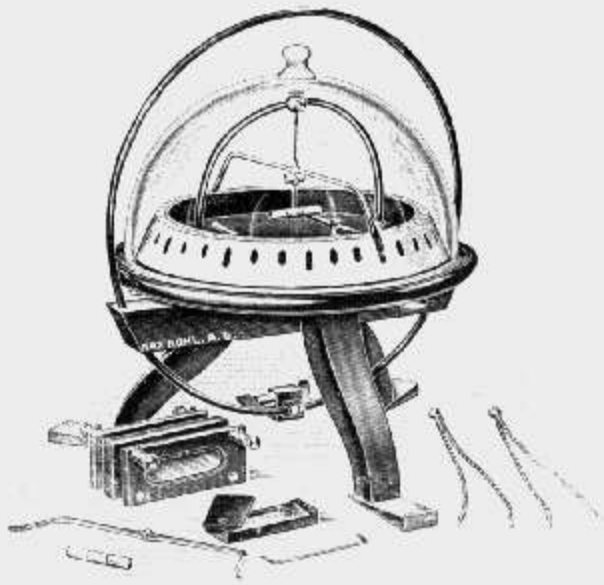
61 296. 1 : 2.



61 297. 1 : 2.



61 299. 1 : 8.



61 300 A. 1 : 8.

61,294. **Model of a Multiplier,** Figure, as suggested by Friedr. C. G. Müller (M. T., p. 256) . . . . . £ s. d. 0. 10. 0

61,295 **Simple Horizontal Galvanoscope,** Figure (M. P., 9th edn., **III**, Fig. 474) 0. 18. 0

61,296. **Horizontal Galvanoscope,** round pattern, with arrestment, Figure. 0. 15. 0

61,297. **Horizontal Galvanometer,** Figure, with bell-shaped magnet, suspended on raw silk fibre, quite aperiodic, with copper damper and pointer reading; extremely useful for resistance measurements and the like when a permanently fixed instrument is not available and without extensive preparation being necessary; with low resistance of about 50 ohms; the two halves of the winding can be used by the aid of 4 terminals either singly, in series or differentially. The instrument is provided with reliable arrestment rendering it easily portable. Sensitivity: 1° deflection = approx. 0.00002 amp. . . . 5. 10. 0

61,298. — idem, with high resistance of about 1000 ohms. Sensitivity: 1° deflection = approx. 0.000005 amp. 6. 0. 0

61,299. **School Galvanometer,** Figure, can also be used as a compass, differential galvanometer, and astatic galvanometer 3. 15. 0

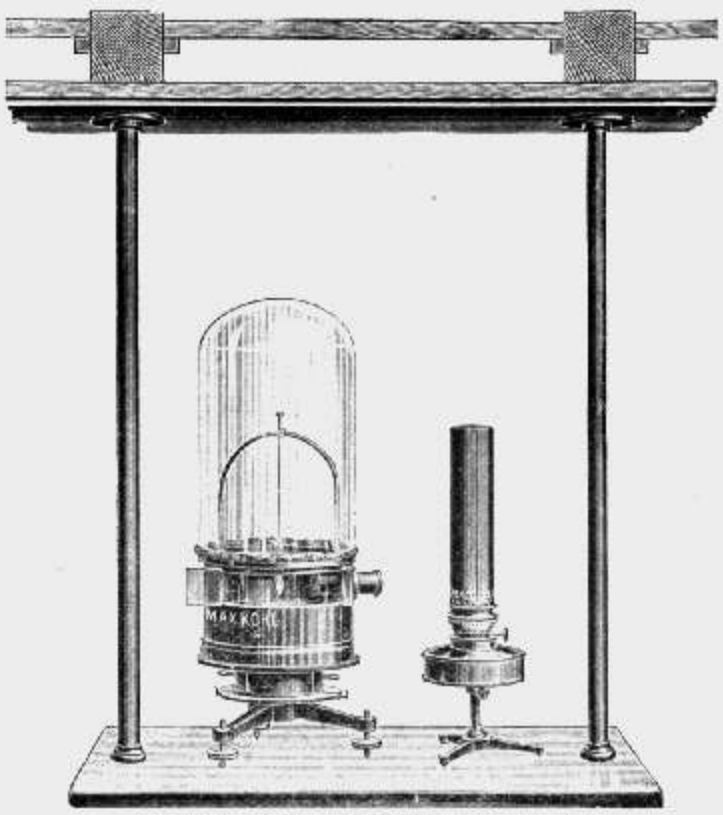
The galvanometer is constructed in such manner that it can be taken to pieces and the individual parts built up again and explained by the teacher.

If one of the two magnets which is constructed of thin walled steel tube is slipped into the lower sleeve, a compass or a magnetometer is obtained.

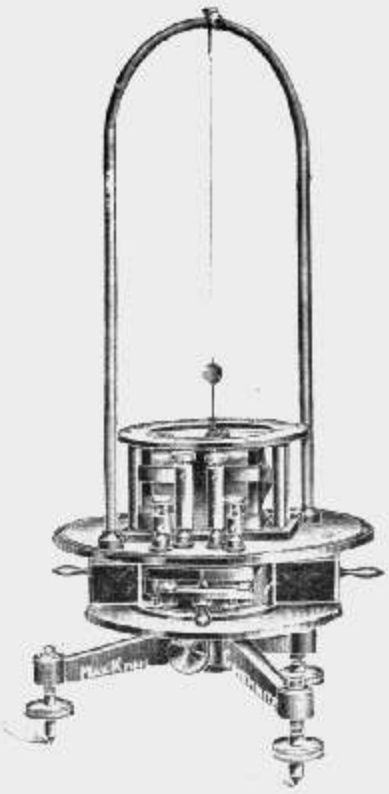
If one of the coils is placed parallel with the magnet a simple galvanometer is the result. If the other coil is added, the sensitivity can be varied by putting in parallel or series or by displacing in relation to the magnets.

Damped vibrations are obtained by placing the copper sleeve in the space between the coils.

C .3880, 5853, 2356, 2371, 5851, 5852.



61 302, 59 119 and **61 310.** 1 : 10.



61 303. 1 : 6

If the two coils are connected in opposition a differential galvanometer results. £ s. d.

If the second magnet is moved into the upper half of the suspension an astatic galvanometer is obtained.

The galvanometer has a scale divided every 10° for the scholars, a second scale, divided in single degrees, being provided for the teacher. As the pointer is arranged to rotate relatively to the magnet, its point can always be directed towards the scholars after the winding plane of the coils have been placed in the magnetic meridian.

Sensitivity with one magnet — e. g., without astaticity — with coils in series: 1 deflection = approx. 0,00004 ampere. Each coil has a resistance of about 3.5 ohms. The sensitivity is ample for all ordinary school experiments.

61,300. **Tangent Galvanometer Ring** for above, of copper, on wood tripod, the baseplate of the galvanometer fitting and rotating about the round top of this tripod, cf. Fig. 61,300 A 1. 10. 0

Set up as a tangent galvanometer the instrument is suitable for measuring currents to 15 amperes (10 amps. = approx. 60° deflection).

For accurate reading the large pointer is changed for another intended for reading the fine scale.

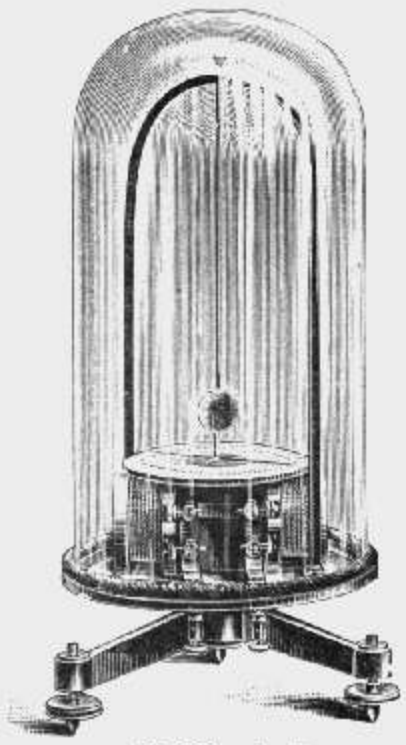
61,301. **Accessories** for carrying out magnetometrical measurements in conjunction with No. 61,299, cf. Fig. 60,127, comprising: Aluminium Case with marks for taking 20 gram brass weights for determining the moment of inertia; Graduated Slider; Bar Magnet; Table for the Galvanometer and Graduated Bar with Measuring Wire, which can be used at the same time as a Wheatstone Bridge 3. 10. 0

61,302. **Reflecting Galvanometer,** Weinhold pattern, Figure (W. D., Figs. 508, 509 [481, 482]), cf. also Fig. 61,303, for setting up permanently on wall bracket or suspended board, with one coil having two different windings. Price exclusive of suspended board and lamp 7. 10. 0

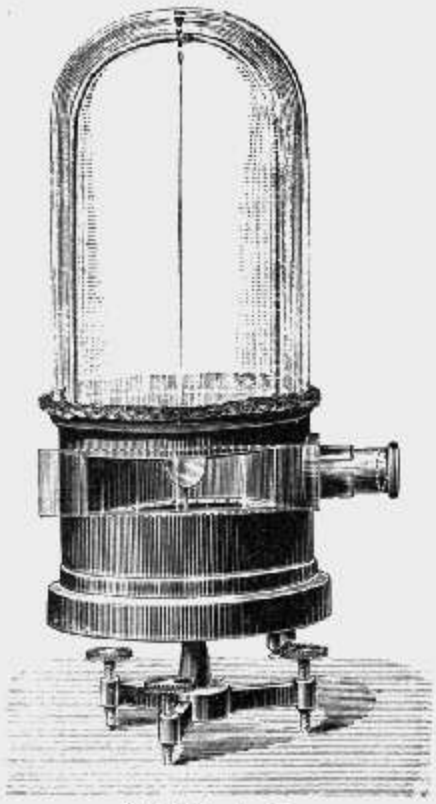
The galvanometer has a Töpler adjustable air damping arrangement, astatic needle with pointer reading, mirror for reading by lamp and scale, transmission chamber with lens and one coil, the latter being provided with one group of windings of thick wire (approx. resistance 0.5 ohm) and one group of fine wire (approx. resistance 500 ohms). The ends of both windings are carried to three terminals, the latter being connected by three wires and three terminals alongside the lecture table. If required the thick or fine winding can be used in this manner and without altering anything on the galvanometer. The precise resistance of the two windings is given on the coil. The following sensitivities are obtained with a medium period of swing (about 20 seconds for the complete period): 1 mm deflection at a distance of 1 m = approx. 1.5×10^{-8} amp. or approx. 7×10^{-7} amp.

61,303. — idem, Figure, with two coils, one with thick and one with fine winding; with change-over switch so as to enable the groups of windings to be put in series or parallel 9. 0. 0

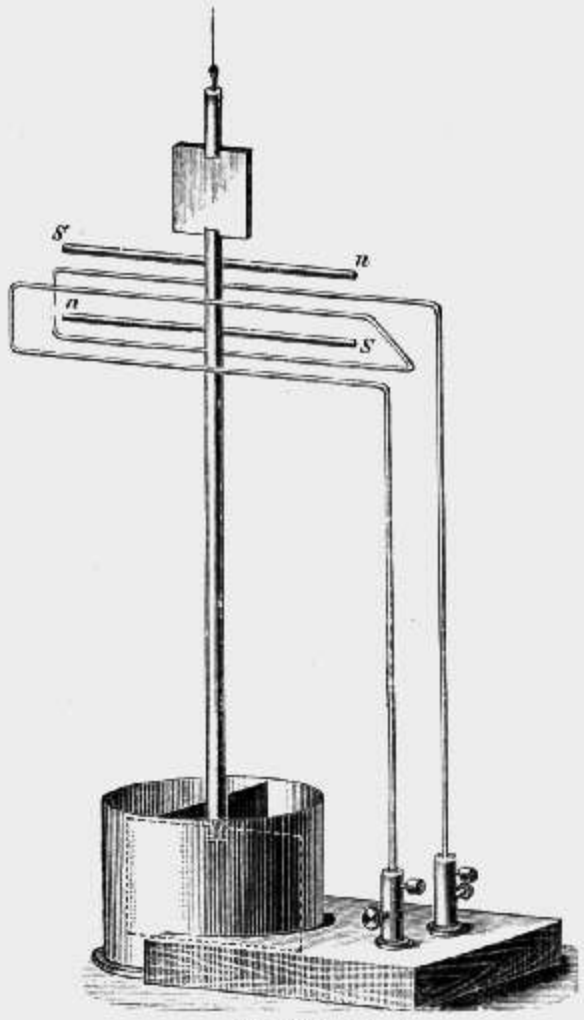
Max Kohl A. G. Chemnitz, Germany.



61304. 1 : 5.



61306. 1 : 5.



61308. 1 : 4.

	£ s. d.
61,304. **Reflecting Galvanometer,** Figure, arranged as No. 61,302, but with copper damper and bell-shaped magnet; it is therefore less sensitive than No. 61,302. With transmission chamber and one pair cylinders with two different windings	7. 10. 0
61,305. — idem, with two pairs cylinders, one with thick and one with fine winding . .	8. 15. 0
61,306. **Reflecting Galvanometer,** Figure, smaller, with detachable oil damper, pointer and mirror reading, transmission chamber and lens, with one coil having two different windings	4. 0. 0
61,307. **Reflecting Galvanometer** with two coils, one having thick and the other fine winding, otherwise exactly as No. 61,306.	5. 0. 0
61,308. **Model of a Reflecting Galvanometer,** Figure, as suggested by Weinhold, with air damping (W. D., Figs. 543 a—c [516 a—c])	1. 8. 0
Moving Coil Reflecting Galvanometers: see further on in List.	
Reflecting Galvanometers Nos. 61,302—61,307 can also be employed with Telescope Reading. It is advisable, however, to insert a polished plane mirror so as to obtain a clear image.	
61,309. **Extra Price** for a polished plane mirror	0. 8. 0

Accessories for Reflecting Galvanometers.

61,310. **Paraffin Lamp** with slotted chimney, for Reflecting Galvanometers, Figure, on stand	0. 8. 0
61,311. **Incandescent Gas Burner** for Reflecting Galvanometers, on stand and with slotted chimney, Figure	0. 12. 0
60,718. **Electric Incandescent Lamp** on stand with protecting chimney, Fig. 60,718, p. 842, for Reflecting Galvanometers	0. 18. 0
The glow lamp is of the long filament type. Voltage to be stated when ordering. If this is not quoted we supply 110 volt lamps.	
61,313. **Spare Glow Lamp** for pressures to 110 volts	0. 3. 0
61,314. — idem, for 150 or 220 volts	0. 4. 0
61,315. **Nernst Lamp** on stand and with protecting cylinder; for use only on Direct Current at 110—220 volts; giving a very bright image	1. 4. 0

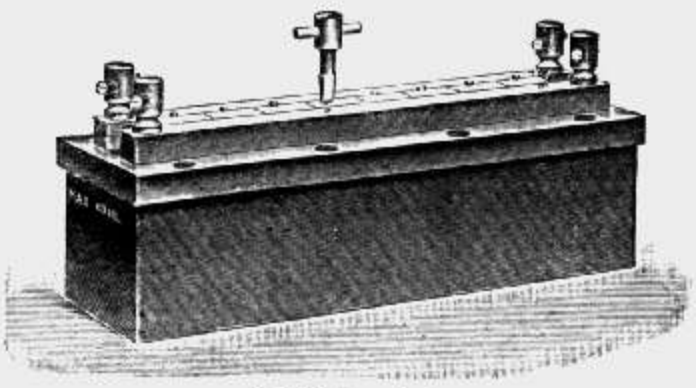
Max Kohl A. G. Chemnitz, Germany.



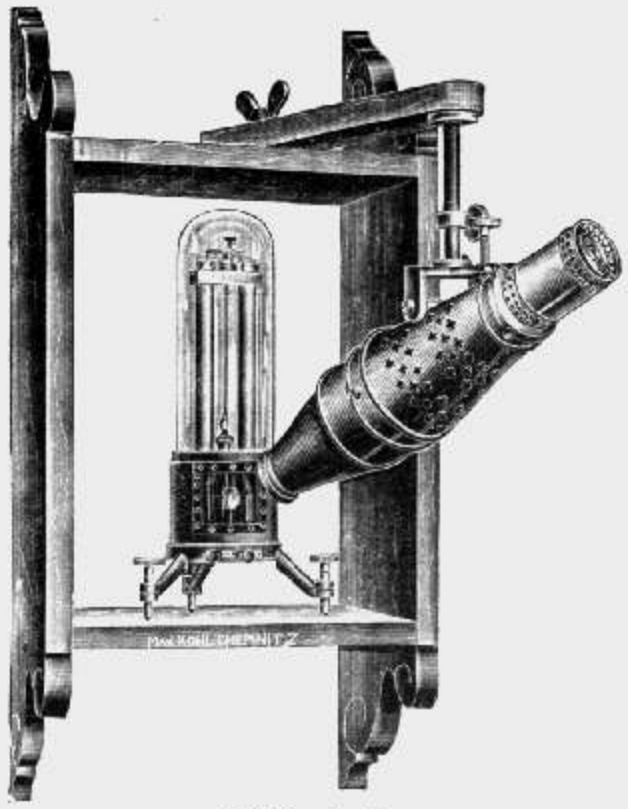
61 310. 1 : 6.



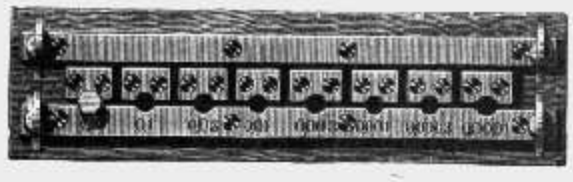
61 311. 1 : 6.



61 320 A. 1 : 3.

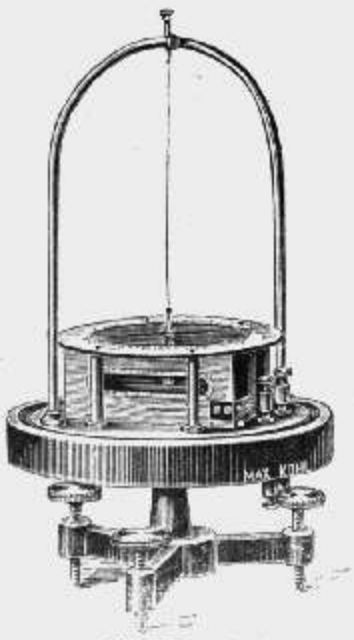


61 316. 1 : 8.

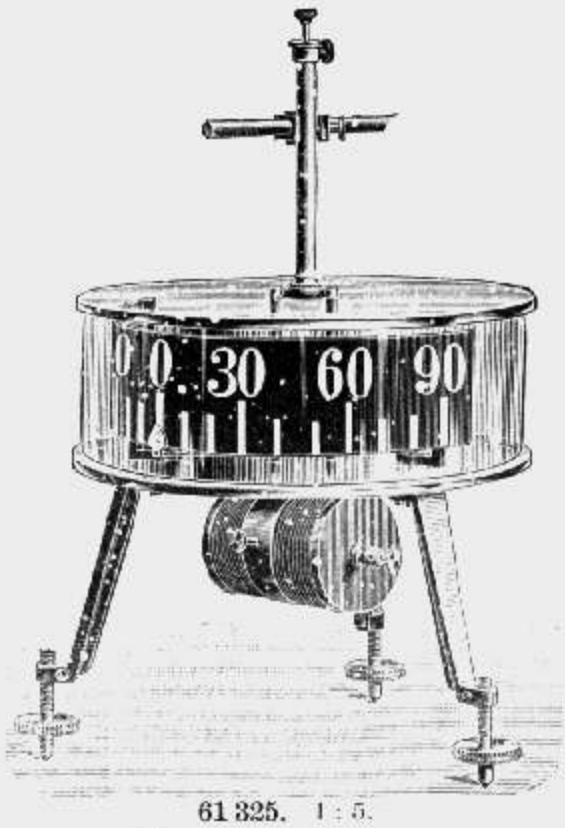


61 320 B. 1 : 3.

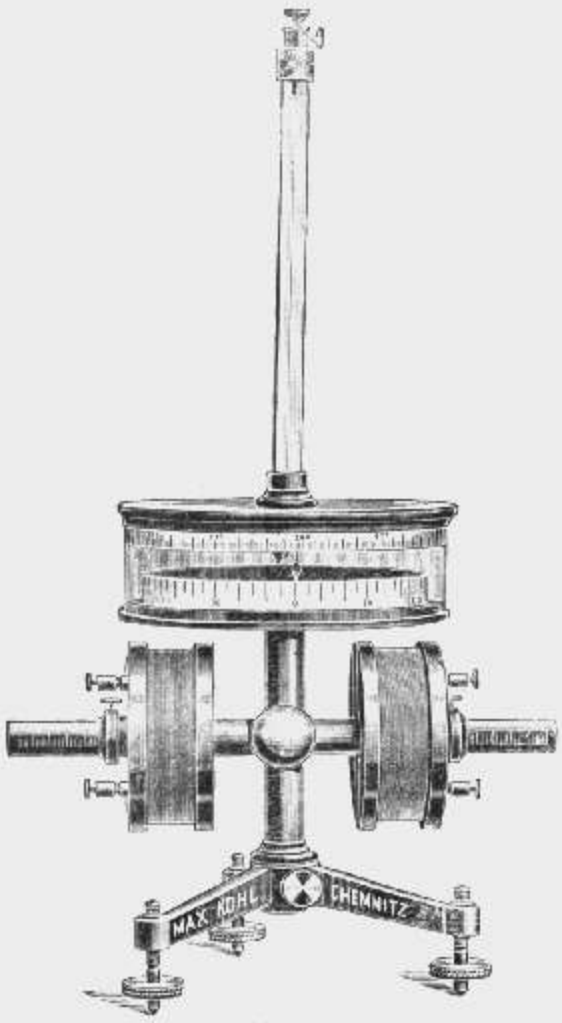
	£ s. d.
61,316. **Nernst Lamp,** Figure, with Condenser and Projection Lens, for projecting the diaphragm placed in front of the condenser on to the scale; for 110—220 volts Direct Current only, with wall bracket	5. 0.0
50,121. **Terminal Board** with 3 terminals on serpentine base, for fixing on the wall, also 7 metres triple flexible cord and 6 porcelain cylinders, for Galvanometers Nos. 61,302, 61,304, 61,306	0. 12. 0
61,317. **Terminal Board** with 2 terminals and triple flex. as No. 50,121, for Galvanometers Nos. 61,303, 61,305, 61,307	0. 10. 0
61,320. **Shunt for Reflecting Galvanometers,** Figures A and B (W. D., Figs. 510 and 511 [483 and 484]), consisting of a resistance box with resistances of $^3/_{7}{}^{th}$, $^1/_{9}{}^{th}$, $^3/_{97}{}^{ths}$, $^1/_{99}{}^{th}$, $^3/_{997}{}^{ths}$, $^1/_{999}{}^{th}$, $^3/_{9997}$, $^1/_{9999}{}^{th}$ value of the galvanometer resistance, for enabling 0.3, 0.1, 0.03, 0.01, 0.003, 0.001, 0.0003, 0.0001 of the current to be measured to be passed through the galvanometer	2. 14. 0
When ordering the resistance of the galvanometer coil for which the arrangement is intended should be given or the coil sent to us. In galvanometers having two coils the shunt is usually wound for the high resistance coil.	
61,321. — idem, smaller, for shunting 0.1, 0.01, 0.001 and 0.0001 of the current to be measured	2. 6. 0
50,118. **Bracket for Reflecting Galvanometers,** Figure 50,118, p. 21. Price without Galvanometer and Scale	0. 8. 0
It is preferable to set up the instrument on a bracket fixed to the wall if space permits rather than on a suspended board fixed to the ceiling as the vibrations of the ceiling have a disturbing action in many cases.	
50,119. **Suspended Board for Reflecting Galvanometers,** Figure 50,119, p. 22, with nickelled brass rods and polished board. Price, excluding Galvanometer	1. 10. 0
50,112. **Galvanometer Scale,** 4 m long, painted on linen, divided in decimetres, the metres figured, for fixing to the wall	0. 12. 0
50,123. — idem, 6 m long	0. 16. 0



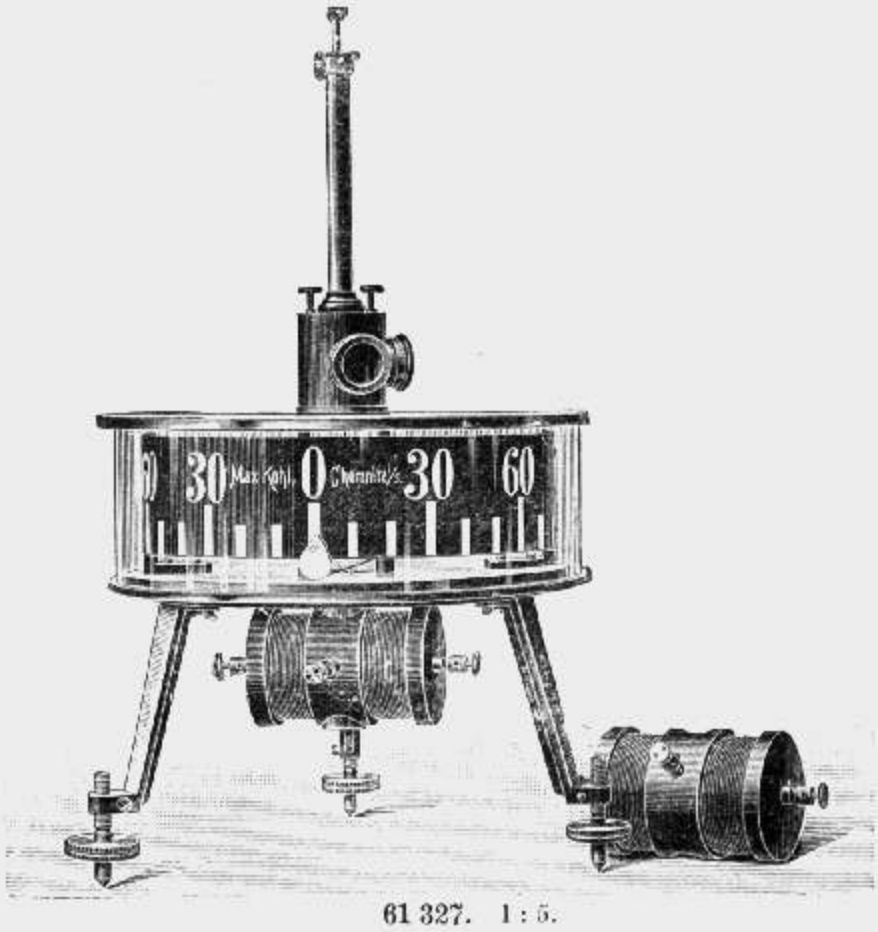
61 322. 1 : 4.



61 325. 1 : 5.



61 329. 1 : 5

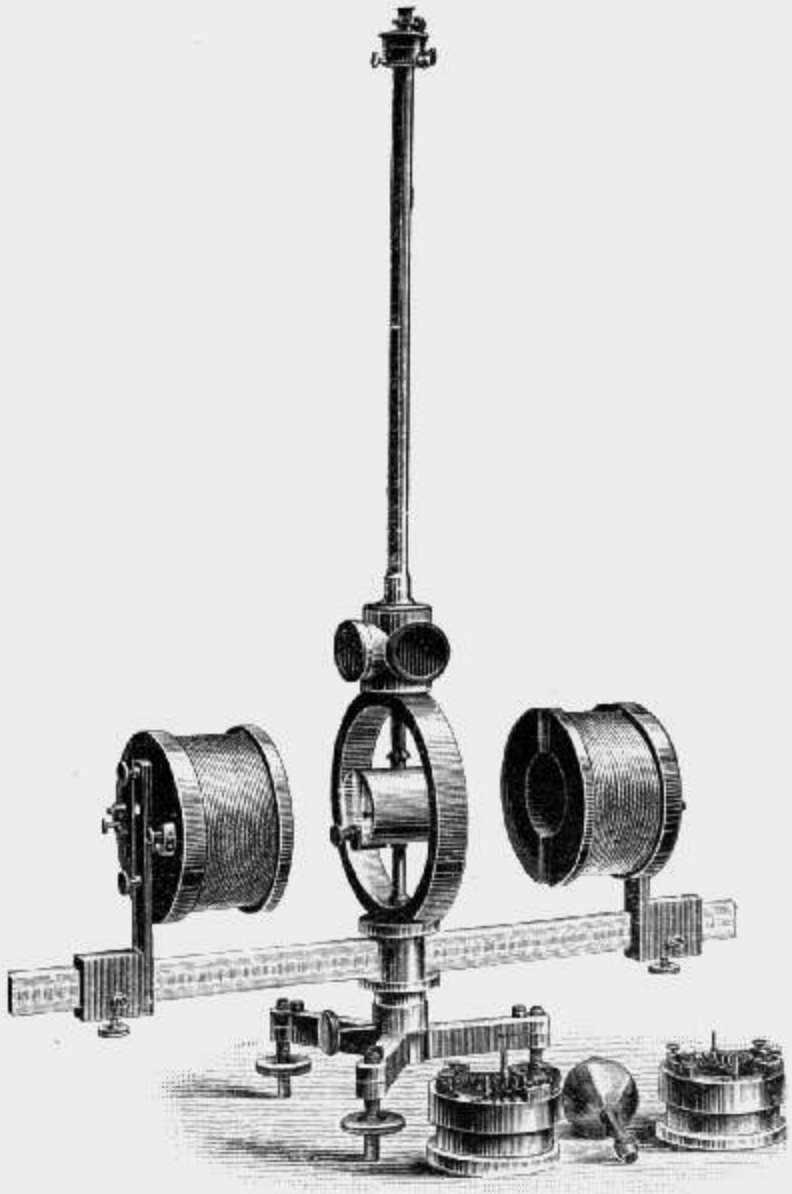


61 327. 1 : 5.

	£ s. d.
50,124. **Transparent Galvanometer Scale,** 2 m long, of ground glass, in wood frame, divided every 5 centimetres, with lugs for suspending on the ceiling, F i g u r e on p. 21. .	0. 17. 0
This scale is suspended at a distance of about 2 m from the galvanometer. With its aid it is possible to arrange the galvanometer and scale in front of the audience.	
61,322. **School Galvanometer (Nobili Multiplier),** F i g u r e, with astatic needle and detachable oil damping, with one coil having thick winding; to be used mainly for thermal currents, with pointer reading (cf. Gan.-Rein., Fig. 830)	3. 0. 0
61,323. — i d e m, with one coil having two windings of different resistance, for thermal and induction currents	3. 10. 0
61,324. — i d e m, with two interchangeable coils of different resistance, for thermal and induction currents	4. 0. 0

Cl. 2339, 2343, 2340, 2344.

Max Kohl A. G. Chemnitz. Germany.



61 331 A. 1 : 4.



61 331 B. 1 : 3.

Luminous Pointer for Galvanometry and Magnetometry after Friedr. C. G. Müller: see under No. 60,132, p. 795.

£ s. d.

61,325. **Lecture Galvanometer** after v. Beetz, Figure, with pointer reading, **with one Coil** with thick wire 6. 0. 0

61,326. — idem, **with two Coils,** one with thick and one with fine wire 7. 5. 0

This galvanometer has been essentially improved by us especially as regards ease of changing the coils. It has a bell-shaped magnet and large copper damper, vertical scale visible at a distance, with black graduations and figures on white ground, and directing magnet. The whole instrument can turn about a tripod.

61,327. **Lecture Galvanometer** after v. Beetz, Figure, with pointer and mirror reading, with polished plane mirror, and **with one Coil** with thick wire. 7.10.0

61,328. — idem, with two Coils, one with thick and one with fine wire 8.15.0

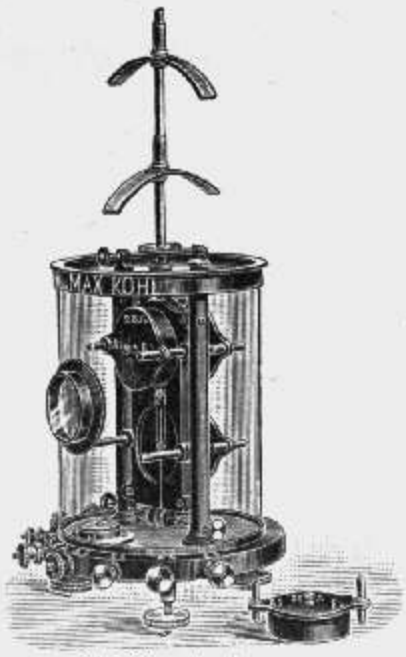
61,329. **School Galvanometer** after Noack, Figure (Ztschr. f. d. phys. u. chem. U. **5.** p. 193) 8. 0.0

The galvanometer has two adjustable coils, vertical tangent and degree graduations easily visible, bell-shaped magnet with copper damper, and can rotate on the base. It can be used both as a demonstration and differential galvanometer, as also for measurements, and can even serve as a voltmeter. Total resistance, approx. 350 ohms. The scales are capable of rotation so as to be able to turn the zero point towards the audience. For thermo-electric currents the galvanometer is supplied if desired with coils of lower resistance.

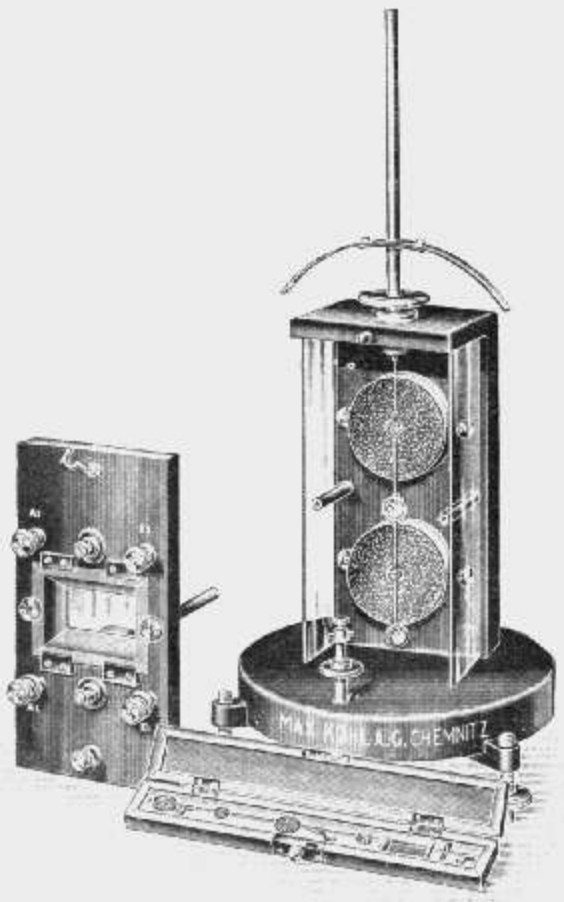
61,330. — idem, with mirror, so as to be used as a reflecting galvanometer 9.10.0

61,331. **Large Mirror Galvanometer** after Wiedemann, Figs. A and B, rotating on tripod, with graduated metal prism and adjustable coils, with bell-shaped magnet and spherical damper, and with ring magnet, with auxiliary weight and adjustable plate damper, with polished plane mirror for telescope reading or objective projection; also with improved magnet- and mirror-suspension; with one pair coils having $4 \times 500 = 2000$ turns, differentially wound; the magnets and damper pertaining thereto are each placed in one case, Fig. 61,331 B 22.10.0

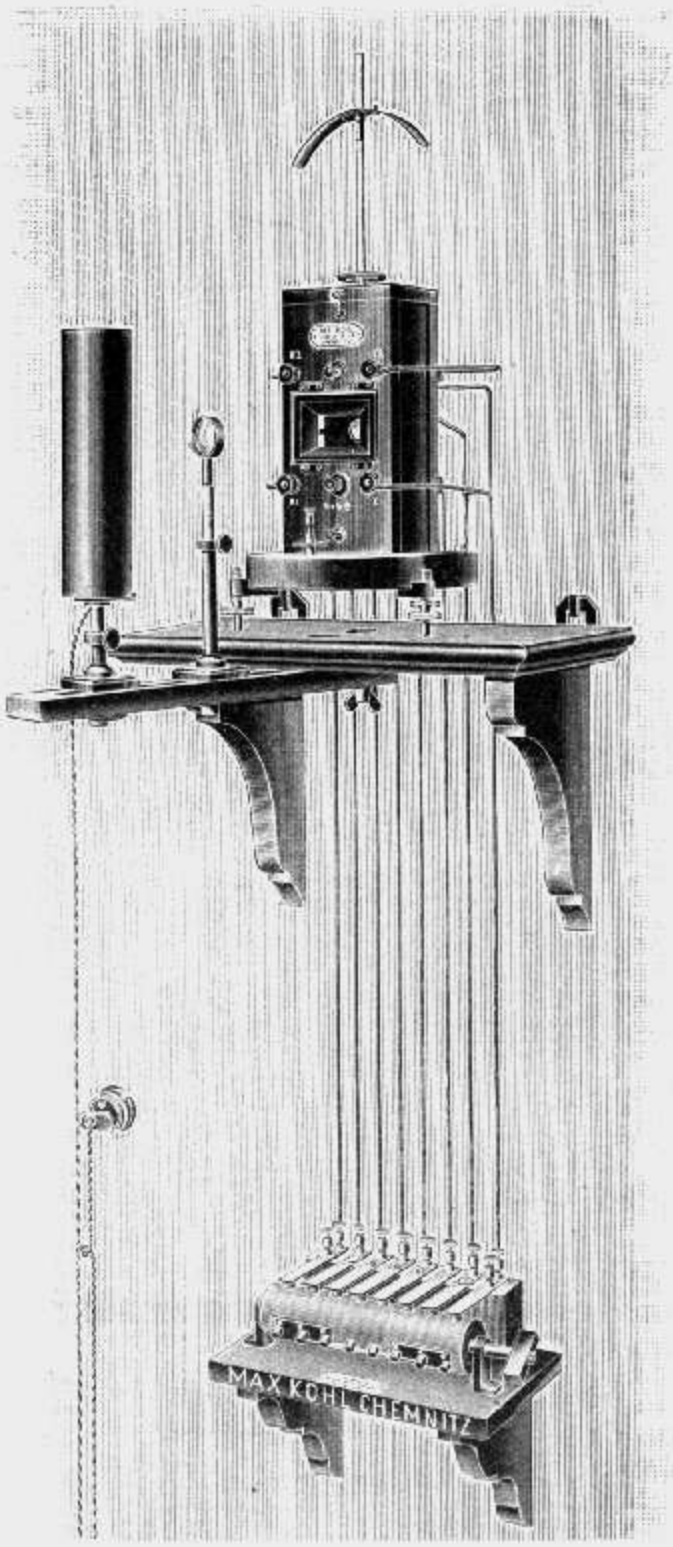
With annular magnet and auxiliary weight the galvanometer can be used as a ballistic instrument.



61 336. 1 : 7.



61 342. 1 : 6.



61 342, 61 343 and 61 346. 1 : 8.

61,332. **Large Mirror Galvanometer,** as preceding, but with bell-shaped magnet and spherical, damper. Magnet and damper in case . . . . . £ 18. 0. 0

61,333. — i d e m, but with annular magnet, weight and adjustable plate damper. Magnet and damper in case 19. 0. 0

Can be used as ballistic galvanometer.

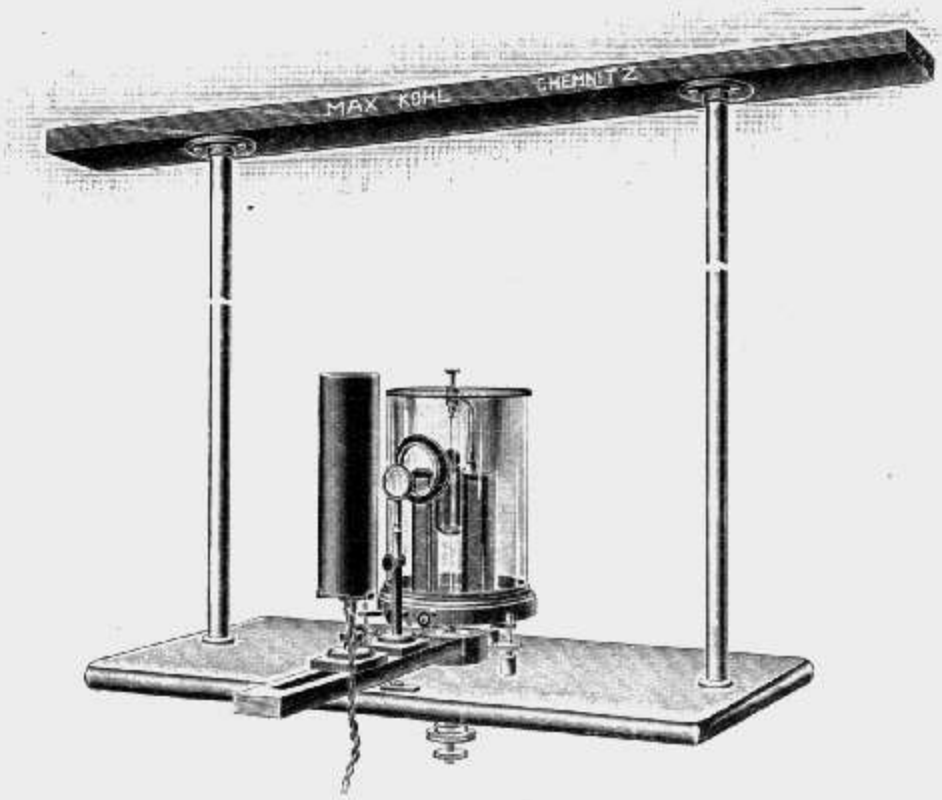
61,334. **Extra price for Screw Motion** for the Coils in Galvanometers Nos. 61,331 –61,333 . . . . . 3. 0. 0

61,335. **Pair of Coils for Wiedemann Galvanometer.**

	Thickness of Wire	Number of Turns		
For thermo-electric currents . . .	1 mm	4 × 50 = 200	differentially wound	1. 10. 0
	2 mm	2 × 250 = 500		2. 12. 0
For Ordinary Galvanic Work . .	0.5 mm	4 × 500 = 2000	differentially wound	1. 10. 0
For Physiological purposes, for Muscle and Nerve Currents . .	0.2—0.4 mm	4 × 1500 = 6000	„ „	2. 12. 0
		4 × 3000 = 12000	„ „	2. 18. 0
		4 × 5000 = 20000	„ „	3. 10. 0
		4 × 8000 = 32000	„ „	5. 10. 0

Cl. 2368, 5858, 3521.

Max Kohl A. G. Chemnitz, Germany.



50 119, 61 345, 61 389. 1 : 9.

61,336. **Astatic 4-Coil Mirror Galvanometer** after Du Bois and Rubens, Figure, with 4 coils each of 20 ohms; one massive magnet system with rotary mirror, about 1 gramme in weight, 1 medium-heavy magnet system 0.25 g weight (Electrot. Ztschr., **1894**, p. 321; cf. Gan.-Man., Fig. 761; Gan.-Rein., Fig. 832) . . . . . £ 22. 10. 0

The following should be ordered separate for above:

61,337. **Protecting Case** 1. 0. 0

61,338. **1 Light Magnet System,** approx. weight 0,1 g 1. 10. 0

61,339. **4 Coils** of each 2000 ohms 5. 0. 0

61,340. **4 Metres Quartz Fibres** in wood case 0. 8. 0

61,341. **1 Shunt Resistance,** $^1/_9$, $^1/_{99}$, $^1/_{999}$ of the galvanometer resistance 5. 0. 0

The preceding instrument is of extraordinarily high sensitivity.

61,342. **Mirror Galvanometer** after Thomson-Szymanski, Figure, with astatic magnet-system and directing magnet, with wire connecting blocks for putting the coils in parallel, in two groups and in series (cf. also Gan.-Man., Fig. 761; Gan.-Rein., Fig. 832) . . 6. 0. 0

The four coils have a resistance of 4 ohms each. By removing the front wall the galvanometer can be opened and therefore easily and quickly adjusted. The instrument is highly sensitive and is very suitable for experiments with thermo-electric currents, for telephone currents, and for demonstrating the currents on cutting the lines of force. The case is of mahogany.

61,343. **Wall Bracket** for above with lens and Glow Lamp for **110—220 volts,** Figure, for enabling the instrument to be used as a **reflecting galvanometer** 2. 5. 0

The voltage should be quoted in ordering; if not stated we supply a 110 volt lamp.

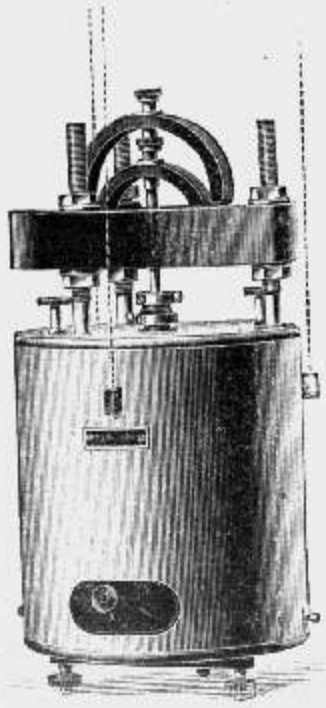
61,344. **Extra Price** for a Nernst Lamp, which gives a bright luminous pointer. For D. C. 110—220 volts only 0. 8. 0

61,345. **Fixing Device** for suspended board No. 50,119, Figure, also rotary arm with lens and scale-lamp. Price without suspended board 2. 0. 0

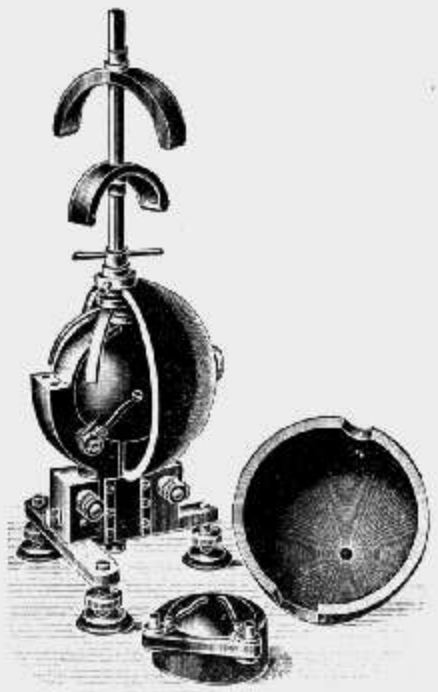
By means of this device the galvanometer is firmly fixed on the suspended board, but in such manner that it can be easily set up by adjusting the three levelling screws.

The illustration shows a suspended board No. 50,119 with a Deprez-d'Arsonval Galvanometer No. 61,389 with mirror reading used as a Reflecting Galvanometer; illumination by a single filament electric lamp and with the above fixing device and rotary arm for the lamp. The device can, however, also be used with Galvanometer No. 61,342 and similar ones. As regards voltage etc. the same remark applies as in No. 61,343.

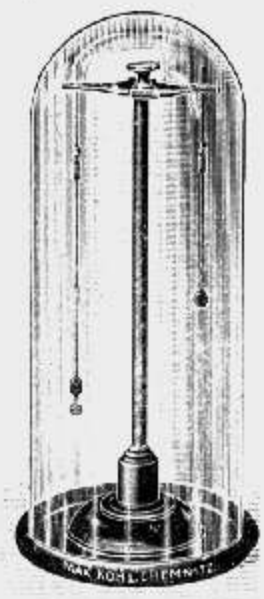
61,346. **Multiple Commutator** for placing alongside the Lecture Table, for enabling the coils of Galvanometer No. 61,342 to be put in parallel, series, and in two groups, Figure, without connecting leads 3. 0. 0



61347A. 1 : 5.



61347B. 1 : 5.



61354. 1 : 5.

61,347. **Iron-Clad-Galvanometer** after Du Bois-Rubens, Figures A and B (Ztschr. f. Instrumentenkunde, 1900, p. 65), with a light and a heavy magnet suspension with plane mirror, two pairs interchangeable internal directing magnets, one pair external directing magnets and two coils of 2000 ohms each in cast steel sheath, with spherical sheath as a second magnetic shield and cast steel cylinder as third magnetic shield . . . . . £ s. d. 37. 10. 0

Fig. 61,347 A shows the outside appearance in conjunction with an anti-vibration suspension No. 61,357; Fig. 61,347 B illustrating the instrument with the second and third shield removed.

This type of galvanometer is constructed in view of the disturbing magnetic influences of electric tramways; the steel envelopes have a strong protecting action against these influences. Each suspension is supplied packed in a small box with a plane mirror.

61,348. **Iron-Clad Galvanometer** after Du Bois-Rubens, as No. 61,347, but with eight terminals and one pair of coils **with differential winding** each of 2 × 1000 ohms in cast steel envelope 11. 5. 0

Accessories and Spares for Nos. 61,347 and 61,348:

61,349. **2 Coils** each of 5 ohms in cast steel sheath 6. 10. 0
61,350. **2 Coils** each of 100 ohms in cast steel sheath 6. 10. 0
61,351. **2 Coils** with differential winding each of 2 × 20 ohms, in cast steel sheath 7. 15. 0
61,352. **1 Light Magnet Suspension** including Mirror, 35 mg 1. 5. 0
61,353. **1 Heavy Magnet Suspension** including Mirror, 165 mg 1. 13. 0
61,354. **Metal Stand,** with glass bell, Figure, for suspending the magnet stirrups 0. 18. 0
61,355. **1 Small Box with 10 Quartz Fibres** on mirror base 0. 5. 0

Shunt of Copper Wire for the coil resistance of 2 × 2000 ohms:

61,356. $^1/_{9}$, $^1/_{99}$, $^1/_{999}$ 6. 0. 0
61,356 a. $^1/_{9}$, $^1/_{99}$, $^1/_{999}$, $^1/_{9999}$ 7. 15. 0
61,356 b. $^1/_{9}$, $^1/_{49}$, $^1/_{99}$, $^1/_{499}$, $^1/_{999}$, $^1/_{4999}$, $^1/_{9999}$ 10. 10. 0

61,357. **Arrangement for the anti-vibration suspension of the Du Bois-Rubens Iron-Clad Galvanometer,** as suggested by Hagen 6. 0. 0

The device, like that of the Julius method, is fitted directly on the cast steel cylinder; when ordering, the iron-clad Galvanometer should be sent us or the instrument should be ordered together with the device.

Moving Coil Galvanometers.

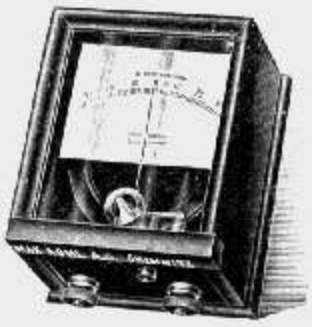
The generally recognised advantages of the Deprez-d'Arsonval Galvanometers with fixed magnet and moving coil are: independence of external magnetic influences; good damping and insensitivity to rough treatment render the instruments specially suitable for educational and practical purposes. We are therefore including in the following pages an extensive selection of these instruments.

61,358. **Portable Moving Coil Needle Galvanometer,** with band suspension for the coil, Figure, suitable for zero methods (Wheatstone Bridge and the like) and for students' exercises, approx. resistance 150 ohms; 1 degree deflection = approx. 1×10^{-6} amps. 2. 10. 0

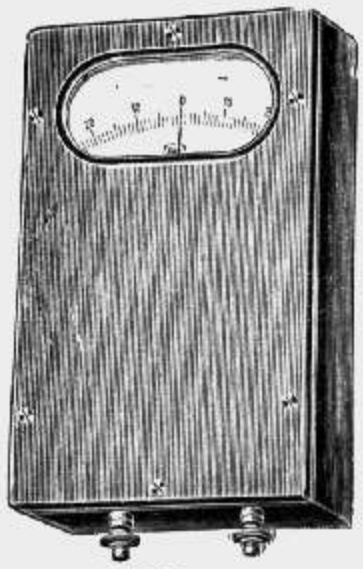
61,359. — idem, arranged for hanging on the wall 3. 15. 0

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



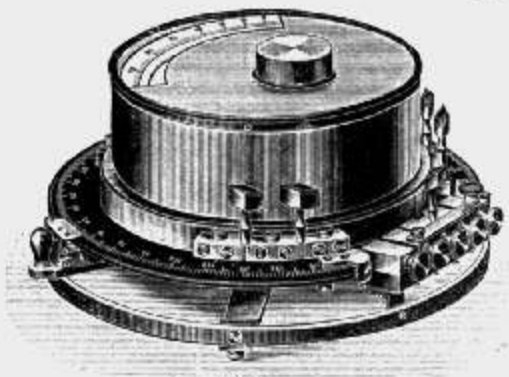
61 358. 1 : 4.



61 360. 1 : 3.



61 361. 1 : 4.



61 362 A. 1 : 5.



61 362 B. 1 : 5.

61,360. **Portable Moving Coil Needle Galvanometer.** Figure; approx. resistance 150 ohms; 1 degree deflection = approx. 0.000 006 amp. . . . . £ s. d. 3. 0. 0

61,361. **Portable Moving Coil Needle Galvanometer** after Weston, Figure, of very high sensitivity, completely replacing a mirror galvanometer for technical resistance-measurements and other zero methods; approx. resistance 300 ohms; 1 degree deflection — approx. 5×10^{-7} amp. The coil rests on pivots and the instrument does not therefore require any special setting up 8. 5. 0

61,362. **Precision Moving Coil Universal Galvanometer,** Figures A and B, for the direct measurement of currents to 0.15 ampere, voltages to 150 volts, e. m. f.'s, battery and wire resistances from 0.03 to about 30,000 ohms, and for determining errors in leads: comprising a precision Millivolt- and Ampere-Meter of 1 ohm resistance and a spherically stretched measuring wire the graduations of which permit of the resistances being read direct. By using a 110 volt battery insulation resistances to approx. 1,000,000 ohms can be measured. For measuring currents above 0.15 ampere the undermentioned shunts are used. A carrying case is included in the price; there is room for 4 shunts in the case 21. 15. 0

The scheme of connections together with explanatory signs **in German** (or if desired, **in French or Russian**) are etched into the cover plate of the instrument.

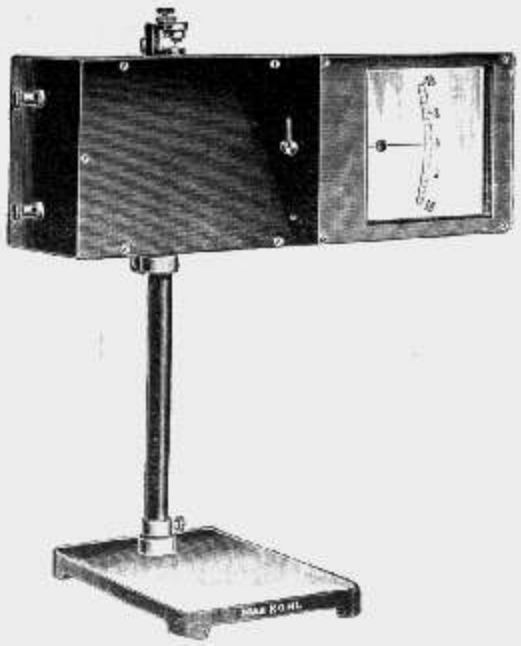
Accessories for No. 61,362:

Manganin Shunts for placing on the instrument:

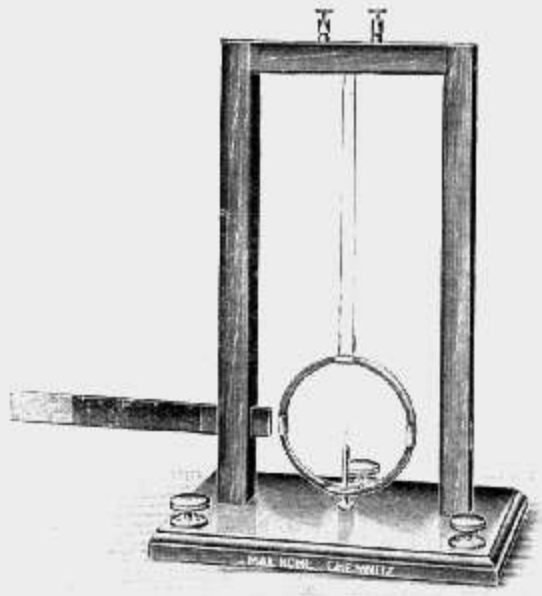
61,363.	For Currents to 0.75 Ampere	0. 15. 0
61,364.	„ „ „ 1.5 „	0. 15. 0
61,365.	„ „ „ 3 „	0. 15. 0
61,366.	„ „ „ 7.5 „	0. 19. 0
61,367.	„ „ „ 15 „	0. 19. 0
61,368.	„ „ „ 30 „	1. 1. 0

Manganin Shunts including leads for connecting to the instrument:

61,369.	For Currents to 75 Amperes } with leads 0.2 mm long	2. 4. 0
61,370.	„ „ „ 150 „ } with leads 0.2 mm long	2. 6. 0
61,371.	„ „ „ 300 „ } with leads 0.75 m long	5. 5. 0
61,372.	„ „ „ 750 „ } with leads 0.75 m long	7. 0. 0
61,373.	„ „ „ 1500 „ } with leads 0.75 m long	9. 0. 0
61,374.	„ „ „ 3000 „ with leads 2 m long	21. 10. 0



61384. 1 : 5.



61385. 1 : 8.

	£ s. d.
Manganin Series Resistances:	
61,375. With 1 section for 300 volts	2. 10. 0
61,376. „ 2 sections for 300, 450 volts	3 15. 0
61,377 „ 2 „ for 300, 750 volts	6. 0. 0
61,378. „ 3 „ „ 300, 750, 1500 volts	10. 0. 0
61,379. **Shunt Plug,** $^1/_9$ ohm, for converting the comparing resistance from 1 ohm to 0.1 ohm	0. 15. 0
61,380. **Resistance Plug, 300 ohms:** for putting in circuit as a safety resistance in the measurement of battery resistances	0. 15. 0
61,381. **Battery Box** with 72 Dry Cells, in 6 compartments with 4 cells each and 4 compartments with 2 cells each, with terminals for each compartment	7. 10. 0
61,382. **Induction Coil** for generating A. C. for measuring **electrolytic** resistances (Kohlrausch' method), for connecting up to from 1 to 2 dry cells	1. 15. 0
61,383. **Telephone** for use in measurements with preceding Induction Coil	0. 8. 0
61,384. **Projection Moving Coil Galvanometer,** Figure, on adjustable stand	4. 0. 0

The galvanometer proper is completely enclosed in a mahogany box and the long horizontal needle plays between two glass plates one of which is provided with a projection scale.

This very sensitive instrument is intended to be used with the projection lantern and is put in circuit by pressing a button on the top of the apparatus.

Needle Galvanometers with moving Coil: see below, under the Technical Measuring Instruments.

61,385. **Model of a Moving Coil Galvanometer with Bifilar Suspension,** Figure, after Friedr. C. G. Müller (M. T., Fig. 185)	1. 16. 0
61,386. **Model of a Moving Coil Galvanometer** after Kolbe, Figure (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 111), very compact instrument with scale visible at a distance; can also be used for zero methods	3. 5. 0
61,387. — idem, larger and more sensitive	5. 0. 0
61,388. **Galvanometer** after Deprez-d'Arsonval, Figure, **with mirror and needle reading,** on ebonite base-plate with glass bell (W. und E. phys. Prakt., Fig. 279; Gan.-Man., Fig. 762; Gan.-Rein., Fig. 897), with polished plane mirror	8. 0. 0
61,389. — idem, for mirror reading only, without needle	7. 10. 0
61,390. **Galvanometer** after Deprez-d'Arsonval, **with mirror reading,** on tripod stand, Figure (W. u. E. phys. Prakt., Fig. 280), with polished plane mirror	7. 15. 0

The following are given in: 1 steadying resistance, 1 pair vibrating weights for ballistic purposes and 2 damping suspension frames. Sensitivity at 1 m scale-distance: 1 mm deflection with approx. 1×10^{-8} amp.; resistance of coil, approx. 250 ohms. The time of swing without weights is about 6 seconds, with weights about 15 seconds.

61,391. **Moving Coil Mirror Galvanometer** after E. Wiedemann, Figure, with 3 different interchangeable coils; a very neat instrument and highly sensitive	7. 5. 0

Coil I has a resistance of approx. 100 ohms, Coil II of approx. 20 ohms; Coil III is formed of 3.5 turns of 1 mm thick wire.

The instrument is covered off on both sides by plate glass which can be raised up for the insertion of rubber coils.

The sensitivity is, when Coil I is used: 1 mm deflection at 1 m scale-distance = approx. 3×10^{-9} amp.; with Coil II approx. 1×10^{-8} amp. The duration of the full period of swing is about 15—20 seconds.

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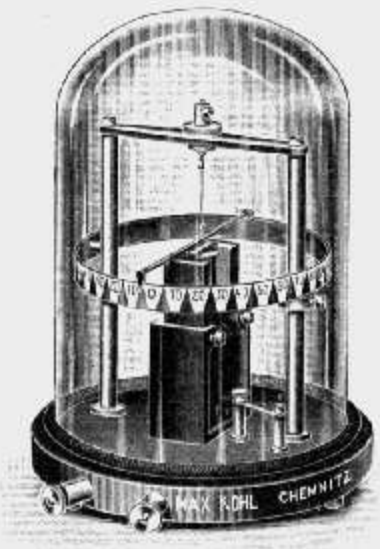
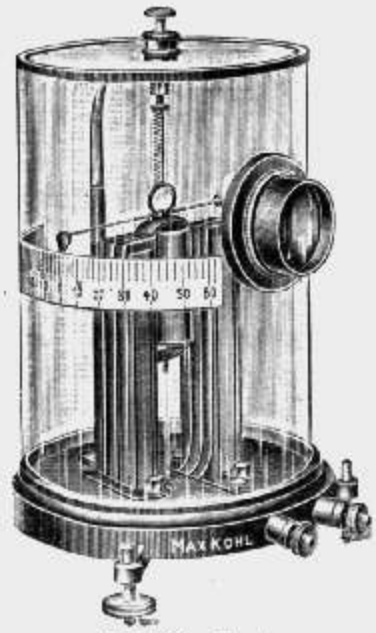
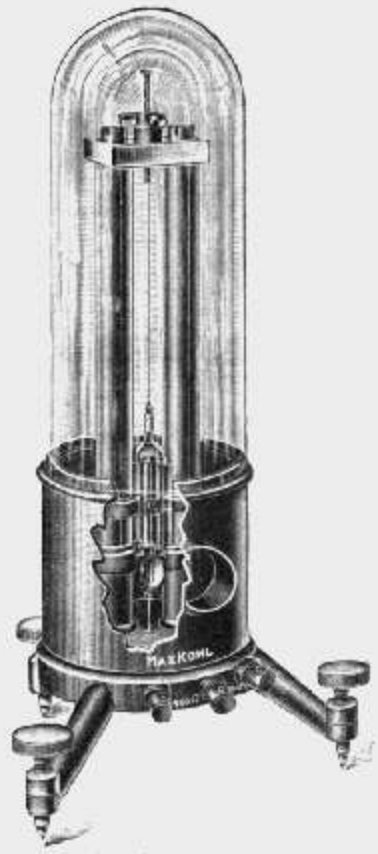


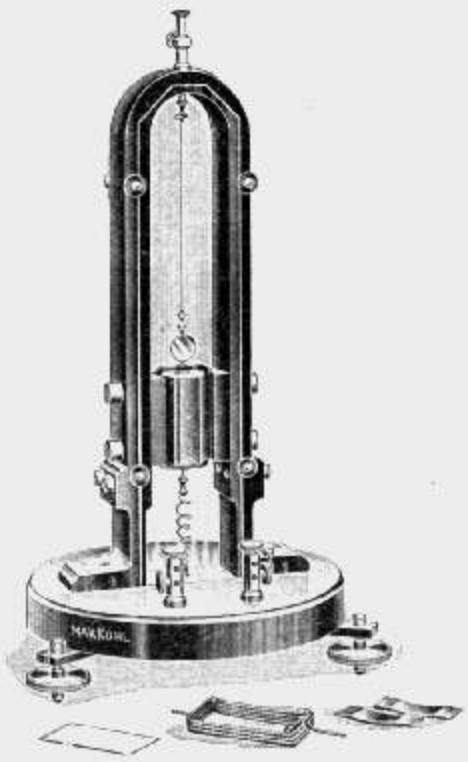
61 386. 1 : 6.



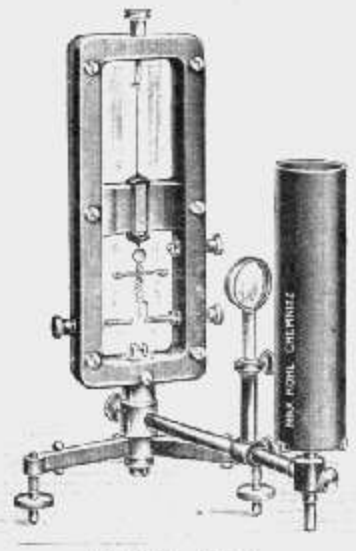
61 388. 1 : 4.



61 390. 1 : 5.



61 391. 1 : 5



61 392. 1 : 6

For using Nos. 61,388—61,391 as a Reflecting Galvanometer the Accessories listed in connection with No. 61,342 are employed. £ s. d.

61,392. **Reflecting Moving Coil Galvanometer,** Figure (German design), with rotary arm for lens and glow lamp (Ztschr. f. d. phys. u. chem. U. **22**, p. 138). Price with single filament glow lamp of 110—220 volts pressure 8. 5. 0

This galvanometer has been specially designed by us for lecture purposes and has the following advantages: (1) **simplicity** and complete comprehensiveness of the construction. (2) **High sensitivity** with light treatment. (3) **Two groups of turns of different resistance** on the same moving coil; the galvanometer can consequently be used for all purposes with advantage without the coils first having to be changed, and the damping can be easily regulated. (4) **The period of swing can be easily increased for ballistic purposes.** (5) The instrument can be conveniently set up and adjusted as a Reflecting Galvanometer.

The galvanometer has one group of turns of approx. 100 ohms (1 mm deflection at 1 m distance = approx. 1×10^{-8} amp.) and a second group of turns of approx. 10 ohms (1 mm deflection at 1 m distance = approx. 3×10^{-8} amp.). The duration of the complete period of swing is 10 seconds without weights and about 18 seconds with weights.

Complete description sent on application.

61,393. — idem, **with Nernst Lamp** (can only be supplied for 110—220 volt D. C.) . . 8. 10. 0

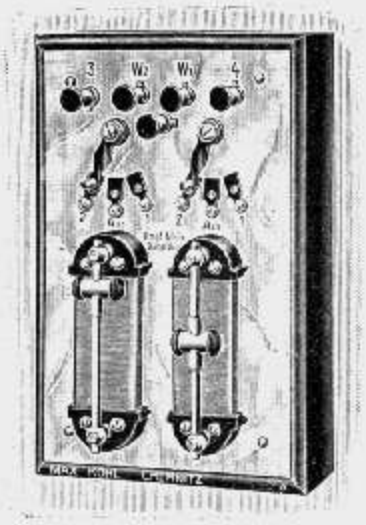
Unless otherwise stated, Lamp is supplied for 110 volts.

Accessories: see Nos. 61,313, 61,314, 50,121, 50,119, 50,122, 50,123, 50,124, on p. 879.

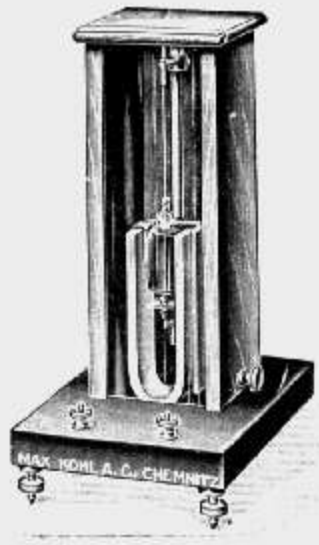
Cl. 5107, 2375, 2376, 2378, 5224.



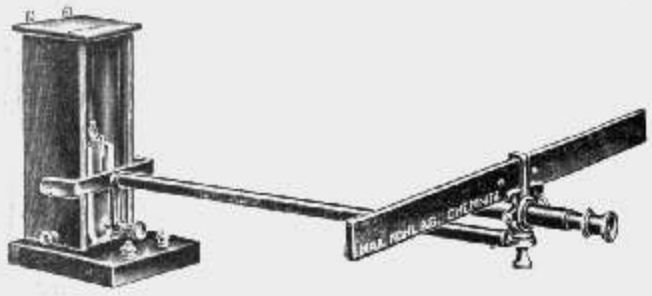
61 394. 1 : 6.



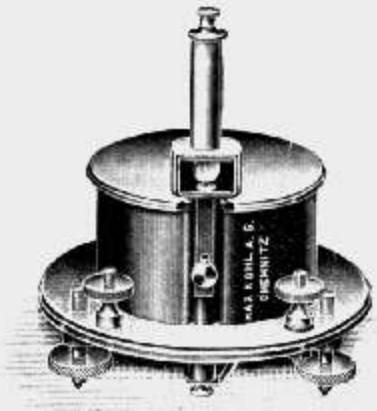
61 395. 1 : 6.



61 396. 1 : 6.



61 397. 1 : 10.



61 398. 1 : 4.

61,394. **Universal Shunt** connected up by Ayrton's method, for No. 61,392, Figure, also suitable for other Galvanometers of 100 ohms max. resistance; total resistance 10,000 ohms with stages of 1, $^1/_{10}$, $^1/_{100}$, $^1/_{1000}$, $^1/_{10000}$. The ratio of damping therefore remains approximately constant . . . . . £ 3. 0. 0

61,395. **Connecting Switchboard** for No. 61,392, Figure, for regulating the sensitivity and damping 3. 4. 0

The variation of sensitivity cannot, of course, be measured in this instance, but can easily be manipulated so that the device is very practical especially for zero methods.

61,396. **Simple Moving Coil Mirror Galvanometer,** for school use, Figure; approx. resistance of coil, 20 ohms 1. 10. 0

61,397. — idem, **with Reading Telescope,** Figure, for firmly fixing, preferably to a wall between two windows 3. 0. 0

61,398. **Moving Coil Mirror Galvanometer** after Ayrton-Mather, Figure 5. 0. 0

As a rule the resistance of the coil is about 325 ohms. If desired we can supply, in place of this, coils with other resistances, e. g., about 14, 95, 1000 ohms or any other values. Coils of 325—1000 ohms are charged **£ 0. 10. 0** extra. In ordering it should be stated whether the coils are to be used aperiodically or ballistically. The coils together with suspension can be interchanged forthwith, cf. Fig. 61,399. The time of swing of the ballistic coils is about 3 seconds. The chief advantage of these Galvanometers is their simple, massive construction and ease of manipulation. The sensitivity at 325 ohms is: 1 mm at 1 m distance = approx. 2×10^{-8} amp.

Interchangeable Coil together with Tube Suspension, Figure, for preceding Galvanometer, aperiodic or ballistic construction.

List No.	**61,399**	**61,400**	**61,401**	**61,402**
Approx. Resistance	14	95	325	1000 ohms
£	**2. 0. 0**	**2. 0. 0**	**2. 0. 0**	**2. 10. 0**

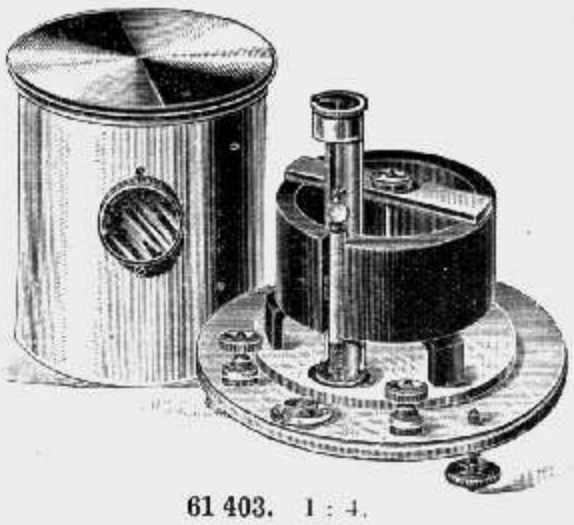
61,403. **Moving Coil Mirror Galvanometer** after Ayrton-Mather, specially constructed **for school use,** Figure 6. 0. 0

This galvanometer is arranged so that the outer covering can be removed for showing the internal construction. As regards resistance of the coils, sensitivity and prices of spare coils, the same remarks applies as in No. 61,398—61,402.

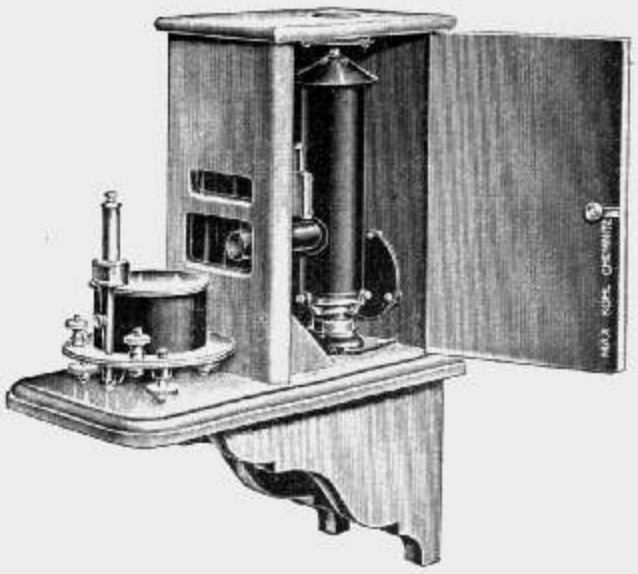
Cl. 5716, 5342, 5517, 5508, 5384.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



61 403. 1 : 4.

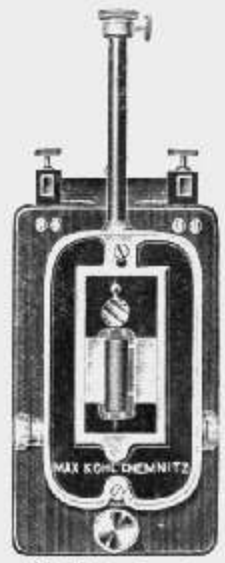


61 405. 1 : 8.



61 399. 1 : 4.

61 406. 1 : 5.



61 407. 1 : 6.

61,404. **Mirror Galvanometer** after Ayrton-Mather Type **No. 61,398,** with three interchangeable coils, 1 aperiodic coil of 30 ohms; one 325 ohm coil, aperiodic; one 1000 ohm coil, ballistic; in mahogany carrying case . . . . . £ 9. 0. 0

The Ayrton-Mather Type Galvanometers are, unless otherwise stated, arranged for objective reading and 2 metres scale distance, which permits of reading by a telescope at about 3.5 m distance. They can also if necessary be provided with a plane mirror for telescope reading at any distance.

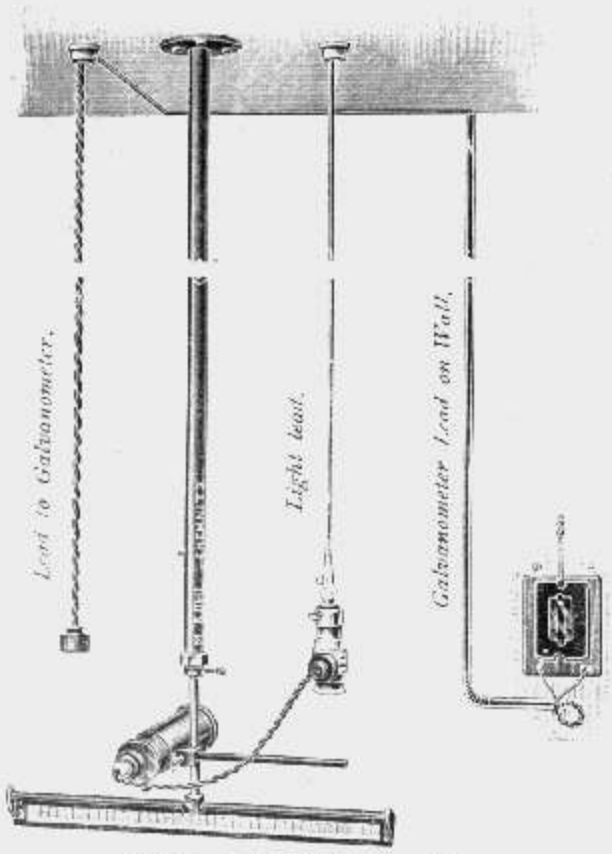
61,405. **Galvanometer** after Ayrton-Mather Type No. 61,398, with arrangement for reading by lamp and scale for zero methods, F i g u r e, for fixing to the wall. In spite of the small scale distance and small amount of space necessary, the sensitivity is increased by interpolating a cylindrical mirror . . . . . £ 8. 0. 0

Unless otherwise stated, the single filament glow lamp pertaining to the instrument is supplied for 110 volts.

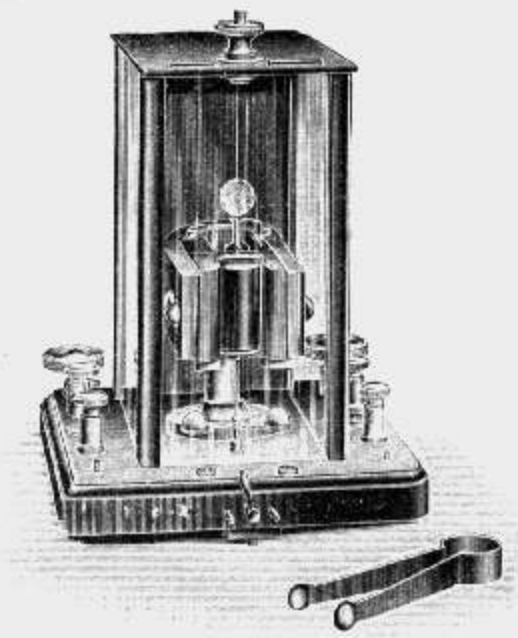
61,406. **Laboratory Galvanometer** after Ayrton, with moving coil, F i g u r e, for fixing to wall. The instrument is always ready for use and takes up but little room. With 600 ohms resistance 1^0 deflection = approx. 3×10^{-8} amp. . . . . £ 9. 0. 0

61,407. **Moving Coil Mirror Galvanometer** for fixing to wall, F i g u r e, very simple and practical type; sensitivity: 1 mm at 1 m scale distance and 300 ohms resistance = approx. 6×10^{-9} amp. . . . . £ 5. 0. 0

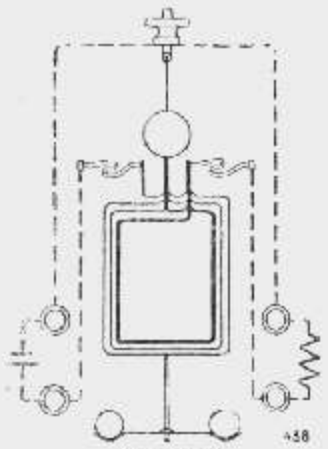
Cl. 2383, 5385, 5329, 2384, 5078.



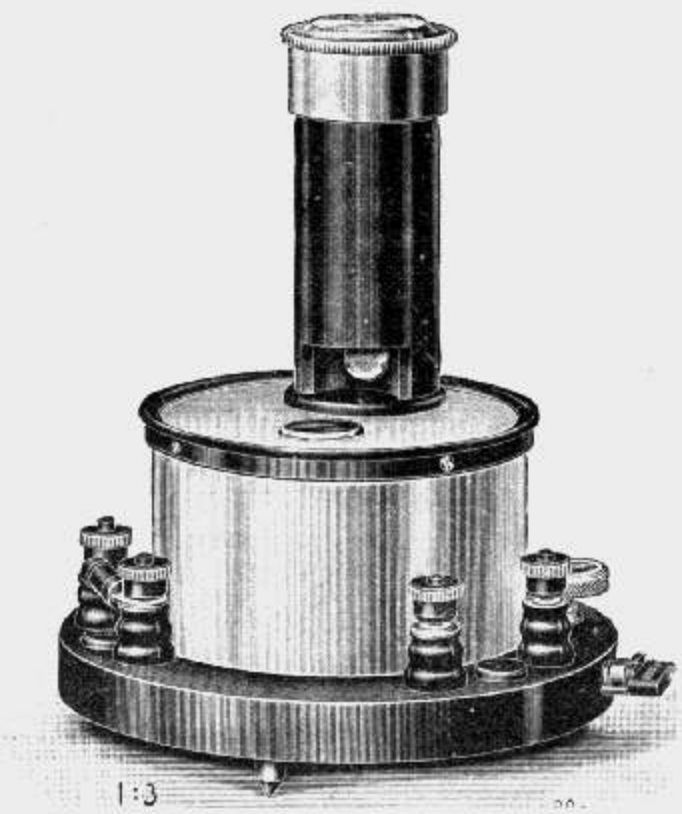
61 407 and 61 409. 1 : 12.



61 411. 1 : 5.



61 412 A.



61 412. 1 : 3.

61,408. **Simple Reading Telescope for preceding,** for fixing direct on galvanometer, similar to Fig. 61,397, p. 888 . . . . . £ 1. 10. 0

61,409. **Objective Reading Device** for Wall Galvanometer, Figure, for fixing to roof, illuminated by a glow lamp; scale 0.5 m long, with vertical adjustment; without leads 4. 10. 0

The apparatus on which measurements are to be taken can be set up on a table immediately below the reading device, thus saving a good deal of room. The galvanometer deflections can conveniently be observed. The galvanometer must have a concave mirror.

61,410. — idem, **with Nernst Lamp,** giving a very bright image, suitable only for 110 to 220 volt D. C. 5. 0. 0

Unless otherwise ordered, Nos. 61,409 and 61,410 are supplied for 110 volts.

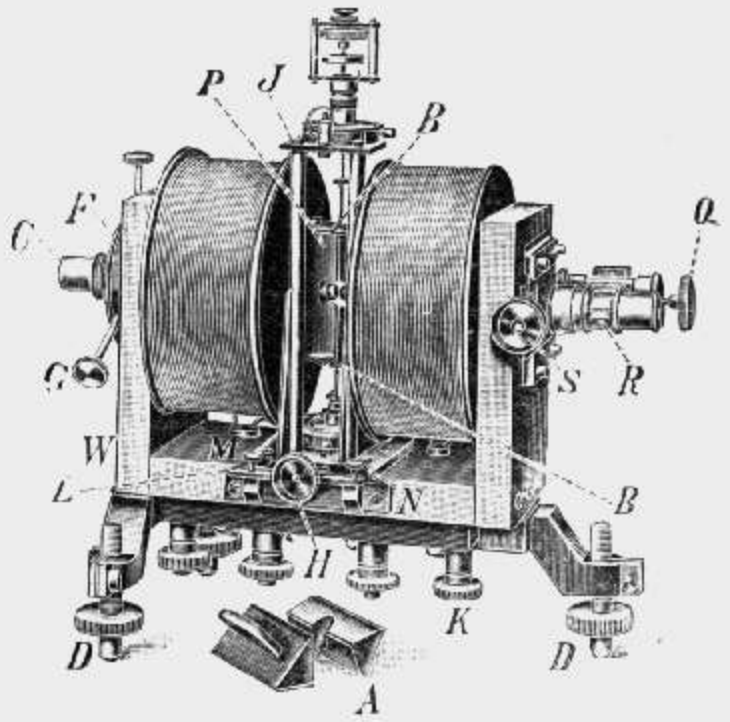
61,411. **Moving Coil Mirror Galvanometer** for demonstration purposes, Figure, with two different groups of windings on the same moving coil, one of which can be used for damping; also with arrangement for increasing the period of swing for ballistic purposes; including fixed damping resistance 9. 0. 0

The sensitivity is: for the group of turns of approx. 100 ohms: 1 mm deflection at 1 m = approx. 4×10^{-9} amp.; for the second group of 10 ohms, approx. 4×10^{-8} amp. The duration of the complete period of swing without weights is approx. 6 seconds; with weights, approx. 15 seconds.

For using this galvanometer as a reflecting instrument, the bracket, etc. listed under No. 61,342 is suitable.

Cl. 4956, 3832, 5696, 5695.

Max Kohl A. G. Chemnitz, Germany.



61 422. 1 : 6

Moving Coil Mirror Galvanometer of max. sensitivity, Figure, with two different groups of windings on the same coil, one of which can be used for damping, with a fixed damping resistance. The second group of windings in Nos. 61,412—61,414 is approx. one-tenth the resistance and sensitivity of the main group. Fig. 61,412 A shows the connections of Nos. 61,412—61,414, the arrangement for ballistic measurements being shown diagrammatically in the illustration. The instruments are provided with polished plane mirror.

£ s. d.

List No.	Terminal Resistance	Complete Time of Swing	Sensitivity per mm at 1 m Amp.	Price £ s. d.	Remarks
61 412	50 Ohms	5 Secs. Appr.	Appr. 4 $\times 10^{-9}$	**12. 0.0**	
61 413	700 „	5 „ „	„ 1,5 $\times 10^{-9}$	**12. 10.0**	
61 414	10 000 „	7 „ „	„ 7 $\times 10^{-10}$	**13. 5.0**	
61 415	2 × 50 „	6 „ „	„ 7 $\times 10^{-9}$	**12. 10.0**	Differential Galvanometer with windings which cannot be used separately
61 416	2 × 300 „	6 „ „	„ 4 $\times 10^{-9}$	**13. 5.0**	

61,417. **Extra Price** for Oil Damping, for enabling the instrument to be used at places which are not anti-vibrating 1. 13.0

61,418. **Extra Price** for Nos. 61,412—61,414 if provided with arrangement for increasing the period of swing to approx. 15 seconds for ballistic purposes 0. 18.0

61,419. **Extra Price** for Nos. 61,415 and 61,416 for two entirely separate windings which can be connected up in any desired manner 1. 2.0

61,420. **Extra Price** for a Mirror Chamber with Telescope the axis of which is placed at 45° to the mirror plane 4. 10.0

61,421. **Extra Price** for a Telescope with Scale on turning arm which can be extended to $^1/_2$ metre 4. 0.0

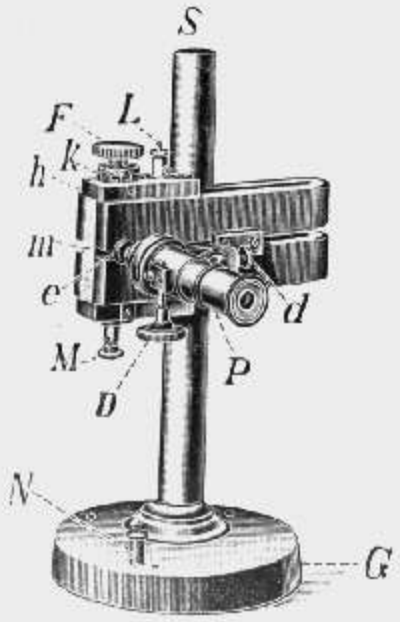
61,422. **Large Einthoven Electro-Magnet String Galvanometer,** improved type, Figure, very sensitive with extremely short period of swing. Price without microscope . . . 47. 10.0

A silvered quartz fibre of high resistance is stretched between the cuneiformly pointed pole pieces of a powerful electro-magnet. The current-sensitivity of the instrument can be varied by regulating the voltage. The deflections of the quartz fibre traversed by the current in the magnetic field can be observed through a microscope let in through the holes of the pole pieces.

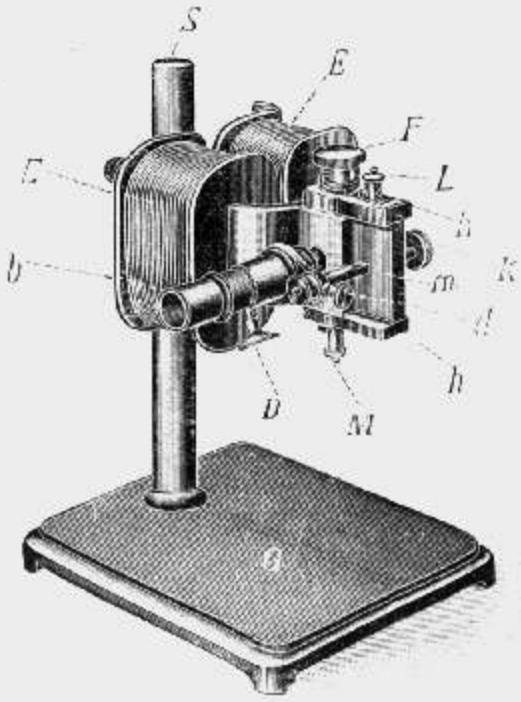
The instrument is of anti-vibration type and independent of external magnetic influences, and possesses a very short period of swing. It is suitable for a large number of fine measurements, e. g.: (1) determining the conductivity of the air produced by uranium and radium preparations; (2) measuring currents produced by atmospheric electricity; (3) ballistic measurements of small quantities of electricity; (4) measurements on telephone currents and nerve currents. Arrangements for registering on sensitive paper can easily be adapted to the instrument.

With a magnification of × 1000 and employing the thinnest quartz fibre, the following sensitivity can be attained: 0.1 mm = 1×10^{-12} amp. A correspondingly lower sensitivity is obtained with the use of platinum, gold, silver, and copper wire. Further particulars of these on application.

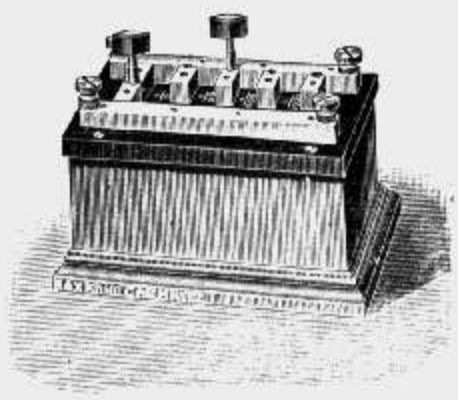
Max Kohl A. G. Chemnitz, Germany.



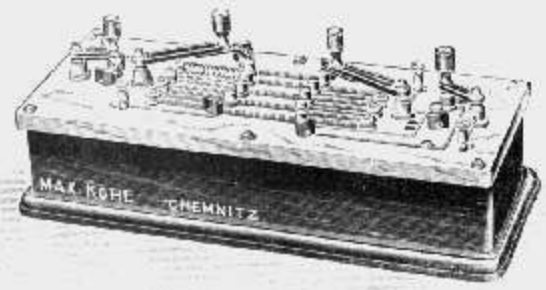
61431. 1 : 5.



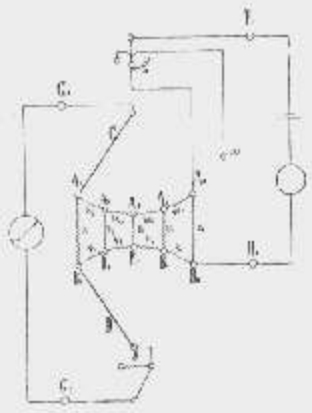
61432. 1 : 5.



61441. 1 : 6.



61443 A. 1 : 7.



61443 B.

Zeiss Optical Apparatus for No. 61,422. £ s. d.

61,423. Achromat A 1. 2. 0

61,424. Achromat A with iris diaphragm 2. 0. 0

61,425. Achromat AA. 1. 13. 0

61,426. Achromat C 1. 13. 0

61,427. Achromat DD 2. 15. 0

61,428. **Micrometer Ocular 3** graduated over the entire field of view 1. 3. 0

61,429. **Projection Ocular No. 2** 2. 4. 0

61,430. **Projection Ocular No. 4** 2. 4. 0

61,431. **Small Permanent Magnet String Galvanometer,** Figure, with simple microscope for direct reading with micrometer ocular of approx. magnification of 60, including case 9. 5. 0

This small simplified string galvanometer is very practical for many experiments where the maximum sensitivity is not required. It can be also used for projection for photographic recording and if desired is arranged to fit the optical bench of a projection lantern. Further particulars on application.

With quartz fibre (approx. 10,000 ohms resistance) and a magnification of 100 the following sensitivity can be reached when adjusted aperiodically: 1 mm deflection $= 8 \times 10^{-7}$ amp.; with extra-aperiodic adjustment 1 mm $= 3.2 \times 10^{-10}$ amp.; with 140 ohm gold fibres the corresponding sensitivities are: 7.5×10^{-8} and 3×10^{-8} amp.

61,432. **Small Electro-Magnet String Galvanometer,** Figure, with simple microscope as in No. 61,431 . . . . . 13. 0. 0

The sensitivity is about 3—4 times as great as in No. 61,431.

Photographic Recording Apparatus and other Accessories for String Galvanometers quoted for on application.

61,433. **Alternating Current Reflecting Galvanoscope** after Weinhold (W. D., Fig. 588) . . 2. 0. 0

Cl. 34ᵉ, 35ᵉ, 2389, 5114, 5046.

Max Kohl A. G. Chemnitz, Germany.



61444. 1 : 8.

Shunts for Mirror Galvanometers.

£ s. d.

Galvanometer Shunts, Figure, for varying the sensitivity:

	For 1 Galvanometer with a Resistance	Reduction of Maximum Sensitivity to	
61,438.	to 1 Ohm	0.1 0.01	2. 0.0
61,439.	1 „ 100 Ohms	0.1 0.01 0.001	2. 10.0
61,441.	100 „ 1000 „	0.1 0.01 0.001 0.0001	3. 0.0

Shunt Resistances Nos. 61,438—61,441 have a short circuit plug. The resistance coils are wound on copper and connected up in such manner that $^1/_9$, $^1/_{99}$, $^1/_{999}$ etc. of its resistance is connected in parallel with the galvanometer. These shunts are therefore chiefly suitable for Moving Needle Galvanometers, as they do not give constant damping with Moving Coil Galvanometers. When ordering, the resistance of galvanometer should be quoted.

61,394. **Universal Shunt** connected up according to Ayrton's method, Figure 61,394, p. 888, for Needle Galvanometers and Moving Coil Galvanometers; damping ratio approx. constant; suitable for all galvanometer resistances up to 100 ohms; total resistance 10,000 ohms; stages, 1, $^1/_{10}$, $^1/_{100}$, $^1/_{1000}$, $^1/_{10000}$; constructed of manganin 3. 0.0

61,442. — idem, total resistance 100 000 ohms, for Galvanometers up to 1000 ohms resistance 4. 10.0

61,443. **Power Shunt** after Prof. Kommerell, German Design, Figures A and B (Ztschr. f. d. phys. u. chem. U. **22**, 1909, p. 13) 9. 0.0

The object of the power shunt is to enable sensitive Mirror Galvanometers to be used not only for their original purposes — demonstrating and measuring very small currents — but also for measuring currents to about 15 amperes. Fig. 61,443 B shows the connections of the apparatus. Complete description forwarded if desired.

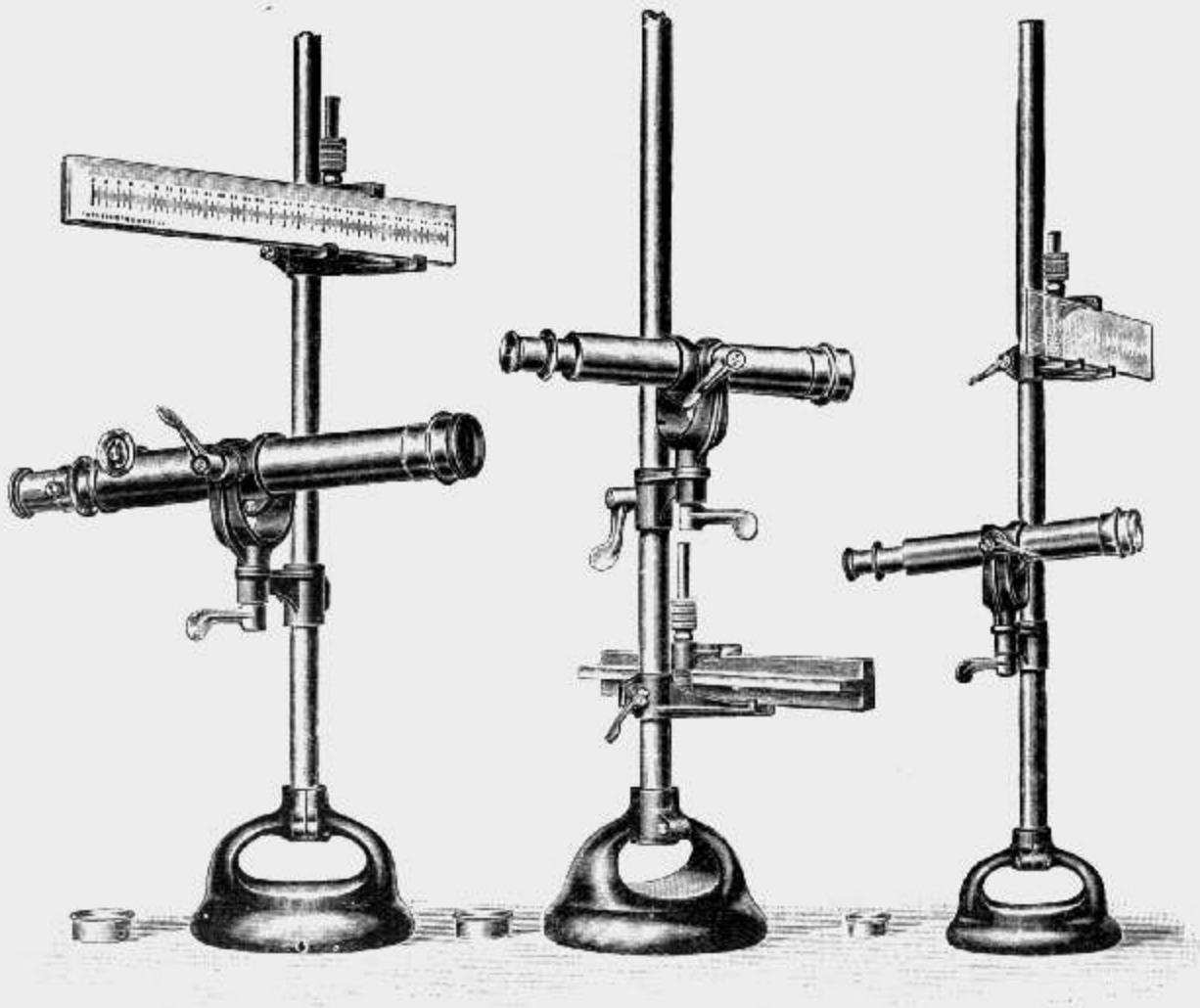
Reading Devices for Mirrors Instruments.

The angle of rotation of Mirror Instruments is measured either in a subjective manner, in accordance with Poggendorff's suggestion, with the aid of a Telescope and Scale, or, in an objective manner, by projecting the filament of an electric glow lamp or the shadow-image given by a wire stretched in front of a brilliantly lighted aperture, on to a scale. In the first case the rotating mirror must be a Plane Mirror; in the second case either a Plane Mirror with projection lens in front, or a Concave Mirror, is used.

61,444. **Simple Reading Telescope** with paper scale, Figure, for schools and exercises . 2. 5.0

The Telescope is fitted with a 24 mm diameter objective and cross wires; it has a vertical adjustment and can rotate about the horizontal and vertical axis.

Max Kohl A. G. Chemnitz, Germany.



61 449. 1 : 6. 61 448. 1 : 6. 61 446. 1 : 6.

Reading Telescopes with Universal Scale Holders (but without Scale), Figures.

List No.	Objective Aperture mm	Magnification	Price £ s. d.	Remarks
61,445.	10	6	£ 3. 15. 0	Telescope without Rack, Universal Scale Holder without fine adjustment.
61,446.	15	12	£ 4. 5. 0	
61,447.	20	16	£ 5. 10. 0	Telescope with Rack, Universal Scale Holder without fine adjustment.
61,448.	25	16	£ 6. 5. 0	
61,449.	30	20	£ 7. 5. 0	
61,450.	25	16	£ 10. 5. 0	Telescope with Rack, Universal Telescope Holder with micrometer tip motion.
61,451.	30	20	£ 11. 0. 0	
61,452.	30	20	£ 12. 10. 0	Telescope with Rack, Universal Telescope Holder with fine adjustment in vertical direction as well as about two horizontal axes.
61,453.	40	26	£ 13. 15. 0	
61,454.	20	16	£ 9. 5. 0	Telescope with Rack, Universal Telescope Holder with micrometer tip motion. The illustration is not exactly in accordance with the construction.
61,455.	25	16	£ 10. 0. 0	
61,456.	30	20	£ 10. 15. 0	
61,457.	40	26	£ 11. 15. 0	

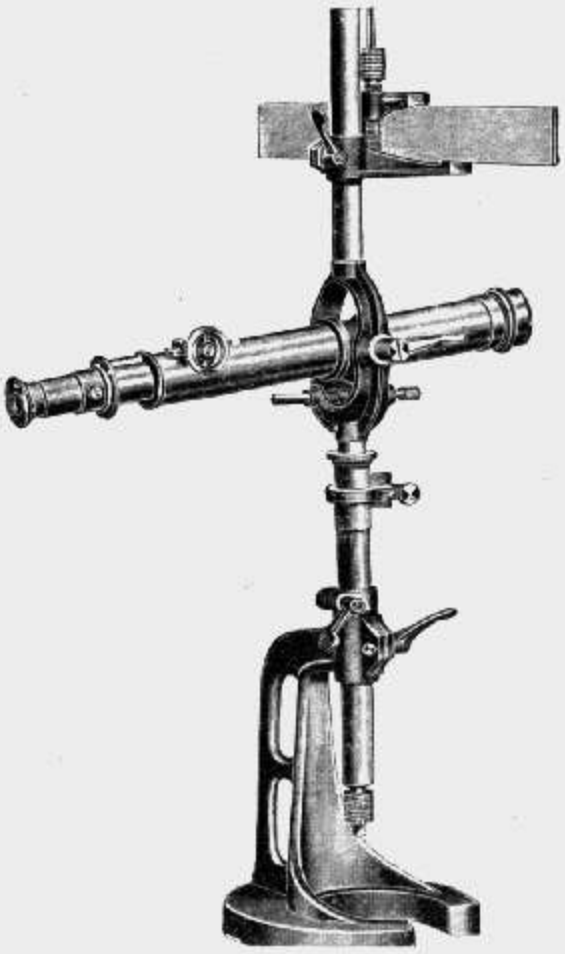
No. 61,448 is (contrary to the illustration) supplied with Telescope having rack adjustment. The scales suitable are Nos. 61,458—61,475.

Wood Scales with T-shaped cross section, of old, dry material, with narrow paper strip, accurately graduated by means of the dividing engine when first obtained, with mirror figures, when ordinary figures are not expressly desired.

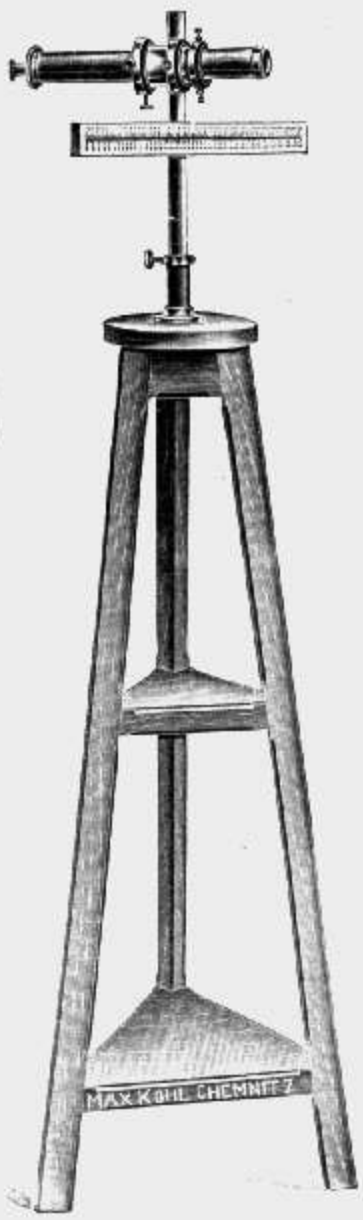
	Length mm	400	600	800	1000
A) **Graduated every 2 Millimetres** *)	List No.	61,458	61,459	61,460	61,461
	£	0. 6. 0	0. 8. 0	0. 10. 0	0. 12. 0
B) **Graduated in Millimetres:**	List No.	61,462	61,463	61,464	61,465
	£	0. 7. 0	0. 9. 0	0. 11. 0	0. 13. 0

*) Can be highly recommended for low magnification Reading Telescopes.

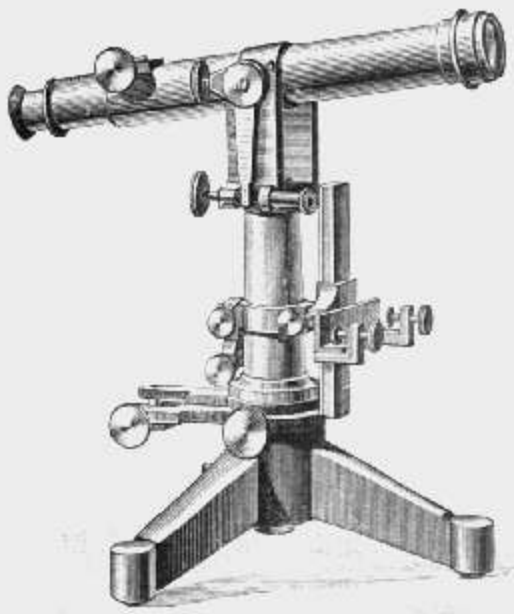
Max Kohl A. G. Chemnitz. Germany.



61452. 1 : 6.



61454. 1 : 12.



61478 61480. 1 : 5.

Plate Glass and Milk Glass Scales, manufactured of glass plates specially prepared for this purpose and plane polished on both sides; with finely etched millimetre graduation and mirror figures. £ s. d.

Length mm	400	600	800	1000	1200	1400
List No.	**61,466**	**61,467**	**61,468**	**61,469**	**61,470**	**61,471**
Plate Glass £	**0. 17. 0**	**0. 22. 0**	**0. 28. 0**	**0. 33. 0**	**0. 40. 0**	**0. 46. 0**
List No.	**61,472**	**61,473**	**61,474**	**61,475**	**61,476**	**61,477**
Milk Glass £	**0. 18. 0**	**0. 23. 0**	**0. 30. 0**	**0. 38. 0**	**0. 50. 0**	**0. 60. 0**

The scales are also made in other lengths and if desired are figured throughout or, commencing from the centre, coloured red in one direction and black in the other, and are also provided with figures for direct reading. If desired, the plate glass scales are supplied slightly ground in order to illuminate the graduation from the back or for enabling them to be used for objective reading.

The Milk Glass Scales are used permanently in a number of Laboratories on account of their brilliancy.

Devices for Objective Reading in Lecture Rooms, i. e., for Reflecting Galvanometers: **see Nos. 61,310—61,316, p. 879; Nos. 61,343—61,345, p. 883.**

Reading Telescope, Figure, adjustable horizontally and vertically, or simply micrometrically. The celluloid scale is fitted under the telescope; ocular extension movable by rack.

List No.	**61,478**	**61,479**	**61,480**
Objective Diameter	27	33	40 mm
Magnification	16	23	27 times
£	**7. 10. 0**	**9. 5. 0**	**11. 10. 0**

For illuminating Scales we recommend 2 Table Lamps No. 50,114, p. 21, at £ **0. 18. 0** each.

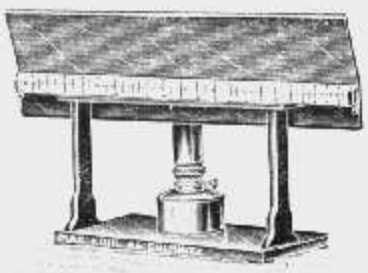
Stands for setting up Reading Telescopes: see Nos. 51,125—51,131, p. 205.



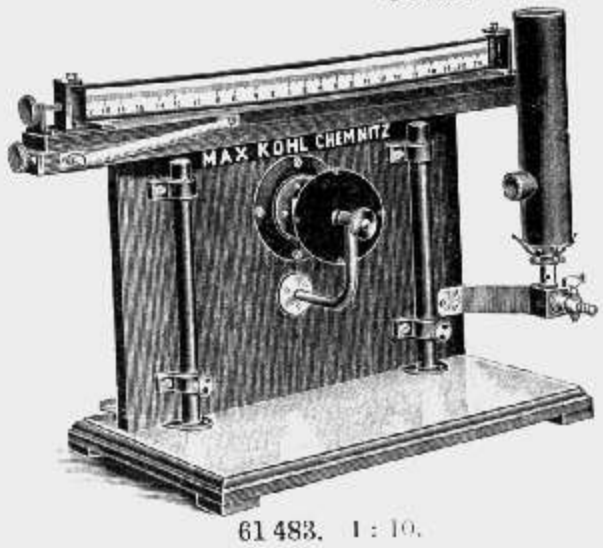
61 481. 1 : 6.



61 482. 1 : 10.



61 480 a. 1 : 10.



61 483. 1 : 10.

	£ s. d.
61,480 a. **Simple Lamp Reading Apparatus,** with paraffin lamp, Figure	1. 12. 0
61,481. **Lamp Reading Apparatus,** for objective reading, Figure, with single filament glow lamp together with switch and plug contact	4. 0. 0
The scale is adjustable vertically and has a lateral motion with fine adjustment. A reading mirror permits of a number of observers reading simultaneously without error.	
61,482. **Lamp Reading Apparatus** with Nernst Lamp and slot diaphragm, Figure, with switch, 2 metres lamp flex., plug contact and plug; for 110—220 volt D. C. only. .	3. 12. 0
Lamp Reading Apparatus for fixing to Ceiling: see Nos. 61,409 and 61,410, p. 890.	
61,483. **Lamp Reading Apparatus** for objective reading, Figure, on wood stand, with electric glow lamp and pliable Celluloid Scale, adjustable vertically	4. 16. 0
The light from the lamp falls on a universal motion mirror. It is projected thence on to the mirror of the measuring instrument through a rectangular aperture across which a vertical thread is stretched. When the lamp reading apparatus is properly set up a strongly illuminated spot appears on the transparent celluloid scale, a fine black line appearing in the centre of this spot. By means of a screw the scale of the apparatus can be moved along its length in order to adjust the fine line on the zero point of the scale. The scale can be spherically curved or stretched straight.	
61,484. — idem, with Nernst Lamp, for D. C. of 110—220 volts only	5. 0. 0
61,485. — idem, with incandescent gas burner	4. 16. 0
61,486. — idem, with paraffin lamp, Figure	4. 10. 0
61,487. **Extra Price** for a Stand for Nos. 61,483—61,486 for placing on the floor, Figure	1. 10. 0
61,488. **Lamp Reading Apparatus,** Figure, as No. 61,483, but without Lamp	4. 4. 0

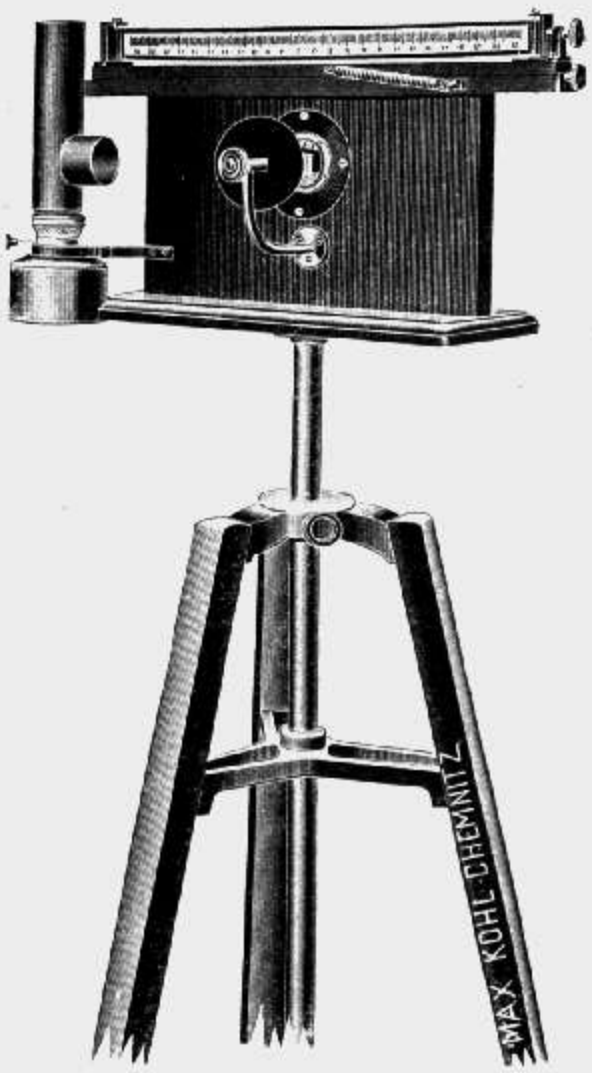
Items Nos. 61,310—61,315 can be used as Lamps for above.

Unless otherwise stated, the apparatus are supplied with 110 volt lamps.

Lamp Reading Apparatus Nos. 61,481—61,488 for objective reading require a Concave Mirror on the apparatus to be read the radius of curvature of which is equal to the scale distance. In all cases a Plane Mirror with projection lens can be used in front of them. Suitable lenses for the individual instruments quoted on application.

Cl. 2402, 4512, 5885, 2403.

Max Kohl A. G. Chemnitz, Germany.



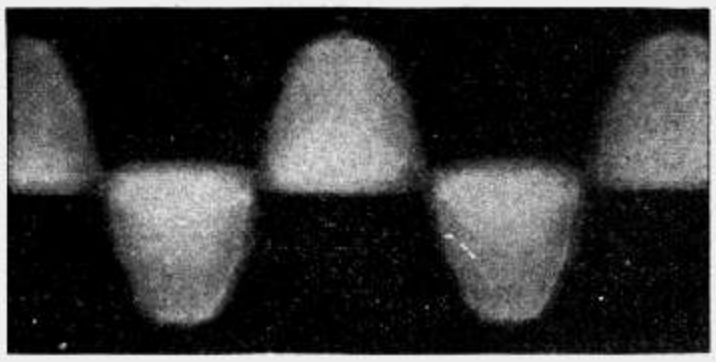
61 486 and 61 487. 1 : 12.



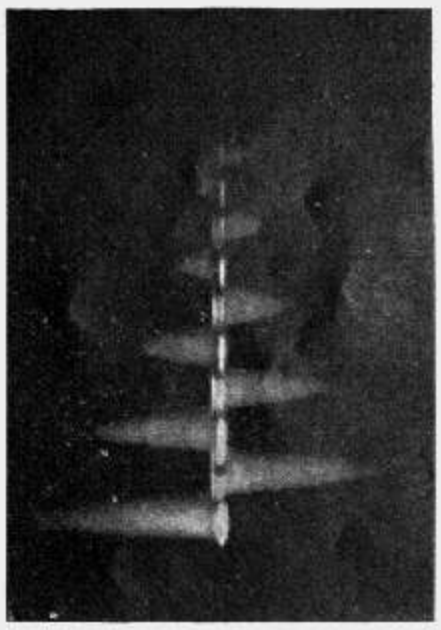
61 488. 1 : 10.



61 489. 1 : 8



61 489 A.



61 489 B.

Demonstration and Graphic Reproduction of Current Curves.

£ s. d.

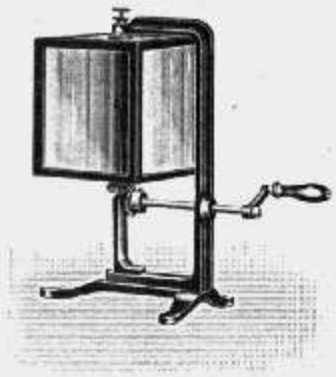
61,489. **Glow Light Oscillograph Tube,** Figure, after Gehrcke-Ruhmer, for demonstrations and investigations, comprising oscillograph tube and stand 2. 10. 0

Two axially arranged electrode wires are enclosed in an evacuated tube divided by an insulating partition. The predominating cathode is covered over by a bluish glow at intervals when the current flows through, this glow being proportional to the momentary current. The curve shape is rendered visible by the aid of a rotating mirror and can be photographed when a certain rotational velocity is imparted to the mirror. The velocity of the mirror can easily be made to suit the current-frequency predominating. The tube can be used in a horizontal position for cinematographic photos.

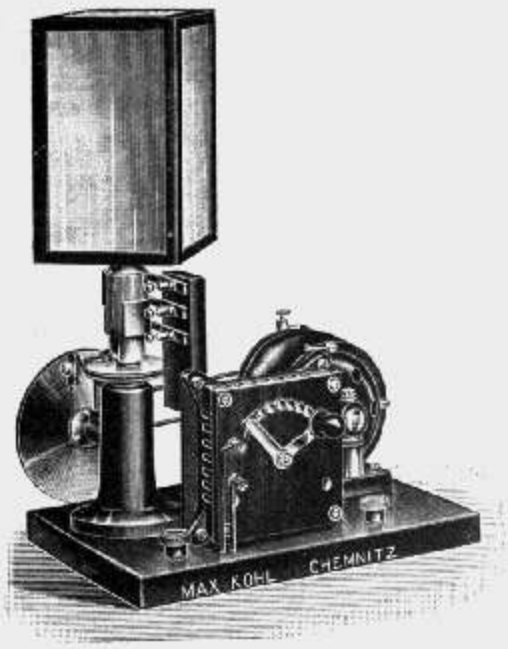
Fig. 61,489 A shows a photograph of an A. C. curve, and Fig. 61,489 B that of a condenser discharge.

If desired, and at an increased price, tubes can be supplied of quartz or Uviol glass.

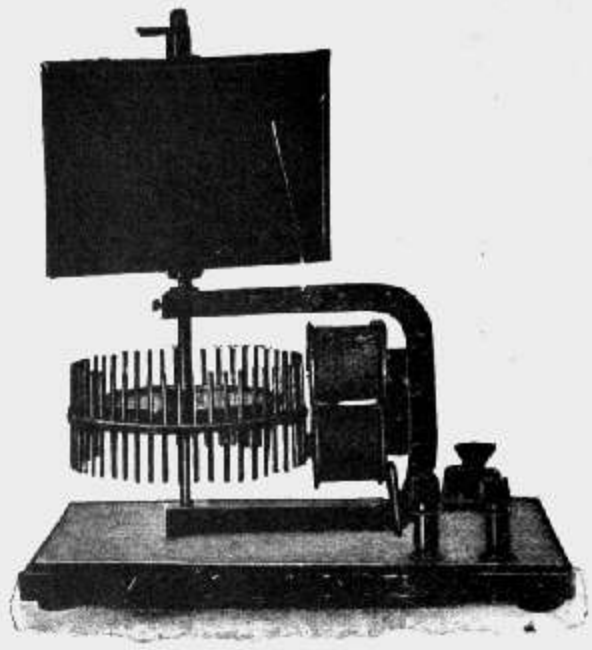
Cl. 3524, 5820, 6009, 3540, 3541.



61 490. 1 : 10.



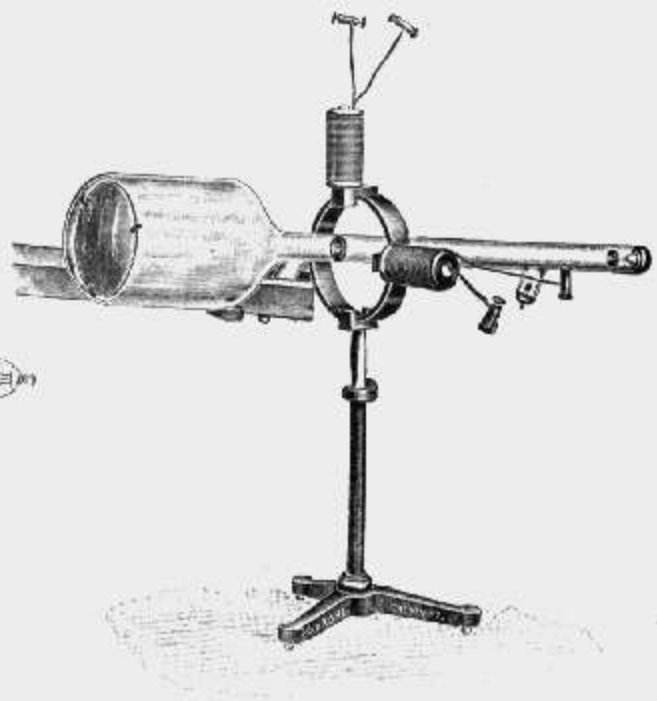
61 491 and 61 496. 1 : 6.



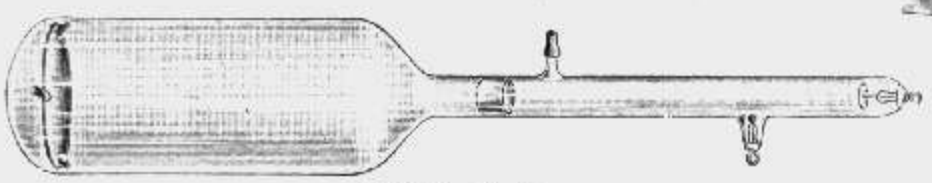
61 493. 1 : 8.



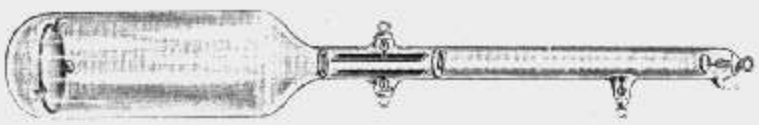
61 499. 1 : 6.



61 502 and 61 499. 1 : 8.



61 500. 1 : 9.

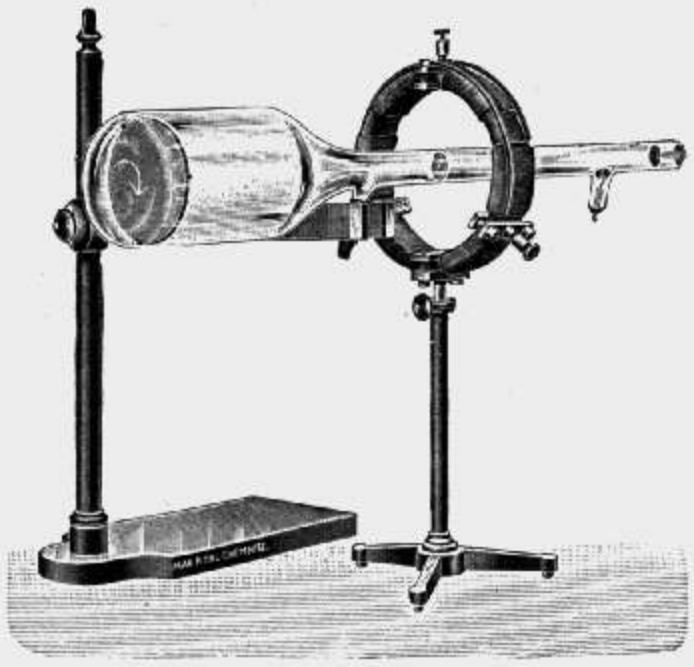


61 501. 1 : 8.

	£ s. d.
61,490. **Rotating Mirror Box** driven by a handle, Figure	2. 10. 0
The mirrors of the box are of the best possible quality. If desired they can be supplied coated with silver or platinum on front at a proportionately higher price.	
61,491. — idem, driven by a 110 volt D. C. Motor, Figure, with rheostat, but without arrangement No. 61,496 shown in illustration	6. 10. 0
61,492. The Motor can also be supplied for 24, 65, 150 and 220 volts D. C. **Extra price**	0. 10. 0
The working voltage should be given when ordering.	
61,493. — idem, driven by a synchronous A. C. Motor, Figure	7. 0. 0
When ordering, kindly state working voltage and frequency.	
61,494. — idem, with clockwork drive. The speed can be regulated within wide limits by means of a centrifugal regulator	5. 10. 0
61,495. **Transformer** for transforming the A. C. to be investigated to the high voltage necessary; for 100—120 volts primary and 50 cycles	10. 0. 0
When ordering, kindly quote voltage and frequency.	

Cl. 6029, 5308, 3543, 2736, 2737, 2738, 2739.

Max Kohl A. G. Chemnitz, Germany.



61 503 a. 1 : 8.

Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
61,496. **Arrangement** on the mirror **for alternating charges and discharges of Condensers**, for observing the charge and discharge curves, Figure	1. 15. 0
61,497. **Falling Slide** for cinematographic photos. Price according to size of plates **£ 3. 0. 0** to	6. 0. 0
61,499. **Cathode Ray Tube** after F. Braun, Figure	1. 0. 0

The mode of action of this vacuum tube is based on the fact that a cone of cathode rays supplied by an influence machine or a rapidly working spark coil (the rays being restricted by a narrow diaphragm) produces on the glow screen, which is coated with phosphorescent paint, a spot which is as small and bright as possible, the behaviour of this spot being observed through the glass and mica.

If a small magnetizing coil, the axis of which is placed fairly vertical to the tube, is slipped along the tube, and a current allowed to traverse the latter, the cathode rays are deflected. If in addition an A. C. is used, the spot of light is set into synchronous vibrations. If now a rotating mirror is placed opposite the tube, the light spot is dissolved for the purposes of the curve. Ample means are therefore available for studying the rapid variations of a magnetic field as well as the secular course of such fields. The current curves of A. C. generating stations are adapted for such observations, as well as the curves of the primary an secondary circuits of an induction coil. For suitable mirrors see Nos. 61,490—61,494.

The rotation of the luminous point in magnetic rotating field is specially adapted for demonstration purposes (cf. List Nos. 61,503 and 61,503a).

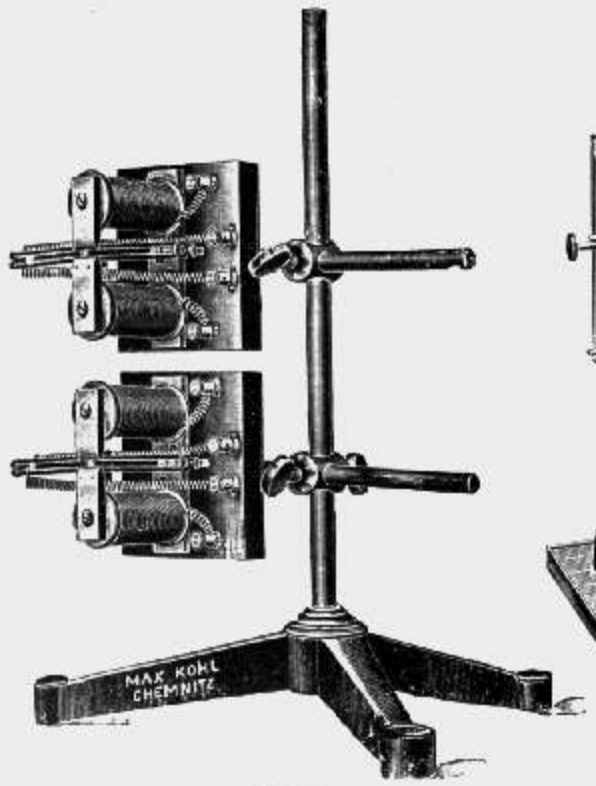
61,500. — idem, larger, Figure, 1 m long, with screen 130 mm diameter	3. 0. 0
61,501. — idem, after Braun-Wehnelt, Figure, for electrostatic deflections	1. 15. 0
61,502. Two Coils on Stand, Figure, one arranged to rotate	1. 10. 0

The luminous point describes Lissajous's and similar curves if alternating current is conducted through two coils placed on the diaphragm of the Braun tube. By rotating one of the magnetizing coils, and thereby altering the angle enclosed by the two coils, the various figures are obtained.

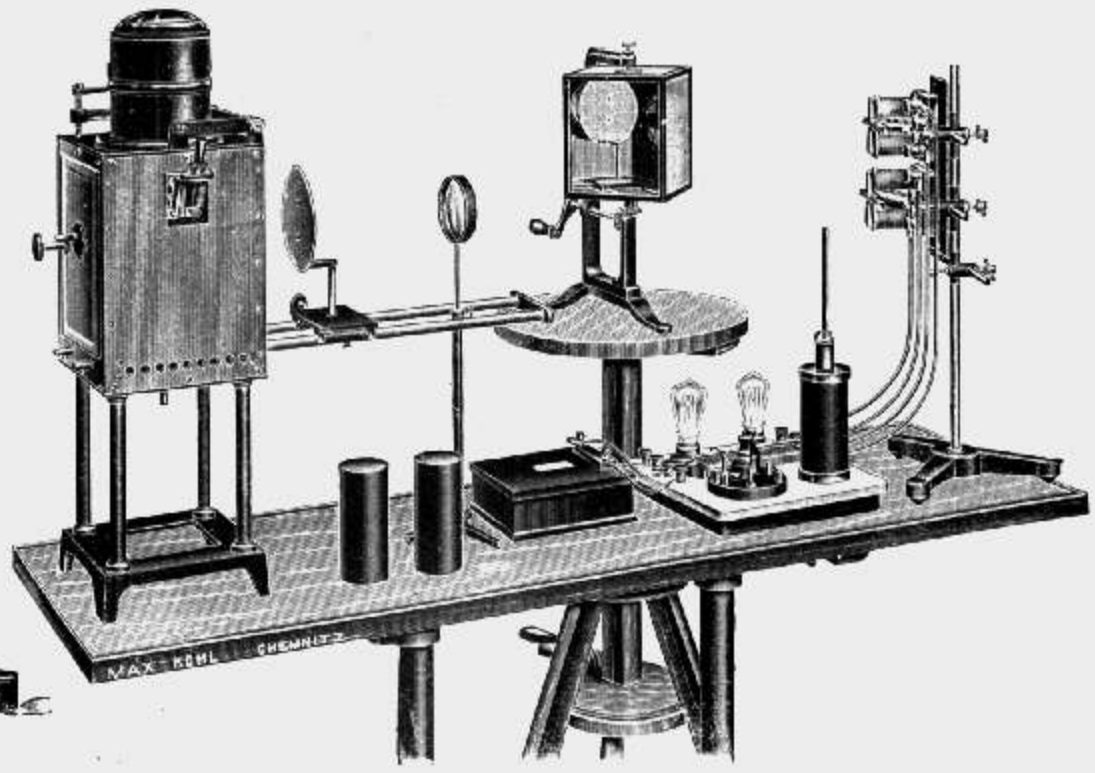
If current from a central station is employed, a glow lamp resistance must be placed in series (see No. 61,504).

61,503. Magnetizing Ring for Two-phase Current, fitting the stand of preceding apparatus. Price without stand	1. 16. 0
61,503 a. — idem, for 3-phase current, Figure, without the retort holder illustrated and without stand	1. 16. 0
61,503 b. Stand for Nos. 61,503 and 61,503 a	0. 6. 0
61,504. Glow Lamp Resistance	1. 4. 0

This resistance consists of 4 glow lamp holders each with two current terminals, mounted on a slate slab. It is used when apparatus Nos. 61,502—60,503a are to be worked connected direct to a network.



61 505. 1 : 6.



50 796, 61 505, 61 507, 61 509, 61 510, 61 511. 1 : 6.

Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
61,505. **Demonstration Double Oscillograph** with two measuring loops, after Wehnelt, Figures (E. T. Z., 1903, p. 703 and 1904, p. 416), on stand	6. 0. 0

Between the poles of an electromagnet excited by D. C., a loop of hard drawn silver wire carries a glass mirror. If this moving system is traversed by fluctuating, pulsating or oscillating currents, and provided that the apparatus is arranged as in above illustration, luminous curves, corresponding to the current curves, are projected on to a screen placed opposite the projection lantern. If now the moving systems of the double oscillograph are connected in parallel on an A. C. network, the current curves can be made to coincide exactly. If now by means of the switch apparatus No. 61,510 a non-inductive resistance, then an inductive resistance, and finally a capacity — or the two latter simultaneously — are put in series with the moving system of one of the oscillographs, the resultant current reductions and phase lead and lag, or in other words, the phase displacement between current and voltage, can be shown in a very pretty manner. We send complete description on demand. For Rotating Mirrors see Nos. 61,490—61,494.

61,510. **NEW! Switch Apparatus (German Design) for producing Phase Displacements** with leading and lagging current, Figure. Price without lantern or other accessories illustrated	6. 12. 0

The apparatus consists of a marble slab on mahogany frame, two non-inductive resistances, one sliding resistance, one coil with large, adjustable self induction, one change-over switch, and the necessary terminals for connecting a capacity, the oscillograph and the A. C. source.

61,507. **Diaphragm** with two holes, fitting projection lanterns	0. 10. 0
61,508. **Screen** with clamp, for screening the secondary radiation	0. 6. 0
61,509. **Large Lens** on Stand	0. 16. 0
61,511. **Condenser** insulated with paraffined paper, about 12 mfd., for voltages to 120 . .	2. 14. 0
61,512. **Photograph on glass** of the scheme of connections of the double oscillograph in conjunction with Switch Apparatus No. 61,510	0. 1. 6
61,506. **Oscillograph** after Wehnelt, with a metal loop	3. 6. 0

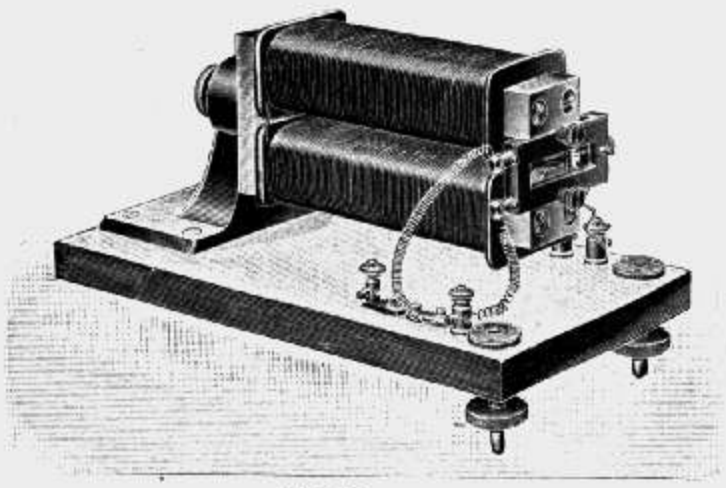
Specially adapted for investigating and demonstrating the curve of the arc of A. C. arc lamps and the influence of the choking coil on the same, for checking the working of interrupters etc.

61,513. **Oscillograph** after Wittmann, with a metal loop, Figure	11. 0. 0

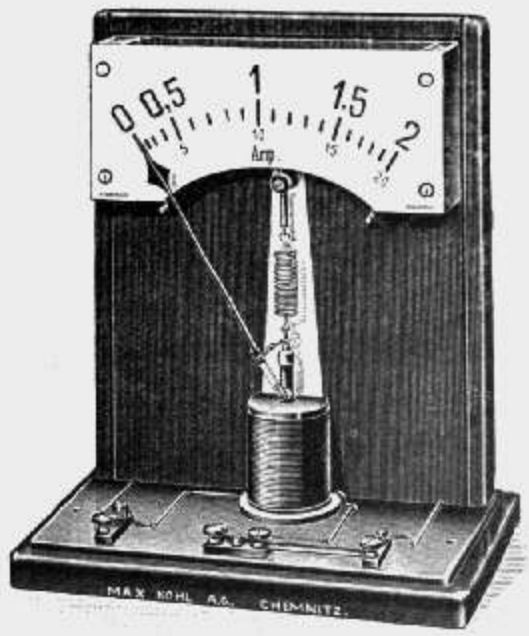
The oscillograph has converging pole pieces the distance apart of which can be varied. A small ebonite frame is placed in the air gap, which is about 4 mm wide, a current loop of tinsel being stretched across this frame. The loop is conducted over a small ivory pulley and can be evenly adjusted by micrometrical arrangement. For damping the oscillations of the loop itself, use is made of a very light aluminium frame which is insulated and cemented on to the loop. The electromagnet is arranged to rotate about a vertical axis so as to render it possible to place the loop vertically.

The apparatus is used in the same manner as the Wehnelt Oscillographs, the present instrument however being much more sensitive.

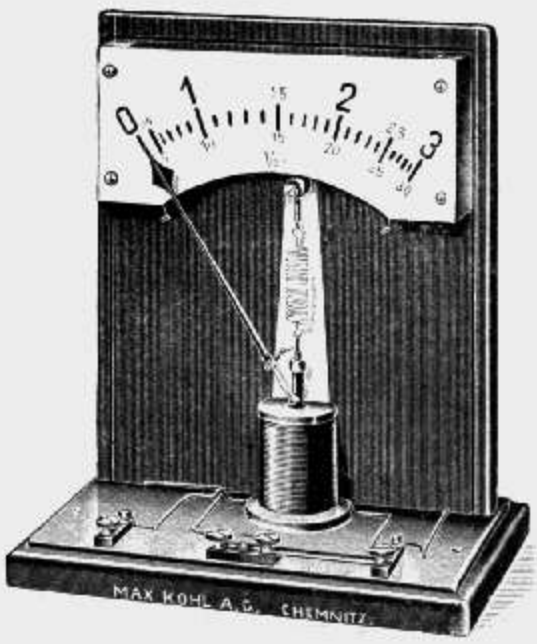
Max Kohl A. G. Chemnitz, Germany.



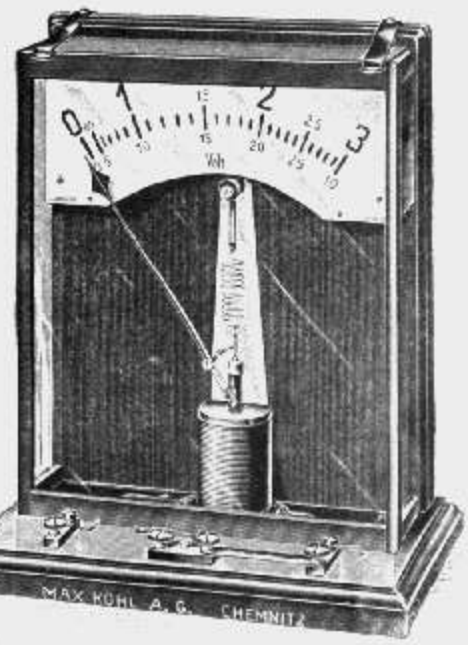
61 513. 1 : 6.



61 520. 1 : 6.



61 521. 1 : 6.



61 521 and 61 522. 1 : 6.

Ammeters and Voltmeters.

£ s. d.

Demonstration Instruments.

61,520. **Direct Current Demonstrating Ammeter,** Kohlrausch's system, Figure, range 0.2—2 amps., with 20 ampere shunt 2. 10. 0

The instrument is fitted with a scale visible from a distance and explains the construction of the ammeter in a very comprehensive manner, as all parts are arranged open. **The scale can be read from both sides.**

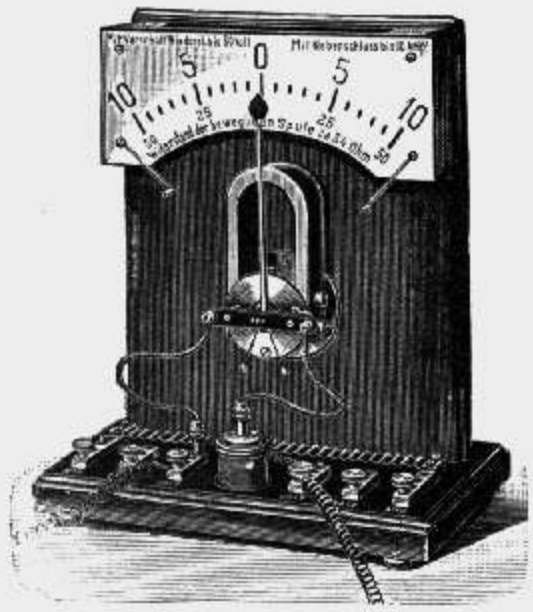
61,521. **Direct Current Demonstration Voltmeter,** Kohlrausch's system, Figure, range 0.5—3 volts, with additional resistance for multiplying the range ten times. 2. 10. 0

The Voltmeter is the same in construction as Ammeter No. 61,520 and differs from the latter simply in the winding and calibration. **Scale can be read from both sides.**

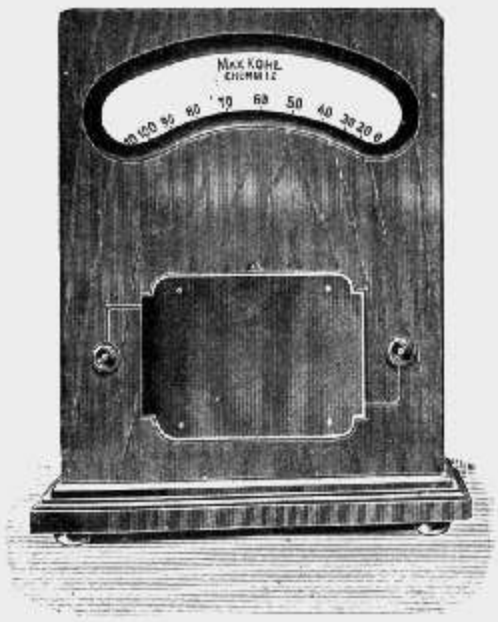
The current is led into both instruments by the left hand terminals. While in the case of the voltmeter the sensitivity is varied and the range increased by releasing the connection between the right hand terminals, in the case of the ammeter the shunt fitted on the back of the instrument is set into action by inserting the connecting piece between these right-hand terminals. If approximate knowledge of the voltage or current available is not known before hand, this measurement is attempted always with reduced sensitivity, i. e. with resistance in series and with shunt connected.

61,522. **Glass Case with brass mount** for Nos. 61,520 or 61,521, Figure. Price, each . 0. 15. 0

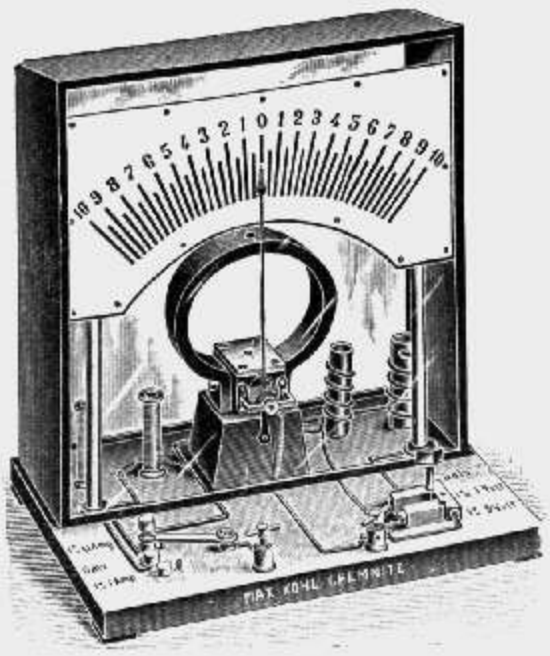
Cl. 3344, 5838, 5839, 5840.



61 523 A. 1 : 6.



61 523 B. 1 : 6.



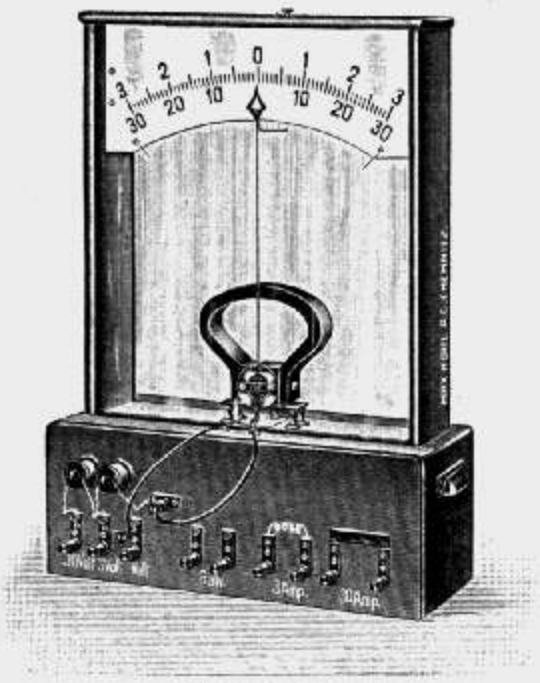
61 527. 1 : 5.

	£ s. d.
61,523. **Dead Beat Universal Moving Coil Measuring Instrument,** Deprez-d'Arsonval system, Figs. A and B, **for Direct Current,** with moving system (which can be taken out). Can be used (1) **as an Ammeter,** range 10—0—10 amps., (2) **as a Voltmeter,** range 50—0—50 volts, (3) **as a Vertical Galvanometer,** range 2—0—2 milliamps. and 200—0—200 millivolts. Can be read from both sides (see Figs. A and B)	5. 10. 0
The instrument is constructed on the Deprez-d'Arsonval system; it has a moving coil in a very powerful magnetic field. Consequently it is independent of its position in regard to the magnetic meridian and of external magnetic influences. The instrument has three pairs of terminals designated respectively "Amp."; "Volts"; "Galv."; the leads are to be connected to these in accordance with the various modes of employment. Two flexible cords with plugs on the ends are fitted on the moving coil. These plugs are inserted in the plug-holes of the terminals designated "Amp." or "Galv." when it is desired to use the instrument as an Ammeter or a galvanometer. When used as a voltmeter one plug is placed in one of the terminals designated. "Volts", the other being inserted in the plug-hole of the resistance coil (see Fig. 61,523 A).	
61,524. — i d e m, moving system cannot be withdrawn	5. 2. 0
61,525. **Glass Case with brass mount** for Nos. 61,523 or 61,524 . . . . . Price, each	0. 15. 0

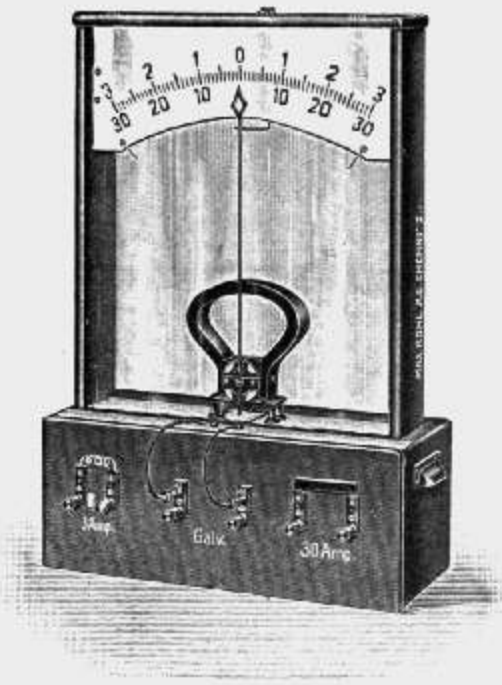
Cl. 2421, 2420, 2422.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



61 528. 1 : 6.



61 531. 1 : 6.

61,526. **Additional Voltage Coils** for increasing the voltage range of Nos. 61,523 and 61,524 in stages of 50 volts each, so that e. g. four extra coils are used for a range of 250 volts . . . . . Price each £ s. d. 0. 8. 0

61,527. **Universal Measuring Instrument for Direct Current,** Deprez-d'Arsonval system, Figure, suitable for current and voltage measurements and for use as a galvanometer 5. 0. 0

The instrument has a scale visible from both sides. The following are the ranges:

As a Galvanometer: 0.015—0—0.015 amp with approx. 10 ohms resistance.
As an Ammeter: 2—0—2 and 15—0—15 amps.
As a Voltmeter: 3—0—3 and 50—0—50 volts.

61,528. **Universal Demonstration Moving Coil Galvanometer** with scale visible at a distance, **for Direct Current,** Deprez-d'Arsonval system, Figure, can be used both as a pointer galvanometer for zero methods (resistance measurements and the like) and as a voltmeter and an ammeter. Total height 450 mm, in glass case 7. 0. 0

This instrument has been designed to satisfy the need of an apparatus adaptable for use in as many ways as possible as well as for technical measurements of large current-densities. The graduation is visible at a distance. We have thus five instruments comprised in one, i. e.:

(1) **Galvanometer.**
(2) **Voltmeter to 3 volts.**
(3) **Voltmeter to 30 volts.**
(4) **Ammeter to 3 amperes.**
(5) **Ammeter to 30 amperes.**

All leads are laid in the open and can be seen easily at a distance. The connections are changed over by plugs.

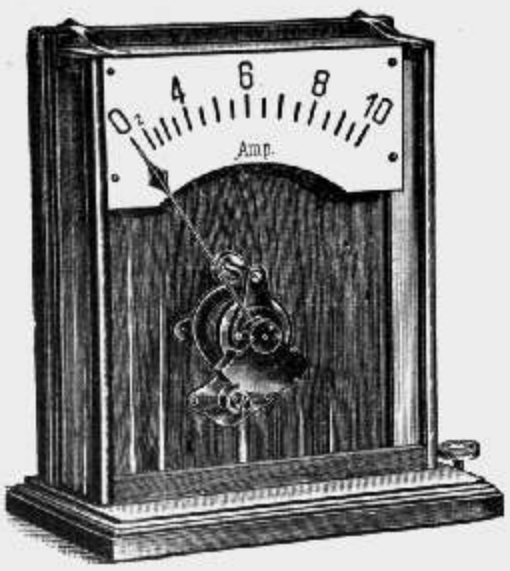
61,529. — idem, considerably larger, total height 60 cm 8. 8. 0

61,530. **Demonstration Moving Coil Voltmeter, for Direct Current,** Deprez-d'Arsonval system, cf. Fig. 61,531, with scale visible at a distance; with two ranges, 0—3 and 0—30 volts, in glass case. Total height 450 mm. Can also be used as a Galvanometer 6. 0. 0

This instrument has the same advantages as No. 61,528; change-over by plugs.

61,531. **Demonstration Moving Coil Ammeter for Direct Current,** Deprez-d'Arsonval system, Figure, with scale visible at a distance; with two ranges, 0—3 and 0—30 amps. In glass case. Total height 450 mm; can also be used as a Galvanometer 6. 0. 0

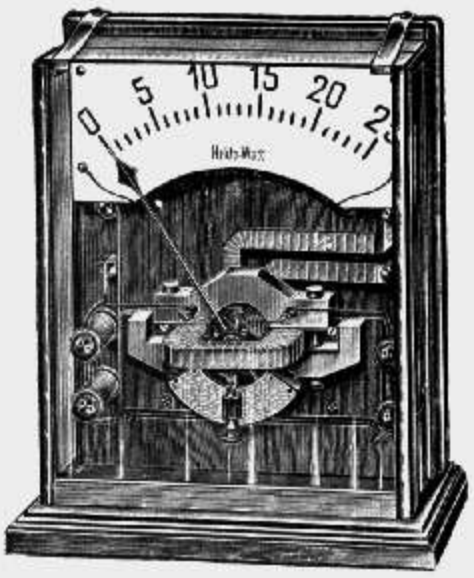
In this instrument, constructed in a similar manner ,to No. 61,528, change over is effected by plugs.



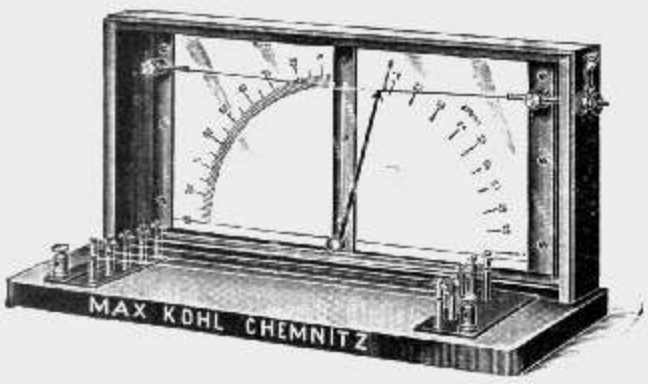
61 534. 1 : 6.



61 562. 1 : 5.



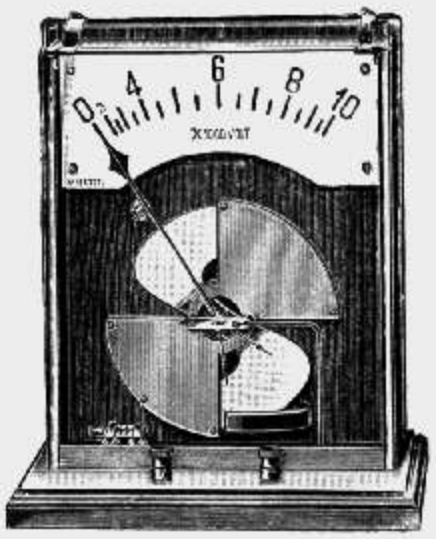
61 572. 1 : 6.



61 563. 1 : 5.



61 565. 1 : 6.



61 570. 1 : 6.

Electromagnetic Soft Iron Demonstration Ammeters for Direct or Alternating Current, with Air Damping, Fig. 61,534, with moving system (can be taken out), in glass case:

	Range	0.2—2	1—5	2—10	2—20	6—30	6—40 amps.	£ s. d.
For D. C.	List No.	**61,532**	**61,533**	**61,534**	**61,535**	**61,536**	**61,537**	
	Price £	**4. 10. 0**	**4. 10. 0**	**4. 8. 0**	**4. 8. 0**	**4. 8. 0**	**4. 8. 0**	
For A. C.	List No.	**61,538**	**61,539**	**61,540**	**61,441**	**61,542**	**61,543**	
	Price £	**4. 12. 0**	**4. 12. 0**	**4. 10. 0**	**4. 10. 0**	**4. 10 0**	**4. 10. 0**	

Electromagnetic Soft Iron Demonstration Voltmeters for Direct or Alternating current, with Air Damping, cf. Fig. 61,534, with moving system (can be taken out), in glass case.

	Range	0.5—3	1—6	2—10	5—25	20—100	30—150	40—200	50—300 volts
For D. C.	List No.	**61,544**	**61,545**	**61,546**	**61,547**	**61,548**	**61,549**	**61,550**	**61,551**
	Price £	**4. 15. 0**	**4. 15. 0**	**4. 15. 0**	**4. 15. 0**	**4. 10. 0**	**4. 10. 0**	**4. 15. 0**	**4. 18. 0**
For A. C.	List No.	**61,552**	**61,553**	**61,554**	**61,555**	**61,556**	**61,557**	**61,558**	**61,559**
	Price £	**4. 18. 0**	**4. 18. 0**	**4. 18. 0**	**4. 18. 0**	**4. 13. 0**	**4. 13. 0**	**4. 18. 0**	**5. 0. 0**

Apparatus Nos. 61,532—61,559 are constructed as in most electromagnetic instruments, on the principle of the repulsion of two magnetized soft iron pieces of the same name.

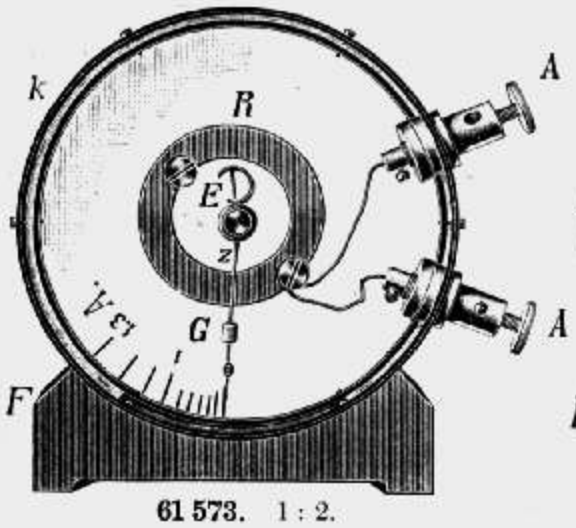
The frequency should be quoted in the case of A. C. instruments. Unless this is stated instruments are supplied calibrated for 50 periods.

61,560. **Reduction in price** if the moving system of Nos. 61,532—61,559 is not required to be made withdrawable 0. 8. 0

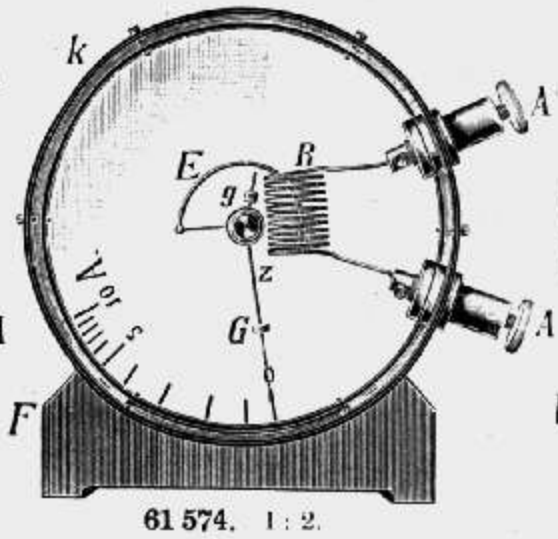
61,561. **Extra price** for subdividing the series resistance for Voltmeters Nos. 61,544—61,559 for obtaining a second range of higher sensitivity. The two ranges must be as 1 : 2 0. 18. 0

61,562. **Demonstration Instrument** after Scotti, for explaining the principle of hot wire instruments, Figure, on stand, for projection. **NEW!** 1. 10. 0

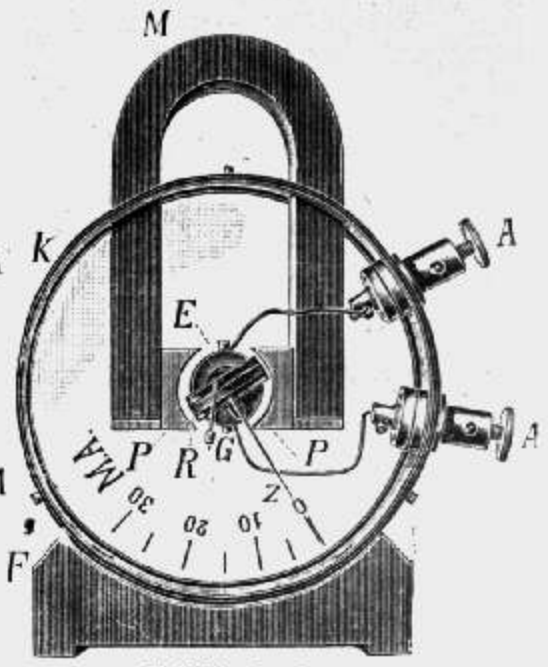
Cl. 2419, 5435, 2428, 2425, 2426, 2427.



61 573. 1 : 2.



61 574. 1 : 2.



61 575. 1 : 2.

61,563. **Demonstration Hot Wire Ammeter** after Grimsehl (Ztschr. f. d. phys. u. chem. U. **16**, 1903, p. 282; Grimsehl, p. 764), Figure; can be used **for Direct and Alternating Current;** with shunts . . . . . £ 1. 8. 0

The instrument possesses a degree scale and a calibrating scale for the permissible currents up to 1 ampere. By using the shunts the range can be increased to 10 times that of the calibrated scale.
The pointer can be bent back so as to use either one or other of the scales.

61,564. **Dead Beat Demonstration Hot Wire Ammeter,** cf. Fig. 61,565, **for Direct and Alternating Current** of from **0—5 amperes,** in glass case 5. 5. 0

61,565. — idem, with 2 ranges, Figure, **for 0—5 and 0—25 amperes** 6. 15. 0

61,566. — idem, with 3 ranges, for **0—5, 0—25** and **0—50 amperes** 7. 10. 0

61,567. **Dead Beat Demonstration Hot Wire Voltmeter for Direct and Alternating Current,** cf. Fig. 61,565, for **0—15 volts,** with fuses, in glass case 5. 15. 0

61,568. — idem, with 2 ranges, for **0—30** and **0—150 volts** 6. 15. 0

61,569. — idem, with 3 ranges, for **0—30, 0—60** and **0—150 volts** 7. 10. 0

61,570. **Electrostatic Demonstration Voltmeter for Direct and Alternating Current,** Figure, for **0—1000 volts,** with damping magnet 9. 0. 0

61,571. — idem, for **0—500 volts** 9. 0. 0

61,572. **Demonstration Wattmeter for Direct and Alternating Current,** Figure, for 10 amps. and 125 volts, with damping 8. 0. 0

If desired, and at a proportionate variation in price, the wattmeters can be supplied for other current maxima between 0 and 50 amps. and for other voltages.

61,573. **Demonstration Ammeter,** Hummel-Schuckert system, Figure, from 0—1.3 amps., **for projection** 3. 15. 0

61,574. **Demonstration Ammeter,** Dobrovolski system, Figure, from 0 to 10 amps., for projection 3. 15. 0

61,575. **Demonstration Galvanometer,** Deprez-d'Arsonval system, Figure, graduated from 0—30 milliamperes, for projection 5. 10. 0

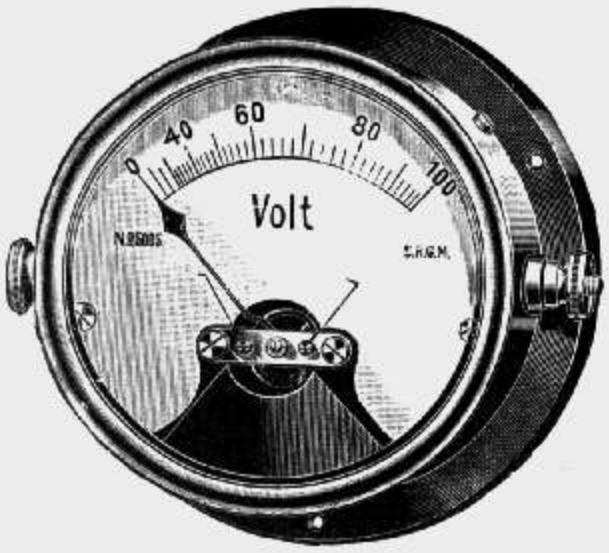
This instrument can also be supplied graduated as a volt- or ammeter.

Technical Measuring Instruments.

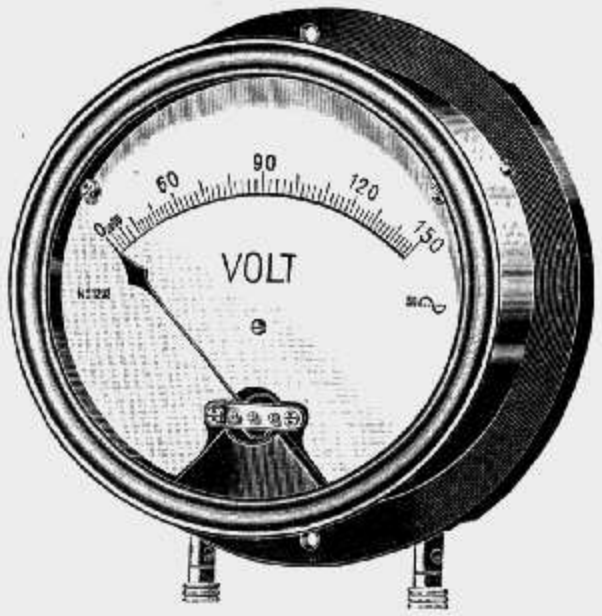
Precision instruments constructed on the Deprez-d'Arsonval system can be recommended before all others for Direct Current, as they are most accurate, dead-beat and possess an even graduation commencing from zero. The electromagnetic instruments for direct or alternating current have an air damping arrangement which is efficient in its action. Their finer graduation commences at about $^1/_5$ of the maximum deflection. When ordering it should be precisely stated whether these instruments are intended for Direct or Alternating Current. In addition, the periodicity should be given, otherwise instruments for 50 cycles are supplied.

For accurate measurements on Alternating Current it is advisable to use Hot Wire Instruments and Dynamometrical Instruments. In these instruments also the finer graduation commences at about $^1/_5$ of the total deflection. The round pattern instruments are, unless otherwise stated, supplied for front connection.

Max Kohl A. G. Chemnitz, Germany.



61 583. 1 : 2.



61 605. 1 : 3.

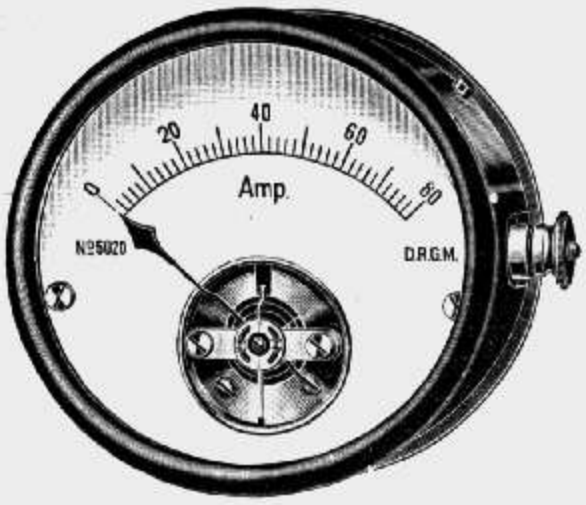
Round Pattern Instruments for permanently fixing on switchboards or stands.

Range	Electromagnetic Soft Iron Instruments with air damping, for Direct or Alternating Current.				Dead Beat Precision Instruments, Deprez-d'Arsonval, for Direct Current only.			
	Baseplate diameter 125 mm		Baseplate diameter 200 mm		Baseplate diameter 125 mm		Baseplate diameter 200 mm	
	List No.	£ s. d.	List No.	£ s. d.	List No.	£ s. d.	List No.	£ s. d.
Voltmeters:								
3 Volts	61 576	1. 1. 0	61 597	1. 8. 0	61 626	1. 19. 0	61 646	2. 3. 0
5 ,,	61 577	1. 1. 0	61 598	1. 8. 0	61 627	1. 19. 0	61 647	2. 3. 0
10 ,,	61 578	1. 1. 0	61 599	1. 8. 0	61 628	1. 19. 0	61 648	2. 3. 0
15 ,,	61 579	1. 1. 0	61 600	1. 8. 0	61 629	1. 19. 0	61 649	2. 3. 0
25 ,,	61 580	1. 1. 0	61 601	1. 8. 0	61 630	1. 19. 0	61 650	2. 3. 0
50 ,,	61 581	1. 1. 0	61 602	1. 8. 0	61 631	2. 1. 0	61 651	2. 3. 0
75 ,,	61 582	1. 1. 0	61 603	1. 8. 0	61 632	2. 1. 0	61 652	2. 3. 0
125 ,,	61 583	1. 3. 0	61 604	1. 9. 0	61 633	2. 3. 0	61 653	2. 3. 0
180 ,,	61 584	1. 6. 0	61 605	1. 10. 0	61 634	2. 3. 0	61 654	2. 3. 0
250 ,,	61 585	1. 6. 0	61 606	1. 11. 0	61 635	2. 6. 0	61 655	2. 8. 0
300 ,,	—	—	61 607	1. 13. 0	—	—	61 656	2. 14. 0
400 ,,	—	—	61 608	1. 16. 0	—	—	61 657	3. 0. 0
600 ,,	—	—	61 609	2. 2. 0	—	—	61 658	3. 6. 0
750 ,,	—	—	61 610	2. 7. 0	—	—	61 659	3. 12. 0
Ammeters:								
0,5 Amp.	61 586	0. 19. 0	61 611	1. 8. 0	—	—	61 660	2. 3. 0
1 ,,	61 587	0. 19. 0	61 612	1. 8. 0	61 636	1. 19. 0	61 661	2. 3. 0
3 Amps.	61 588	0. 19. 0	61 613	1. 8. 0	61 637	1. 19. 0	61 662	2. 3. 0
5 ,,	61 589	0. 19. 0	61 614	1. 8. 0	61 638	1. 19. 0	61 663	2. 3. 0
10 ,,	61 590	0. 19. 0	61 615	1. 8. 0	61 639	2. 0. 0	61 664	2. 3. 0
15 ,,	61 591	0. 19. 0	61 616	1. 8. 0	61 640	2. 0. 0	61 665	2. 3. 0
20 ,,	61 592	0. 19. 0	61 617	1. 8. 0	61 641	2. 0. 0	61 666	2. 3. 0
25 ,,	61 593	0. 19. 0	61 618	1. 8. 0	61 642	2. 2. 0	61 667	2. 3. 0
30 ,,	61 594	0. 19. 0	61 619	1. 8. 0	61 643	2. 2. 0	61 668	2. 3. 0
50 ,,	61 595	1. 0. 0	61 620	1. 9. 0	61 644	2. 4. 0	61 669	2. 3. 0
80 ,,	61 596	1. 1. 0	61 621	1. 9. 0	—	—	61 670	2. 3. 0
100 ,,	—	—	61 622	1. 10. 0	—	—	61 671	2. 4. 0
150 ,,	—	—	61 623	1. 10. 0	—	—	61 672	2. 8. 0
200 ,,	—	—	61 624	1. 12. 0	—	—	61 673	2. 9. 0
250 ,,	—	—	61 625	1. 14. 0	—	—	61 674	2. 10. 0

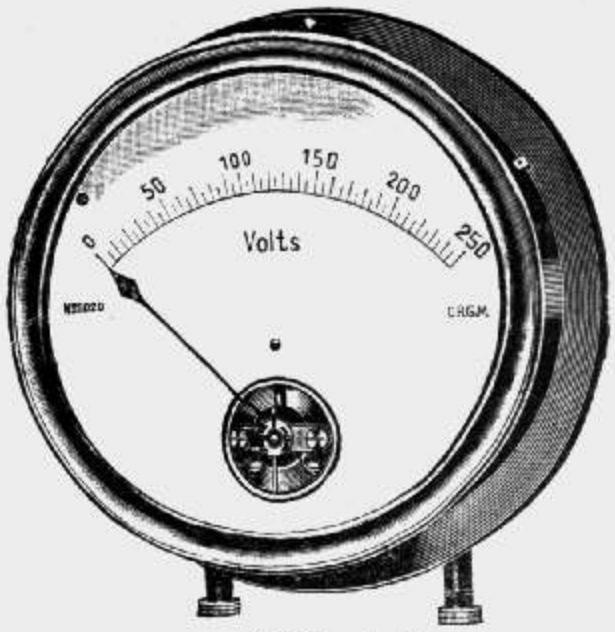
The Precision Ammeters having ranges over 50 amperes are supplied with external shunt.

Kindly read carefully the Preliminary Remarks on p. 905. Cl. 44 b, 46 f.

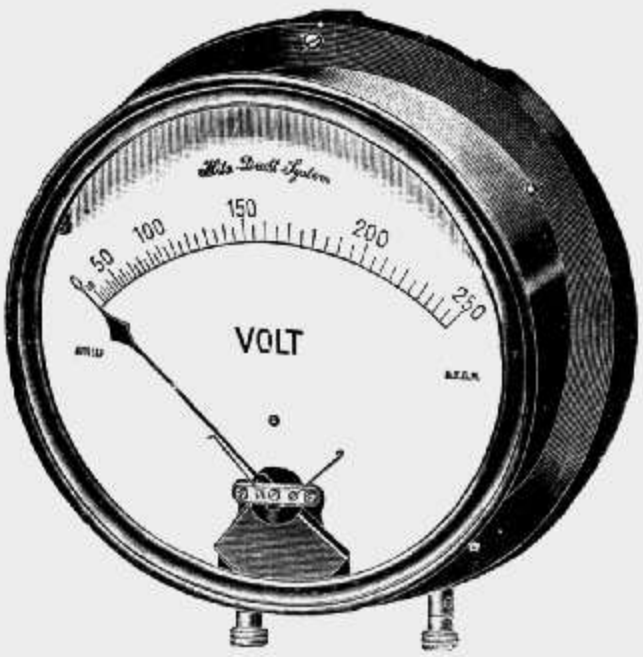
Max Kohl A. G. Chemnitz, Germany.



61 644. 1 : 2.



61 655. 1 : 3.



61 700. 1 : 3.



61 704 and **61 628.** 1 : 3.

61,675. **Extra Price** for the 200 mm diameter Voltmeters, with a third terminal for subdividing the series resistance and obtaining a second range . . . . . £ s. d. 0. 12. 0

61,676. **Extra Price** for the Electromagnetic Instruments if fitted with a spiral spring for enabling them to read correctly in any position . . . . . £ s. d. 0. 2. 0

Dead Beat Hot Wire Measuring Instruments for Direct and Alternating Current, Figure, round pattern, independent of magnetic influences (and, in the case of Alternating Current, independent of the current curve and periodicity as well); **Base plate 246 mm diameter.**

Ammeters:						Voltmeters:					
List No.	Amperes	£ s. d.	List No.	Amperes	£ s. d.	List No.	Volts	£ s. d.	List No.	Volts	£ s. d.
61 677	0.5	**3. 15. 0**	**61 683**	50	**3. 15. 0**	**61 690**	3	**3. 5. 0**	**61 696**	75	**3. 5. 0**
61 678	1	**3. 15. 0**	**61 684**	80	**3. 15. 0**	**61 691**	6	**3. 5. 0**	**61 697**	100	**3. 5. 0**
61 679	5	**3. 15. 0**	**61 685**	100	**3. 15. 0**	**61 692**	10	**3. 5. 0**	**61 698**	125	**3. 5. 0**
61 680	10	**3. 15. 0**	**61 686**	150	**4. 0. 0**	**61 693**	25	**3. 5. 0**	**61 699**	180	**3. 5. 0**
61 681	20	**3. 15. 0**	**61 687**	200	**4. 0. 0**	**61 694**	40	**3. 5. 0**	**61 700**	250	**3. 10. 0**
61 682	25	**3. 15. 0**	**61 688**	300	**4. 10. 0**	**61 695**	60	**3. 5. 0**	**61 701**	300	**3. 15. 0**
			61 689	500	**5. 0. 0**				**61 702**	600	**5. 0. 0**

The Ammeters to 50 amps. have the shunt built into the instrument, those over 50 amps. being provided with external shunt.

Iron Base for Instruments Nos. 61,576—61,674, Figure, for placing on the table.

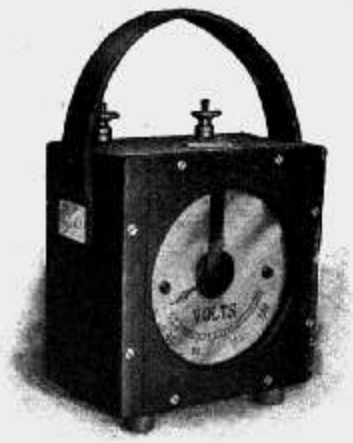
List No.	**61,703**	**61,704**
For instruments of	200	125 mm diameter Base plate
£	**0. 6. 0**	**0. 5. 0**



61 706. 1 : 8.



61 717 and 61 725. 1 : 5.



61 731. 1 : 4.

Wood Stand for Instruments Nos. 61,576—61,702, for placing on a table, Figure.

List No.	61,705	61,706	61,707
For instruments of	246	200	125 mm diameter Base plate
£	0. 12. 0	0. 10. 0	0. 8. 0

Precision Milliammeters, Deprez-d'Arsonval system, Figure.

Range Milliamperes	List No.	Diameter of base	£ s. d.	List No.	Diameter of base	£ s. d.
1—0—1	—	—	—	61 715	125 mm	2. 10. 0
5—0—5	61 708	80 mm	1. 12. 0	61 716	125 ,,	2. 5. 0
10—0—10	61 709	80 ,,	1. 12. 0	61 717	125 ,,	2. 5. 0
25—0—25	61 710	80 ,,	1. 12. 0	61 718	125 ,,	2. 5. 0
50—0—50	61 711	80 ,,	1. 10. 0	61 719	125 ,,	2. 2. 0
100—0—100	61 712	80 ,,	1. 10. 0	61 720	125 ,,	2. 2. 0
500—0—500	61 713	80 ,,	1. 10. 0	61 721	125 ,,	2. 0. 0
1000—0—1000	61 714	80 ,,	1. 10. 0	61 722	125 ,,	2. 0. 0

	£ s. d.
61,723. **Extra Price** for a second range for Instruments of 80 mm and 125 mm diameter of base	0. 7. 0
61,724. **Extra Price** for three ranges — only applicable to instruments of 125 mm diameter of base	0. 11. 0
61,725. **Serpentine Stone Slab** with carrying pillars, Figure, for Milliammeters Nos. 61,708 to 61,722	0. 10. 0

Portable Instruments in Wood Cases.

Simple Electromagnetic Soft Iron Instruments with air damping, for Direct or Alternating Current, with lancet shape pointer, Figure.

Voltmeters	Range	5	10	30	75	125	180	250 volts
	List No.	61,726	61,727	61,728	61,729	61,730	61,731	61,732
	Price £	1. 11. 0	1. 11. 0	1. 11. 0	1. 11. 0	1. 11. 0	1. 13. 0	1. 14. 0

Ammeters	Range	2	5	10	15	20	40	60	80	100 amps.
	List No.	61,733	61,734	61,735	61,736	61,737	61,738	61,739	61,740	61,741
	Price £	1. 10. 0	1. 10. 0	1. 10. 0	1. 10. 0	1. 10. 0	1. 10. 0	1. 11. 0	1. 11. 0	1. 11. 0

In the case of Alternating Current, kindly state frequency; otherwise instruments for 50 periods are supplied.

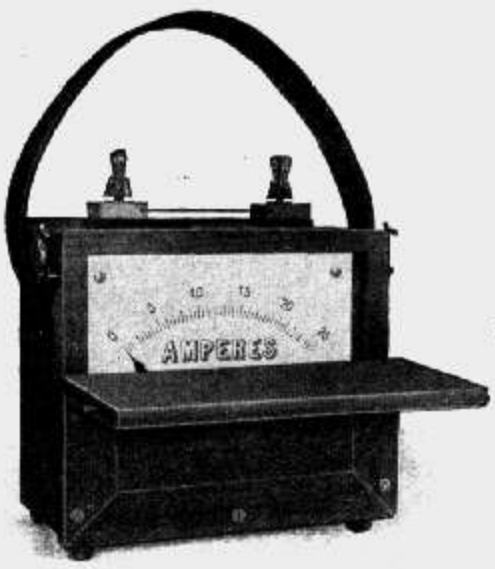
	£ s. d.
61,742. **Extra Price** for two scales for Direct and Alternating Current	0. 3. 6

Dead Beat Precision Instruments, Deprez-d'Arsonval system, for Direct Current only, with lancet shaped pointer, Figure.

Voltmeters	Range	12.5	75	125	250	12.5 and 125	125 and 250 volts
	List No.	61,743	61,744	61,745	61,746	61,747	61,748
	Price £	2. 12. 0	2. 12. 0	2. 14. 0	2. 16. 0	3. 8. 0	3. 8. 0

Ammeters	Range	1.5	15	30	50	75	100 amps.
	List No.	61,749	61,750	61,751	61,752	61,753	61,754
	Price £	2. 12. 0	2. 12. 0	2. 14. 0	2. 14. 0	2. 16. 0	2. 18. 0

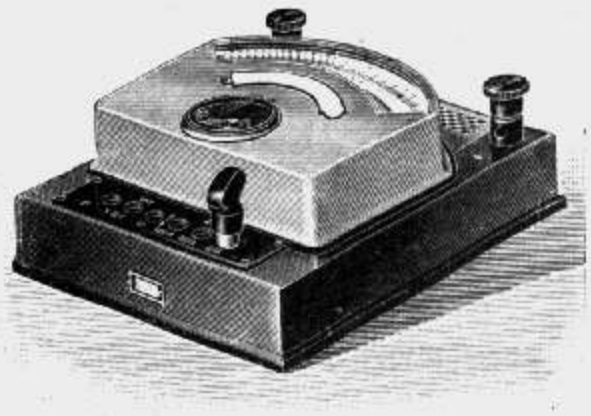
Max Kohl A. G. Chemnitz. Germany.



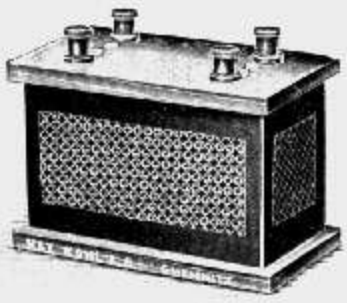
61 751. 1 : 5.



61 757. 1 : 5.



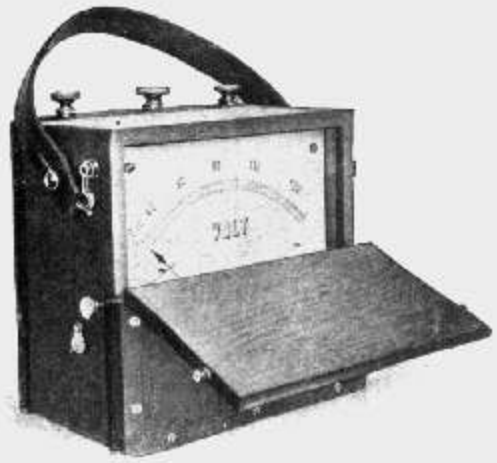
61 777. 1 : 5.



61 769. 1 : 5.



61 776. 1 : 5.



61 784. 1 : 6.

Dead Beat Precision Instruments, Deprez-d'Arsonval system, for Direct Current only, with knife-edge pointer and mirror scale, Figure.

							£ s. d.
Voltmeters	Range	12.5	75	125	250	12.5 and 125	125 and 250 volts
	List No.	**61,755**	**61,756**	**61,757**	**61,758**	**61,759**	**61,760**
	Price £	**4. 5. 0**	**4. 5. 0**	**4. 6. 0**	**4. 10. 0**	**5. 2. 0**	**5. 2. 0**

Ammeters	Range	1.5	15	30	50	75	100 amps.
	List No.	**61,761**	**61,762**	**61,763**	**61,764**	**61,765**	**61,766**
	Price £	**4. 5. 0**	**4. 5. 0**	**4. 8. 0**	**4. 8. 0**	**4. 10. 0**	**4. 12. 0**

Instruments with different ranges, also Ammeters with external shunt, quoted for on application.

Compare also Universal Galvanometer No. 61,362, p. 885.

Series Resistances for Precision Voltmeters, Figure, for increasing the range.

Maximum Range	15	75	150	200	250	300	600	750 volts
List No.	**61,767**	**61,768**	**61,769**	**61,770**	**61,771**	**61,772**	**61,773**	**61,774**
Price £	**1. 2. 0**	**1. 2. 0**	**1. 6. 0**	**1. 8. 0**	**1. 8. 0**	**1. 10. 0**	**1. 18. 0**	**2. 10. 0**

Each Series Resistance can be divided up into as many as five ranges.

61,775. **Extra Price** for each subdivision 0. 9. 0

61,776. **Dead Beat Precision Voltmeter,** Deprez-d'Arsonval system, for Direct Current only, Figure, can also be used for measuring insulations with the working voltage; with three ranges, 0—120, 0—240 and 0—480 volts 2. 6. 0

61,777. **Dead Beat Precision Volt- and Ammeter,** Deprez-d'Arsonval system, for Direct Current only, Figure, with six ranges, 0.15, 1.5 and 15 Amps.; 3, 15 and 150 volts . . . 12. 10. 0

Shunts, of Manganin, for above, with leads.

Range	30	75	150 amperes
List No.	**61,778**	**61,779**	**61,780**
Price £	**2. 0. 0**	**3. 0. 0**	**3. 6. 0**

Precision Hot Wire Voltmeters for Alternating and Direct Current, Figure.

Range	5	30	75	125	250	6 and 120	125 and 250 volts
List No.	**61,781**	**61,782**	**61,783**	**61,784**	**61,785**	**61,786**	**61,787**
Price £	**5. 6. 0**	**5. 6. 0**	**5. 12. 0**	**5. 12. 0**	**6. 0. 0**	**6. 6. 0**	**6. 10. 0**



61 800.



61 810.

61,789. **Precision Hot Wire Ammeter** for Alternating and Direct Current, with external shunts (Millivoltmeter), these shunts not being included in the price, cf. Fig. 61,784. — £ 5. 6. 0

Shunts for above.

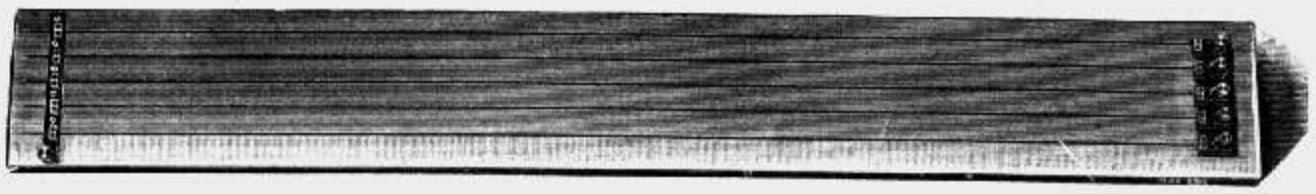
Range	10	20	40	60	100	150	200 amperes
List No.	**61,790**	**61,791**	**61,792**	**61,793**	**61,794**	**61,795**	**61,796**
Price £	**0. 10. 0**	**0. 10. 0**	**0. 10. 0**	**0. 12. 0**	**0. 14. 0**	**0. 16. 0**	**1. 2. 0**

Precision Instruments constructed on the dynamometrical principle, for Alternating and Direct Current. Figures. The graduation on the Voltmeters and Ammeters commences at one-fifth of the maximum scale value. The instruments are provided with leather carrying cases and carrying boxes respectively.

Voltmeters:

List No.	Range. Volts max. I	II	III	IV	One Scale-division. Volts I	II	III	IV	Price £ s. d.
				With 2 Ranges					
61 797	7.5	15	—	—	0.05	0.1	—	—	**12. 15. 0**
61 798	15	30	—	—	0.10	0.2	—	—	**12. 15. 0**
				With 3 Ranges					
61 799	7.5	15	30	—	0.05	0.1	0.2	—	**13. 15. 0**
61 800	15	30	75	—	0.10	0.2	0.5	—	**13. 15. 0**
				With 4 Ranges					
61 801	7.5	15	30	75	0.05	0.1	0.2	0.5	**14. 5. 0**
61 802	15	30	75	150	0.10	0.2	0.5	1.0	**14. 10. 0**
				With 2 Ranges					
61 803	75	150	—	—	0.5	1	—	—	**13. 0. 0**
61 804	150	300	—	—	1.0	2	—	—	**13. 15. 0**
61 805	150	750	—	—	1.0	5	—	—	**14. 5. 0**
61 806	300	750	—	—	2.0	5	—	—	**14. 5. 0**
				With 3 Ranges					
61 807	75	150	300	—	0.5	1	2	—	**15. 0. 0**
61 808	150	300	750	—	1.0	2	5	—	**16. 0. 0**
				With 4 Ranges					
61 809	75	150	300	750	0.5	1	2	5	**17. 5. 0**

Max Kohl A. G. Chemnitz, Germany.



61 833. 1 : 8.



61 835. 1 : 11.

Ammeters:

List No.	Ranges. Amperes maximum		One Scale-division. Amps.		Price
	I	II	I	II	£ s. d.
		With 1 Range			
61 810	1	—	0.01	—	**10. 10. 0**
61 811	5	—	0.05	—	**10. 10. 0**
		With 2 Ranges			
61 812	1	2	0.01	0.02	**12. 5. 0**
61 813	2.5	5	0.025	0.05	**12. 5. 0**
61 814	5	10	0.05	0.1	**12. 5. 0**
61 815	10	20	0.1	0.2	**12. 5. 0**

60,118. **Precision Compass** for determining the direction of current in leads and the poles in magnetic fields, Fig. 60,118, p. 792 . . . . . £ s. d. 0. 12. 0

The instrument is closed on both sides by watch glasses in order to render the magnet needle always visible. The magnet needle itself is very light, thoroughly well balanced, and rests in stones. As the instrument always gives a plain deflection when brought into the immediate neighbourhood of a conductor traversed by a current of 0.1 ampere, it is consequently possible to ascertain the direction of flow of currents in conductors.

Section 4: Ohm's, Kirchhoff's and Joule's Laws.

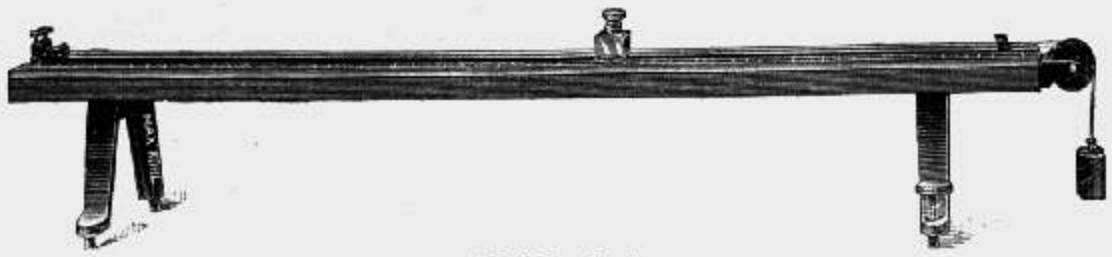
61,833. **Apparatus for Fundamental Resistance Experiments,** Figure, comprising 5 wires of 1 m length stretched between clamps on a polished board. The resistance of each wire can be measured singly. The wires are: 3 Manganin wires of 2, 1 and 0.5 mm; 1 Iron wire of 0.5 mm and 1 Silver wire of 0.5 mm diameter . . . . . £ s. d. 1. 0. 0

61,834. — idem, after Weinhold (W. D., p. 782 [723]), on board with terminals . . . 1. 0. 0

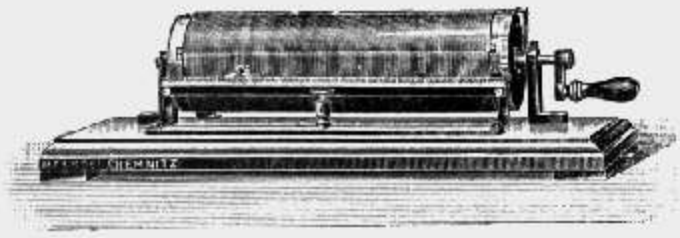
61,835. **5 Wires of Constantan, German Silver, Iron, Copper and Silver,** Figure, of same thickness and same resistance, the lengths corresponding to the specific resistance; on board with pole terminals 1. 0. 0

61,836. **4 Wires of Copper, Brass, Iron and Manganin,** of same length and same cross section, in glass vessel for filling with paraffin, for determining specific resistance (M. T. Fig. 198) 1. 4. 0

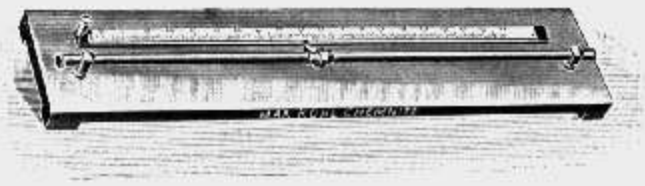
Max Kohl A. G. Chemnitz, Germany.



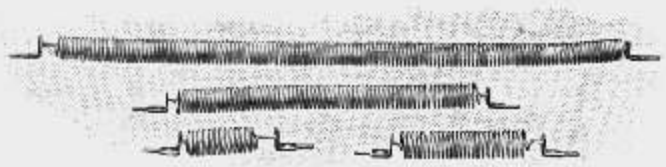
61 839. 1 : 9.



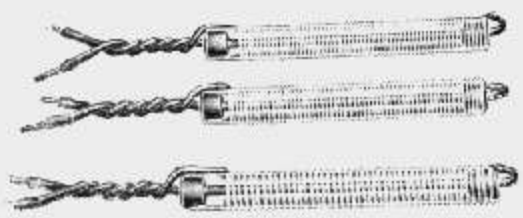
61 837. 1 : 5.



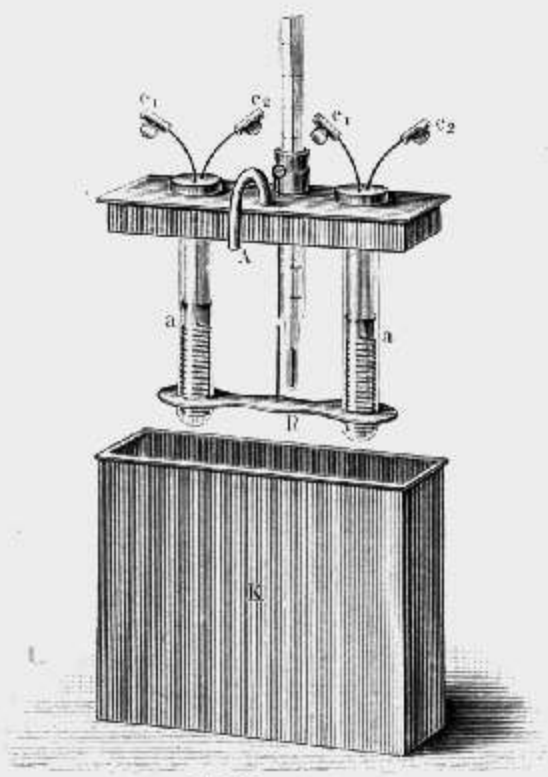
61 840. 1 : 10.



61 841. 1 : 6.



61 843. 1 : 4.



61 846. 1 : 6.

61,837. **Rheostat** after Wheatstone (M. P., 10th Edn., IV, 1, Figs. 343 a and b; 9th Edn., III, Figs. 361 and 362), Figure, with 1 slate cylinder 160 mm long. The resistance corresponding to one turn should be quoted . . . . . £ 3. 0. 0

61,838. — idem, with 1 cylinder 250 mm long 3. 6. 0

61,839. **Rheochord** after Poggendorff, Figure (M. P., 9th Edn., III, Fig. 364), with 2 platinum wires 1 m long and mercury contact vessel 4. 0. 0

61,840. **Rheochord,** Figure, simple, with sliding contact, measuring wire 500 mm long 1. 10. 0

61,841. **4 Resistance Spirals of thick Manganin Wire,** Figure, after Friedr. C. G. Müller (M. T. Fig. 194) one each of 1, 0.5, 0.2 and 0.1 ohm 0. 16. 0

61,842. **Resistance of 0.01 ohm, for Shunt Experiments,** after Friedr. C. G. Müller (M. T. Fig. 195) 1. 0. 0

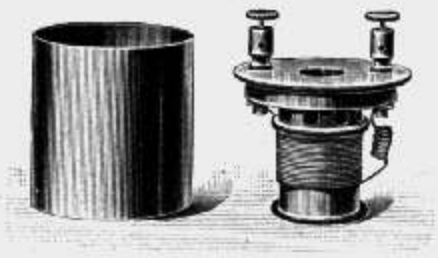
61,843. **3 Resistance Spirals,** after Friedr. C. G. Müller, Figure (M. T. Fig. 191), of copper, German silver and manganin, of equal length and cross section, for demonstrating temperature coefficient 0. 9. 0

61,844. **Device for explaining that the conducting resistance of a metallic conductor depends upon the temperature;** with platinum wire (W. D. Fig. 514 [487]) 0. 4. 0

61,845. **Device for the same Purpose,** for liquids (W. D. Fig. 515 [488]) 0. 1. 0

Cl. 2462, 2460, 2463, 4133, 4809, 2474.

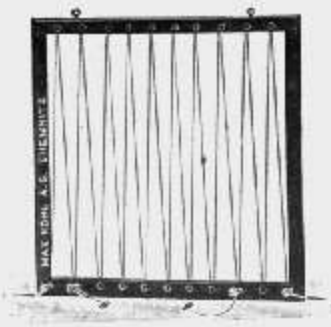
Max Kohl A. G. Chemnitz, Germany.



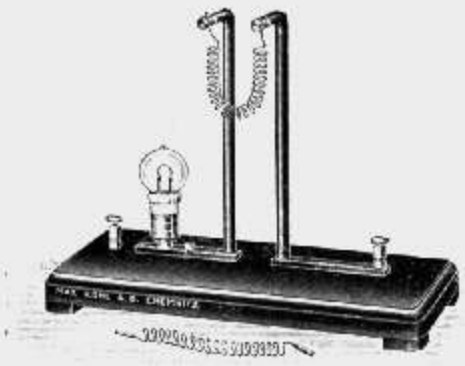
61848, 61849. 1 : 4.



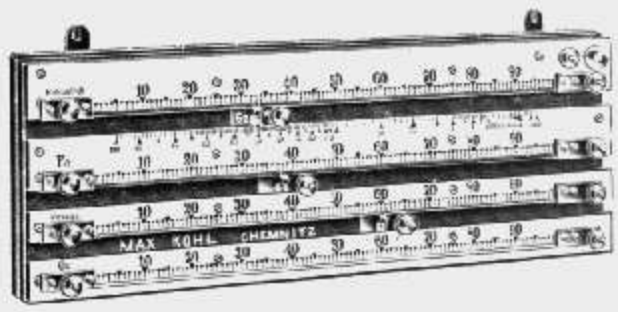
61854. 1 : 4.



61871. 1 : 20.



61847. 1 : 8.



61872. 1 : 10.

61,846. **Apparatus for showing the Influence of Temperature on Resistance,** Figure (W. u. E., Fig. 301), with one spiral each of platinum, nickelin, iron and copper on wood reels in two reagent flasks, with heating vessel, stirrer and thermometer . . — £ 2. 0. 0

61,847. **Apparatus for the same purposes,** after Grimsehl, Figure, with iron wire and manganin spiral heated by a Bunsen burner. A small glow lamp serves as indicator (Grimsehl, Fig. 819) . . . . . — £ 0. 11. 0

61,848. **1 Ohm for School Use,** of manganin, bifilar wound, Figure, adjusted at 20° C., in metal case arranged to receive petroleum for maintaining a constant temperature — £ 0. 16. 0

61,849. **Siemens Unit,** of manganin, bifilar wound, Figure, adjusted at 20° C., in metal case, arranged to receive petroleum for maintaining a constant temperature . . . . . — £ 0. 16. 0

We still supply this unit as being of historica interest.

Single Resistances for forming sets, Figure, of constantan, in metal case, bifilar wound, calibrated at 20° C., with connecting links for forming complete sets of resistances; **also suitable for scholars' exercises.** The terminals have double nuts so as to be able conveniently to introduce branches.

List No.	**61,850**	**61,851**	**61,852**	**61,853**	**61,854**	**61,855**	**61,856**	**61,856a**	**61,857**	**61,858**	**61,859**
Resistance	0.1	0.2	0.3	0.4	1	2	3	4	10	20	30 ohms
£	**0. 3. 0**	**0. 3. 0**	**0. 3. 0**	**0. 3. 0**	**0. 3. 0**	**0. 3. 0**	**0. 3. 0**	**0. 3. 0**	**0. 3. 0**	**0. 3. 0**	**0. 3. 0**

List No.	**61,860**	**61,861**	**61,862**	**61,863**	**61,864**	**61,865**	**61,866**	**61,867**	**61,868**	**61,869**
Resistance	40	100	200	300	400	1000	2000	3000	4000	10,000 ohms
£	**0. 3. 0**	**0. 4. 0**	**0. 4. 0**	**0. 4. 0**	**0. 4. 0**	**0. 4. 0**	**0. 4. 0**	**0. 4. 0**	**0. 4. 0**	**0. 5. 0**

61,870. **3 Resistance Coils** each of **100 ohms,** on wood board (W. D. Fig. 516 [489]) . . — £ 0. 16. 0

61,871. **Conductor** after Kolbe, Figure (Kolbe-Skellon, Introduction to Electricity, Part I, Fig. 3) . . . . . — £ 1. 5. 0

61,872. **Rheostat** after Kolbe, **for demonstrating relative resistance,** Figure (Ztschr. f. d. phys. u. chem. U. **20,** 1907, p. 82); can also be used as a bridge and for students' exercises . . . . . — £ 5. 0. 0

A baseboard (which is also arranged for hanging on the wall) has four wires of constantan, iron, brass and copper of the same cross section, the three first named being provided with a sliding contact. The constantan wire is provided with double push terminals and scale for use, thus enabling it to be used also as a bridge wire.

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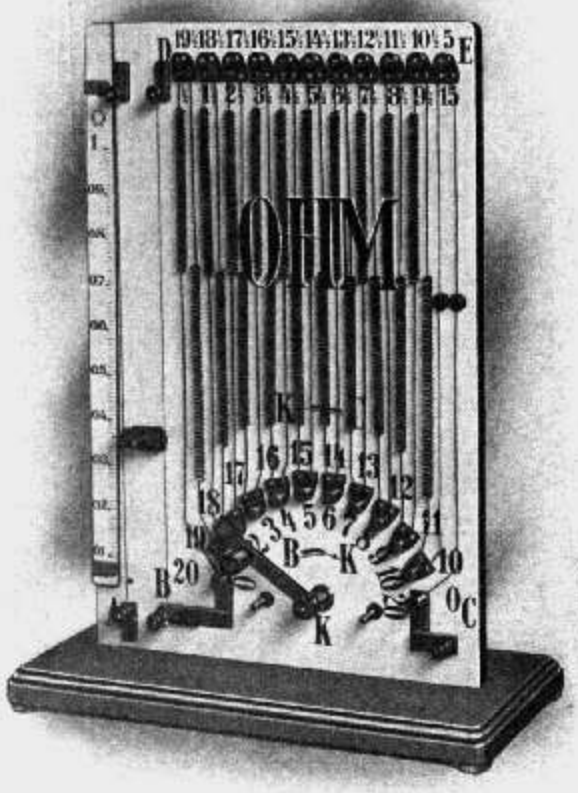
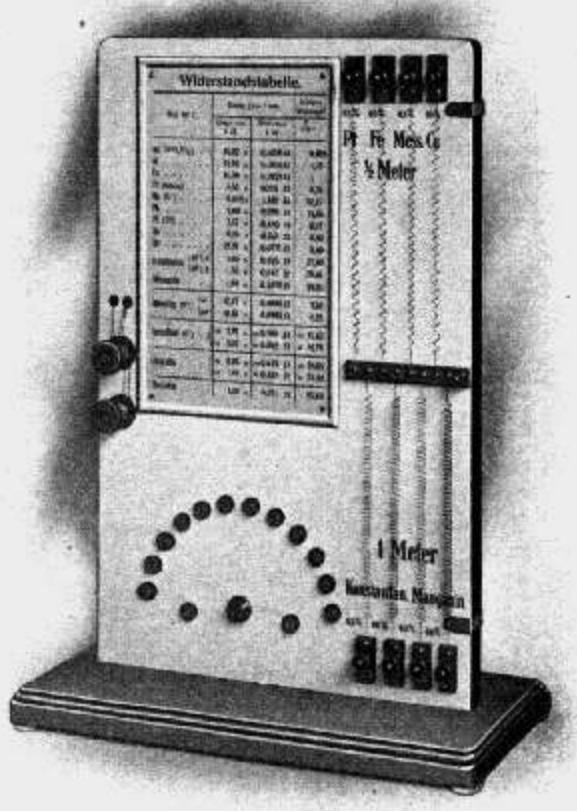


61 873 A. Front View. 1 : 8.



61 873 B. Back View. 1 : 8.

61,873. **School Rheostat** after Kolbe, Figs. A and B (Ztschr. f. d. phys. u. chem. U. **21**, 1908, p. 217), with supplementary rheostat and table of resistances on the back . £ 7. s. 0. d. 0

Fig. A shows the front of the apparatus. Upon a white lacquered, vertical wood slab is arranged first of all a single ohm of bare constantan wire, which can be regulated between 0 and 1 ohm without intermediate steps, by means of a reliable sliding contact. The resistance values corresponding can be read off on an easily interchangeable cardboard scale. This cardboard scale is interchangeable in order that it can be arranged properly when the constantan wire has undergone some wear. To the right of the single ohm is a switch handle rheostat of constantan wire, consisting of 20 spirals of 0.5 ohm each, covered green, and two spirals of red-covered manganin wire (visible on the back) of 5 ohms each. All spirals can be got at easily by the employment of push terminals and can easily be re-calibrated should this prove necessary after long use. All connections are laid open, being comprehensively arranged. The single ohm and the switch handle rheostat are connected in series but can also be used independently. All values between 0 and 21 ohms can be got in fine stages by means of two handles.

On the back of the rheostat (Fig. B) is fixed a table containing the resistances of the commoner metals together with the resistance per metre and the length per ohm for wires of one mm diameter, also the relative resistances. In addition there is also a supplementary rheostat consisting of $^1/_2$ metre of 0.3 mm thick platinum, iron, brass, and copper wire and 1 m each constantan wire 0.3 and 0.6 mm thick and manganin wire 0.3 and 0.9 mm thick. All these wires are accessible singly.

All numbers are painted on very distinctly and are visible at a distance.

61,874. — idem, without supplementary resistance and without table of resistances on the back 6. 0. 0

61,875. **Demonstration Sliding and Plug Rheostat,** after Erlemann, Figs. A, B and C (Ztschr. f. d. phys. u. chem. U. **22**, 1909, p. 353) 12. 0. 0

The rheostat consists of two upright boards joined together by a hinge and a single board for the single ohm, it being possible to attach this smaller board to the large one. Fig. A shows the front with the single ohm 0—1 ohm attached, plug resistance 0—210 ohms, and sliding resistance 0—10 ohms. A copper, iron and German silver wire of equal length and equal cross section are stretched zig-zag fashion across the back (Fig. B). In addition the back contains 8 wires of 50 cm length (3 each of cross Section 1, 2 of cross section 2, and 3 of cross section 3). Fig. C shows the front folded up with the single ohm taken off and fixed on a special baseboard.

This rheostat can be used in a great variety of ways and the zig-zag arrangement of the resistances assists the comprehension of the students.

61,876. — idem, with back blank 10. 10. 0

Max Kohl A. G. Chemnitz, Germany.

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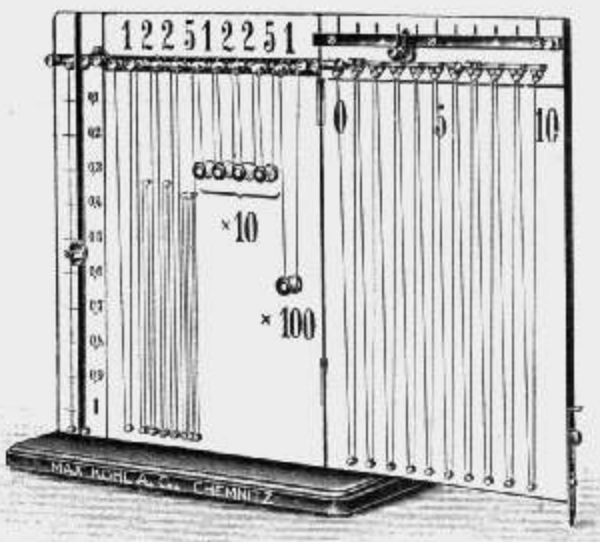
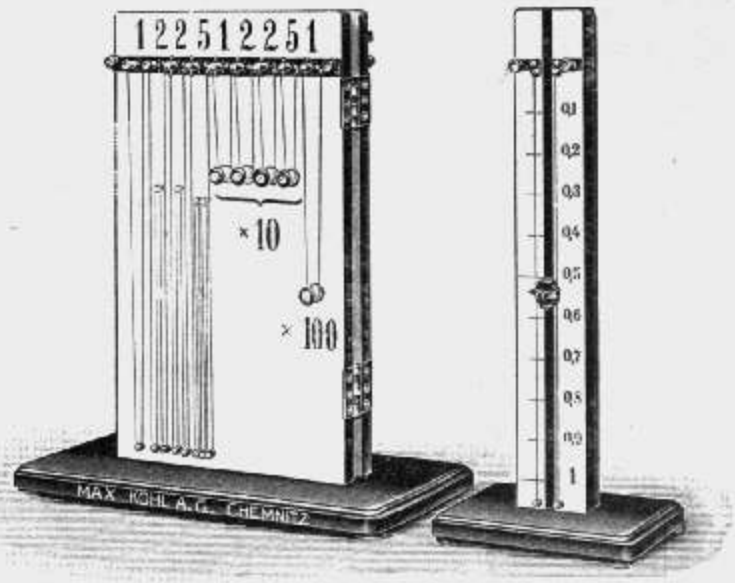
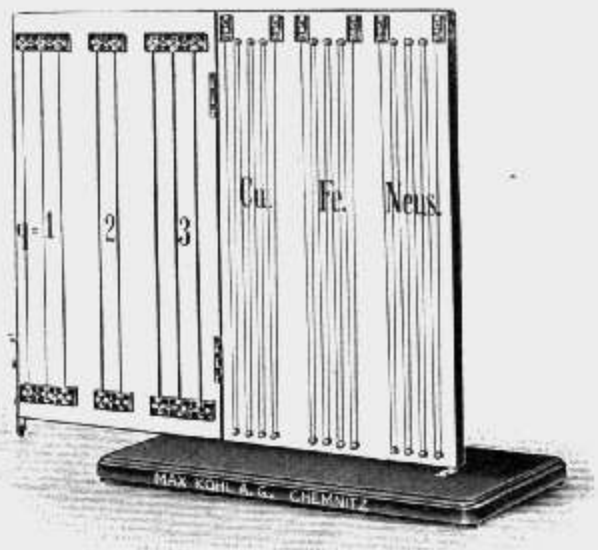


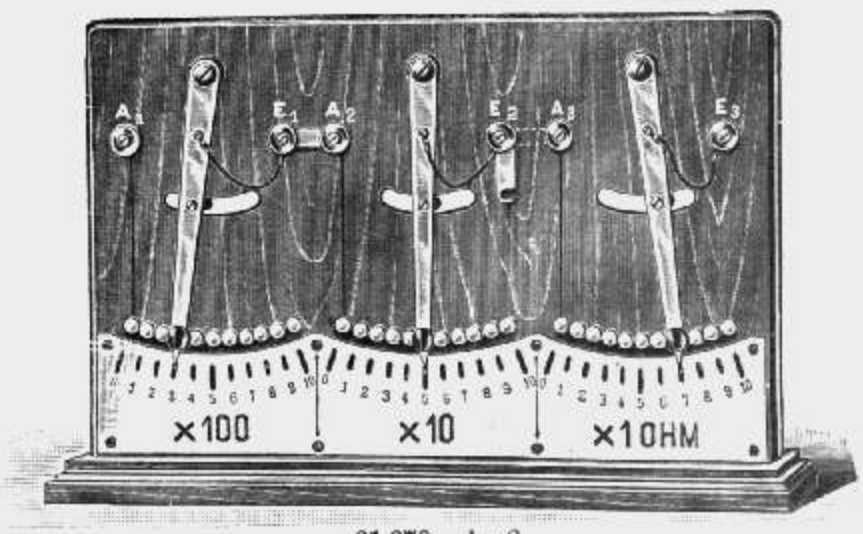
61 875 A. 1 : 10.



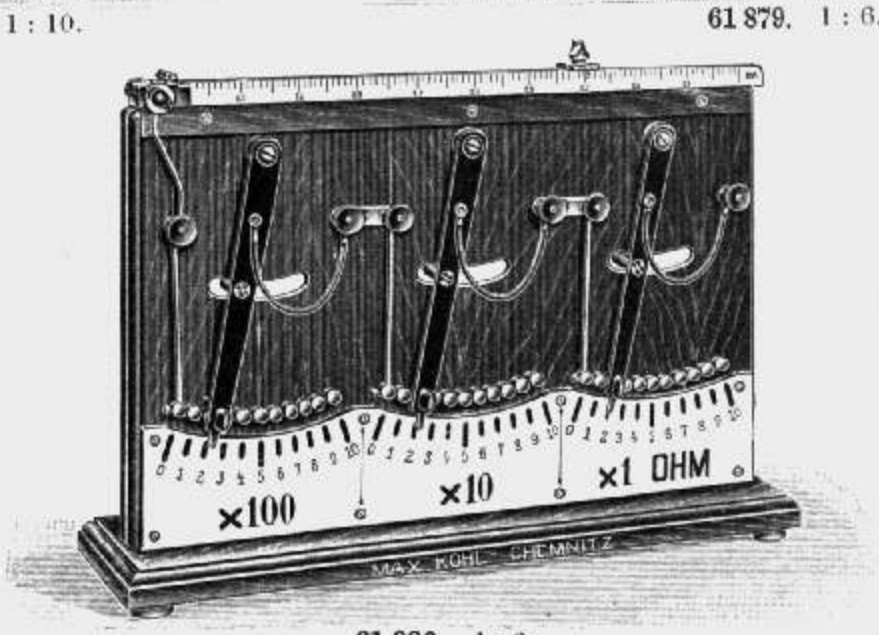
61 875 C. 1 : 10.



61 875 B. 1 : 10.



61 879. 1 : 6.

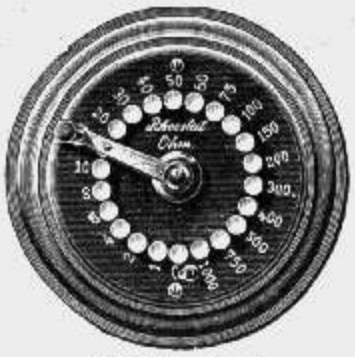


61 880. 1 : 6.

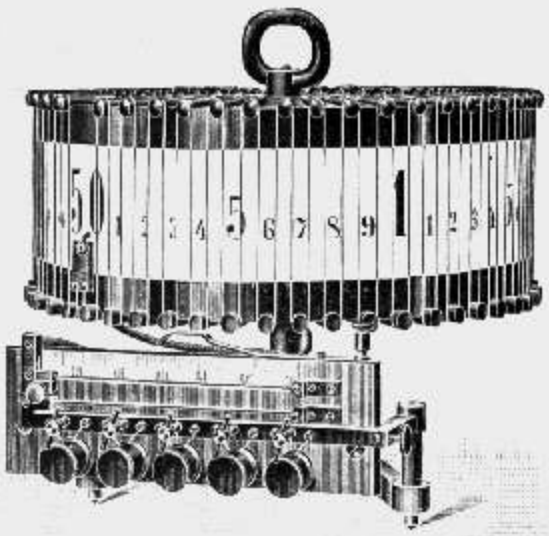
	£ s. d.
61,877. **Single Ohm,** alone, cf. Fig. 61,875 C, to the right	1. 10. 0
61,879. **Switch Contact Rheostat for school use,** Figure	5. 5. 0

The resistance comprises three decades of 10 × 1, 10 × 10 and 10 × 100 ohms, a total of 1100 ohms, which can be used both in series and, by loosening the two connecting bars, separately in single decades for different circuits. The handle, which is manipulated backwards and from the front serves at the same time as a resistance indicator. The non-inductively wound resistances are placed on the back of the apparatus in a comprehensive fashion, being laid open. The maximum load is for the units, 2 amperes; for the tens, 0.8 ampere; and for the hundreds, 0.2 ampere.

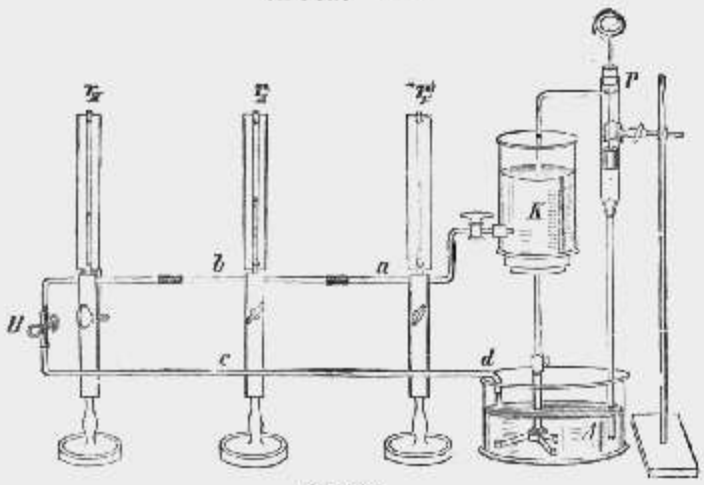
61,880. — idem, with slide wire resistance, Figure, of 1 ohm, divided into 0.1 ohm, for maximum load of 2.5 amps.	6. 10. 0
61,881. **Slide Wire Resistance alone**	1. 5. 0



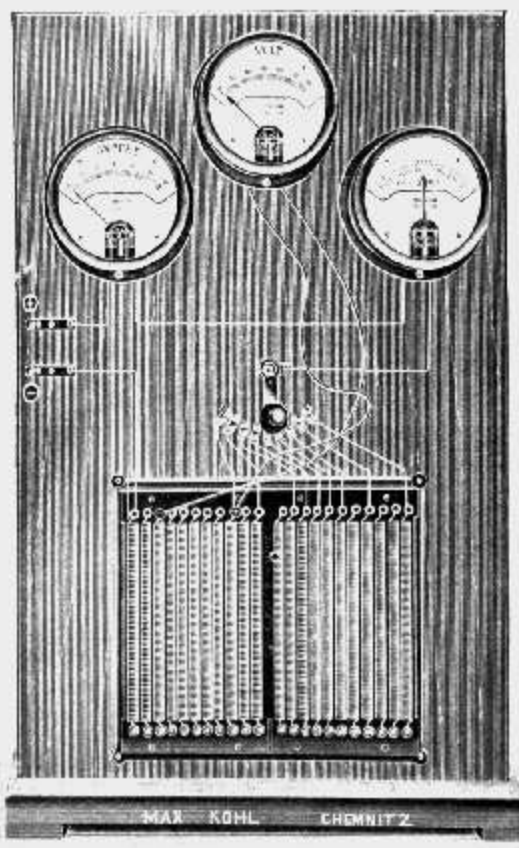
61 882. 1 : 4.

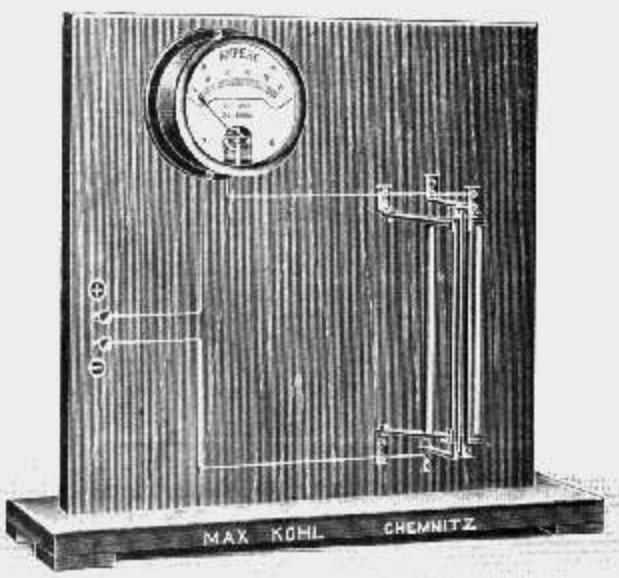


61 888. 1 : 5.



61 889.





61 892. 1 : 10.

61 893. 1 : 13.

61,882. **Switch Contact Rheostat,** Figure, in wood case with ebonite top, with 22 stages, 0, 1, 2, 4, 6, 8, 10, 15, 20, 30, 40, 50, 60, 75, 100, 150, 200, 300, 400, 500, 750, and 1000 ohms (total resistance) . . . . . £ 3. 0. 0

61,883. — idem, in 22 stages, total 2000 ohms 3. 10. 0

61,884. — idem, in 22 stages, total 3000 ohms 4. 0. 0

61,885. — idem, in 22 stages, total 4000 ohms 5. 0. 0

61,886. — idem, in 27 stages, 0, 1, 2, 4, 6, 8, 10, 15, 20, 30, 40, 50, 60, 75, 100, 150, 200, 300, 400, 500, 750, 1000, 1500, 2000, 3000, 4000, 5000 ohms (total resistance) 6. 0. 0

The maximum load for Rheostats Nos. 61,882—61,886 is, for the units, 0.3 ampere; for the tens, 0.1 ampere; for the hundreds, 0.05 ampere; and for the thousands, 0.02 ampere. The resistances are only approximately correct.

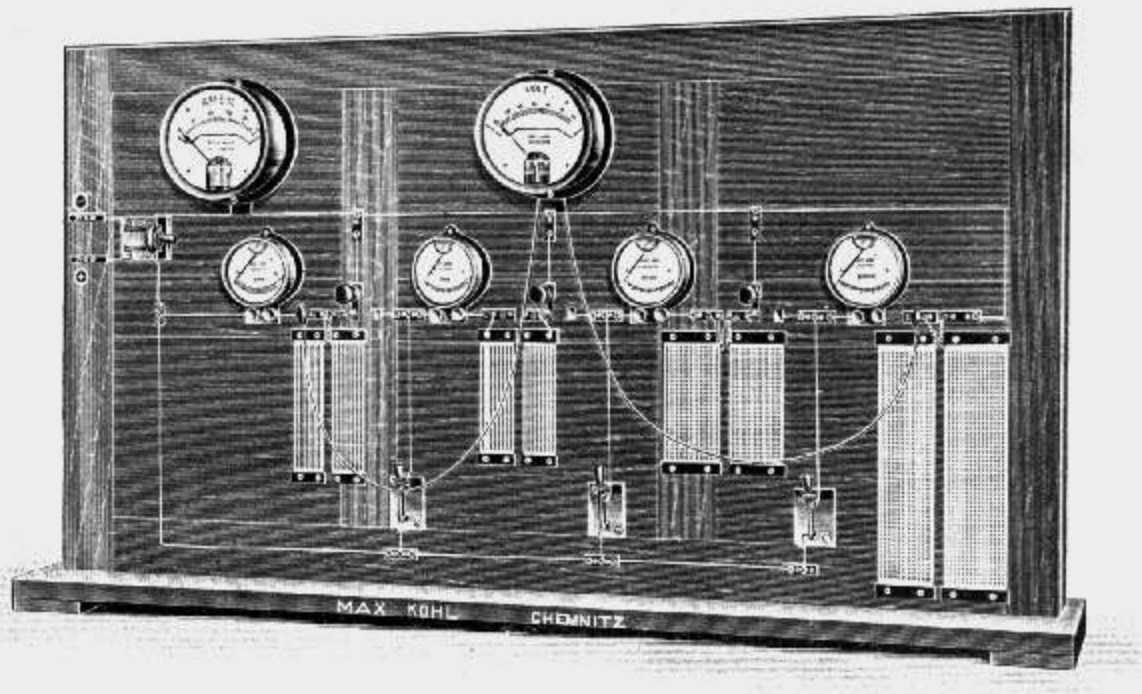
61,888. **Drum Rheostat** after Friedr. C. G. Müller, Figure (Ztschr. f. d. phys. u. chem. U. **10**, p. 12; M. T. p. 275) 7. 0. 0

On a wood drum are stretched vertically 100 manganin wires of which 10 = 0.5 ohm. The drum is rotary and thus more or less resistance can be put in. On a board are fitted four coils with 5, 10, 15 and 20 ohm and a rheochord with 0.1 ohm resistance. Total resistance, 50 ohms. The apparatus is very compact, and the scale visible at a distance.

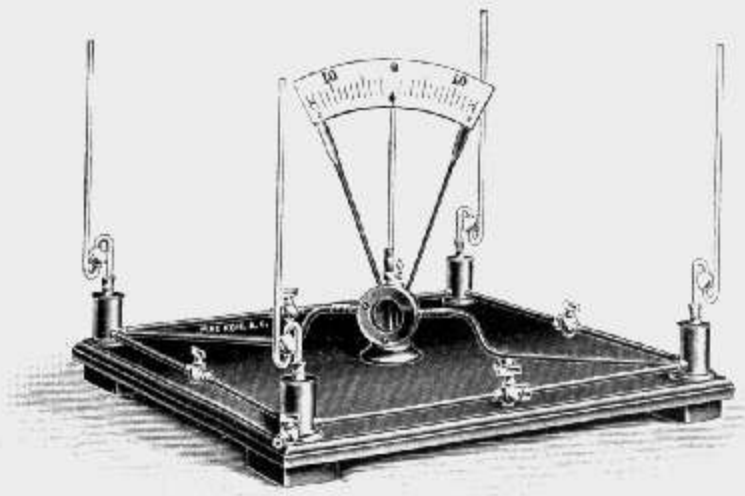
61,115. **Forceps for Shunting,** for above, Figure on p. 866 (M. T. Fig. 200) 0. 4. 0

cp. 2473, 2471, 5907, 4118, 4127.

Max Kohl A. G. Chemnitz, Germany



61 894. 1 : 12.



61 895. 1 : 12.

61,889. **Model for explaining the Galvanic Current and Ohm's Law** by comparison with a water lead (Rüdorff-Lüpke, Grundriß der Chemie, 12th Edn., Fig. 219), Figure — £ 1. 15. 0

61,890. **Model for explaining the Phenomena in Electric Circuits** by liquid currents, after Grimschl (Ztschr. f. d. phys. u. chem. U. **8**, p. 210), single . . . . . — £ 2. 0. 0

61,891. — idem, double . . . . . — £ 2. 15. 0

61,892. **Apparatus** after Götze, for explaining that three Conductors in parallel act the same as one Conductor of three times the cross section, Figure . . . . . — £ 7. 10. 0

61,893. **Apparatus for explaining Ohm's Law,** Figure, after Götze, with precision instruments — one ammeter, one voltmeter, one ohmmeter, resistance with contact circuit, and plug arrangement for connecting up the voltmeter to any parts of the resistance . . . . . — £ 18. 0. 0

61,894. — idem, **with Resistances which can be put in parallel or series,** Figure, with a precision ammeter for the main circuit, 4 small ammeters, 3 change-over switches, and 4 switches, also a precision voltmeter with plug cords . . . . . — £ 24. 0. 0

61,895. **Apparatus for explaining the Wheatstone Bridge hydrodynamically,** after Noack, Figure (Ztschr. f. d. phys. u. chem. U. **1**, p. 236), **with Current Indicator** after Szymanski (Ztschr. f. d. phys. u. chem. U. **2**, p. 272) . . . . . — £ 4. 0. 0

Cl. 4124, 5881.

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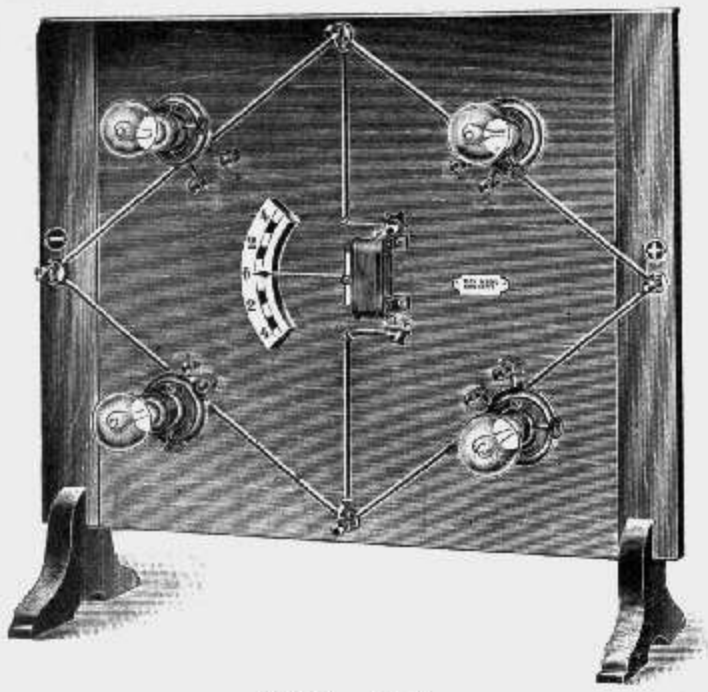
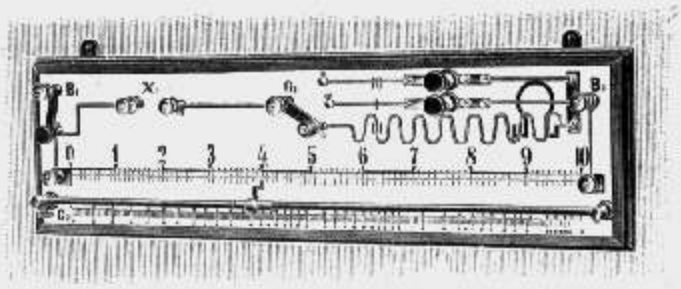
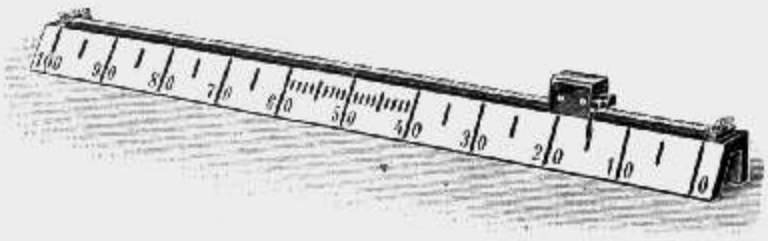


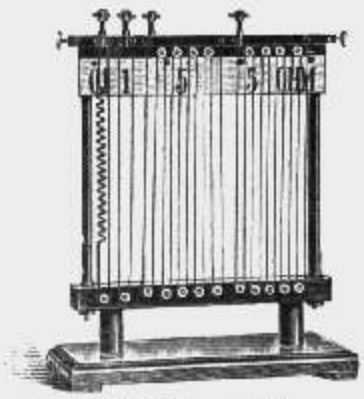
61 896. 1 : 9.



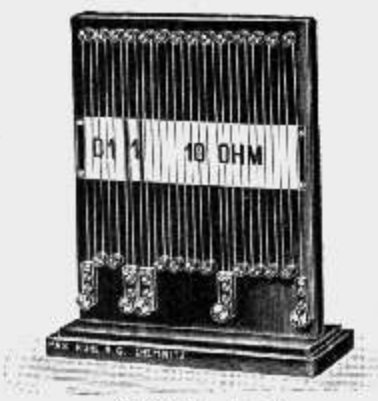
61 897. 1 : 10.



61 898. 1 : 12.



61 899. 1 : 10.



61 900. 1 : 8.



61 901. 1 : 3.

61,896. **Apparatus for explaining the Wheatstone Bridge,** after Spies, Figure, with 4 glow lamp branches (Ztschr. f. d. phys. u. chem. U. **12**, p. 78) . . . . . £ 2. s. 8. d. 0

The glow lamps can be switched out singly and resistances connected to the terminals pertaining to the lamps for comparison purposes.

61,897. **School Pattern Wheatstone Bridge** after Kolbe, Figure, for demonstration and students' exercises (Ztschr. f. d. phys. u. chem. U. **20**, 1907, p. 78) 4. 16. 0

In constructing this apparatus the value has been emphasized of comprehensiveness, plain figuring visible at a distance, and ease of manipulation. The connections have been made on the principle of Kohlrausch's bridge. The measuring wire with its slider G_2, 3 comparison resistances of 0.1, 1 and 10 ohms, a reversing switch G_1, 1 key, also the terminals, are mounted on one baseboard. The slider of the pilot wire slides over two different scales, one of these being provided with a graduation in hundredths, the other — the scale used — being divided according to the quotient $\frac{a}{100-a}$. The bridge can also be hung upon the wall.

61,898. **Wheatstone Bridge for teaching purposes,** Figure, with stretched measuring wire, 1 m long, of constantan, divided in half-decimetres for the audience, and in millimetres for the teacher; without comparison resistances 1. 16. 0

61,899. **4 Comparison Resistances for above,** of 0.1, 1, 5 and 5 ohms, Figure 2. 0. 0

The comparison resistances are prepared of manganin, the temperature coefficient of which is negligible. The wires are stretched in the open and are non-inductive; and the individual amounts can be easily put in circuit by drawing out the corresponding plug. Very neat and convenient to manipulate.

61,900. **3 Comparison Resistances** for No. 61,898, of 0.1, 1 and 10 ohms, Figure . . 1. 10. 0

The smallest resistance of 0.1 ohm is of copper: the other two resistances of 1 and 10 ohms respectively being made of constantan wire, so that it is possible to show the ratio of the specific resistances. The exact resistance values are given on the upper edge of the board.

61,901. **4 Simple Comparison Resistances,** Figure, of manganin, wound on wood reels; 0.1, 1, 5 and 5 ohms 1. 0. 0

Cl. 2469, 5234, 5338, 2466, 5899, 2467.

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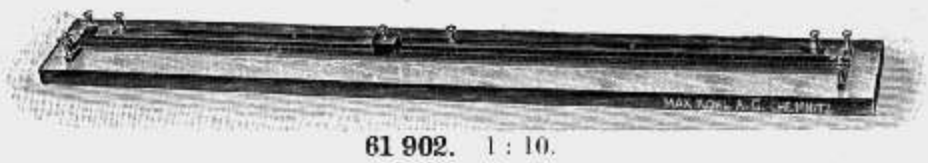
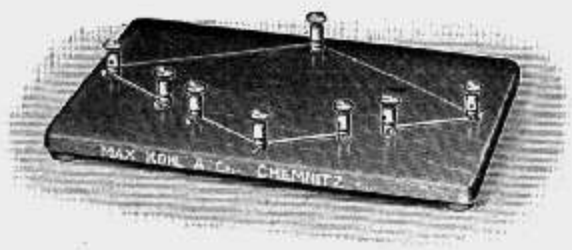


61 902. 1 : 10.



61 905. 1 : 8.



61 906 — 61 911. 1 : 4.



61 912. 1 : 4.

61,902. **Simple Wheatstone Slide Wire Bridge for students' use,** after Hahn, Figure (Hahn, Schülerübungen, Fig. 314; cf. Gan.-Man. Fig. 768; Gan.-Rein., Fig. 936), without comparison resistances . . . . . £ 0. 11. 0

For comparison resistances use can be made of Nos. 62,000—62,011 or the resistances Nos. 61,850 to 61,865.

61,903. **Simple Wheatstone Bridge for school use,** after Friedr. C. G. Müller (M. T. Fig. 196), without comparison resistances 1. 4. 0

61,904. **Double Key** for above (M. T. Fig. 197) 0. 12. 0

For further Double Keys see Nos. 61,144 and 61,145, p. 868.

61,905. **Simple Wheatstone Bridge,** Figure (M. P., 9th Edn., III, Fig. 395), without comparison resistances 0. 15. 0

Standard Resistances.

Please Note. We attach special value to the construction of accurate standard resistances and our laboratory is thoroughly well equipped for satisfying all requirements in this connection.

If desired, and on payment of the usual fees and postal charges, we will send our standard resistances to the Physikalisch-Technische Reichsanstalt for certification as precision resistances.

Standard Resistances, Figures, **of Manganin Wire,** wound on metal cylinder, impregnated with shellac and heated to 140° C. before adjustment. Enclosed in a metal case and provided with bent copper leads for hanging in the mercury cups of a petroleum bath. These resistances, like all other resistances of our manufacture, are calibrated in **International Ohms** (1 ohm = the resistance of a column of mercury 106.3 cm long and of 1 sq. mm cross section at 0° C.

List No.	**61,906**	**61,907**	**61,908**	**61,909**	**61,910**	**61,911**	**61,912**	
Resistance	0.1	1	10	100	1000	10,000	100,000	Ohms
	£ 2. 14. 0	**2. 8. 0**	**2. 8. 0**	**2. 8. 0**	**2. 12. 0**	**2. 14. 0**	**3. 10. 0**	

The load permissible for these resistances is up to **1 watt** when used in the petroleum bath without cooling, and for a short time in air for precision measurements and resistance-comparisons; for technical current measurements the load can be as much as **10 watts.** The maximum permissible currents in the petroleum bath are consequently:

Resistance Ohms	Precision measurements Amperes	Current measurements for technical purposes Amperes
100.000	0.003	0.01
10.000	0.01	0.03
1.000	0.03	0.1
100	0.1	0.3
10	0.3	1
1	1	3
0.1	3	10
0.01	10	30
0.001	30	100
0.0001	100	300

Standard Resistance No. 61,912 of 100,000 ohms has special terminals on the limbs, see Fig. 61,912.

61,913. **Extra price** for Nos. 61,906—61,911 constructed with special terminals as per Fig. 61,912 to enable the resistances to be connected direct to wires 0. 5. 0

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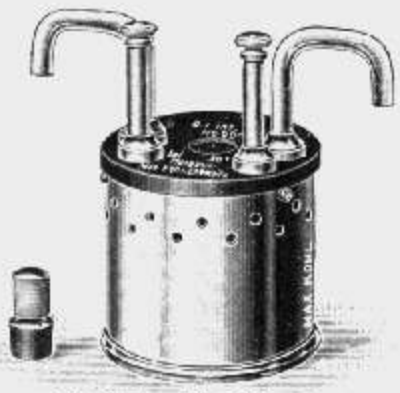
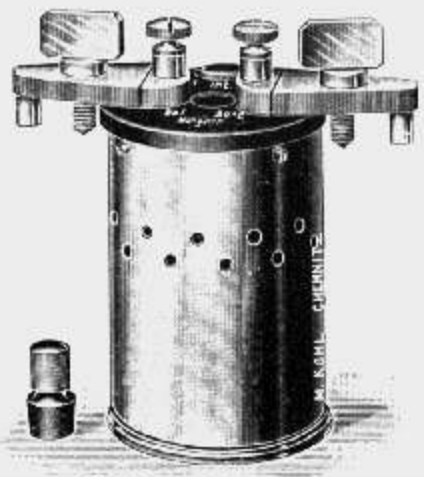
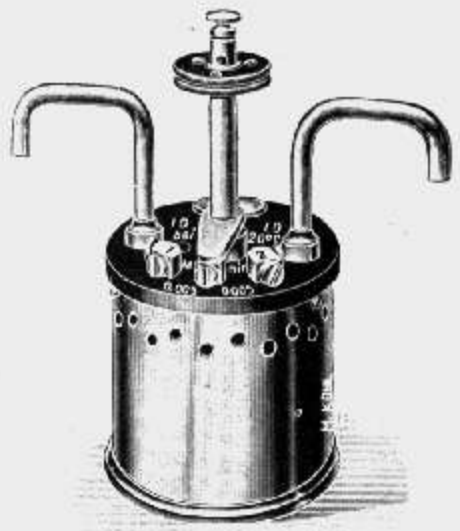


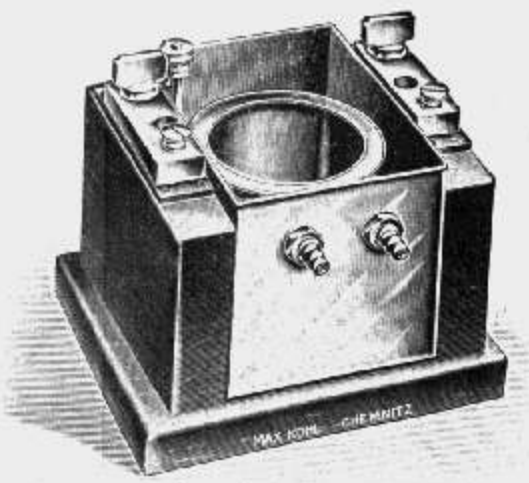
61 914 — 61 917. 1 : 4.



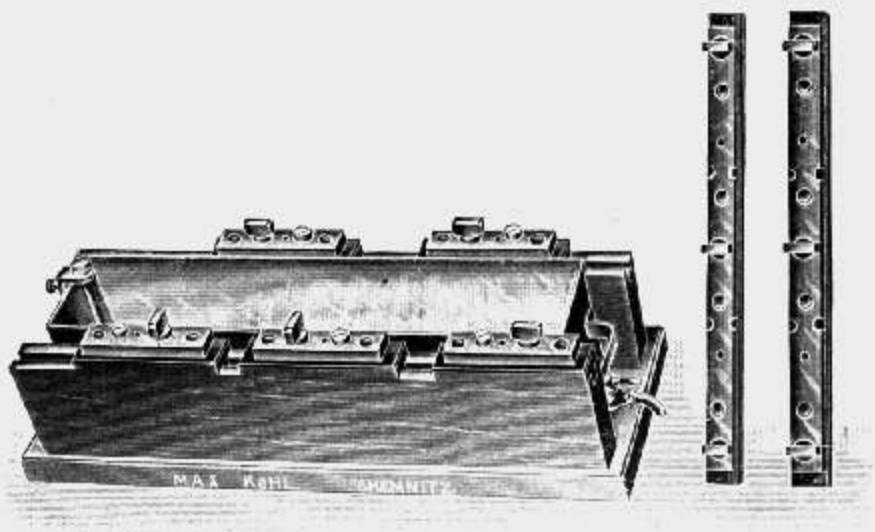
61 918 — 61 921. 1 : 4.



61 924 — 61 926. 1 : 3.



61 927. 1 : 6.



61 928. 1 : 10.

Standard Resistances with separate Shunt Terminals for current measurements, of manganin wire, Figure

				£ s. d.
List No.	**61,914**	**61,915**	**61,916**	**61,917**
Resistance	0.001	0.01	0.1	1 ohm
£	**3. 0. 0**	**3. 0. 0**	**3. 0. 0**	**2. 14. 0**

Standard Resistances of small values, for current measurements, of manganin sheet, Figure.

List No.	**61,918**	**61,919**	**61,920**	**61,921**
Resistance	0.00001	0.0001	0.001	0.01 ohm
£	**12. 0. 0**	**6. 0. 0**	**4. 0. 0**	**4. 0. 0**

The sheet resistances can be loaded up to 100 watts for technical current measurements in petroleum bath No. 61,927 if well cooled.

— idem, **for heavy Currents,** with case formed to suit petroleum bath and with turbine.

For currents to	2000	800 amps.
List No.	**61,922**	**61,923**
Resistance	0.0001	0.001 ohm
£	**18. 15. 0**	**16. 0. 0**

Shunt Resistances with interpolation, Figure.

List No.	**61,924**	**61,925**	**61,926**
Resistance	10	100	1000 ohms
£	**4. 10. 0**	**4. 10. 0**	**4. 10. 0**

With two similar resistances of the magnitude given. These resistances serve also as the two arms of a Wheatstone Bridge for the purpose of accurately comparing two standard resistances of the same value in petroleum bath No. 61,928 or 61,932. By means of a reversing switch one of the resistances can be increased or decreased by $^1/_{100}$ or $^1/_{1000}$ of its value as compared with the other. As a rule these resistances are supplied to change by $^1/_{1000}$.

61,927. **Petroleum Bath** for **one** standard resistance, Figure, with Turbine and Cooler 5. 0. 0

This bath is arranged for using standard resistances Nos. 61,906—61,921 for current measurements. The resistances are suspended in two fixed mercury cups insulated by ebonite, these cups having each

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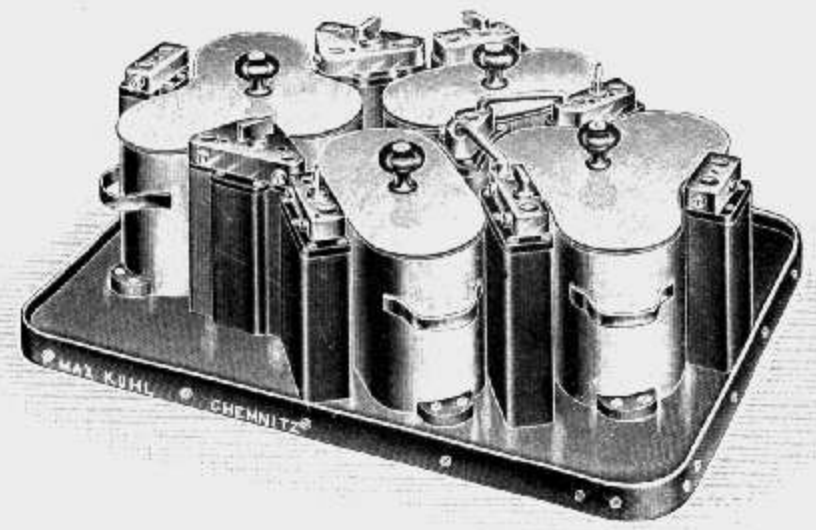
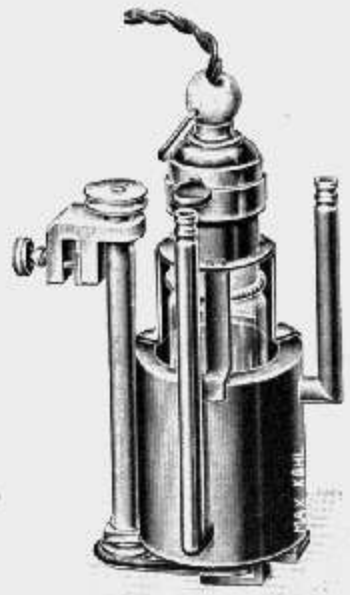


61 932 A. 1 : 8.



61 932 B. 1 : 3.

one massive binding screw for leading in the current and each a second for the potential lead. In the case of the resistances with special shunt terminals the potential lead is fixed to these. The petroleum bath contains a cooling vessel for water circulation and an efficient turbine for circulating the petroleum. The turbine has a cord drive, being actuated by a small electric motor or a water motor.

	£ s. d.
61,928. **Petroleum Bath** for **4** Resistances, with one turbine, 5 short bars with terminals and mercury cups for series connection and 2 long bars for parallel connection of the resistances, Figure	7. 0. 0
61,929. — idem, without the two paralleling rails	6. 0. 0
61,930. — idem, for **5** resistances, with turbine, 6 short and 2 long copper bars . . .	9. 0. 0
61,931. — idem, without the 2 copper paralleling bars	7. 15. 0
61,932. **Petroleum Bath**, Figs. A and B, own new pattern, for comparing single resistances and two resistances in series and for determining temperature coefficients; with heating and cooling arrangements, Fig. B; can also be used as it stands for the Thomson method of connecting	16. 0. 0

Standard Resistances can be compared both by the Wheatstone and the Thomson method with the aid of the shunting resistances Nos. 61,924—61,926. The heating is done by a glow lamp and the cooling by a water jacket and stirring turbine.

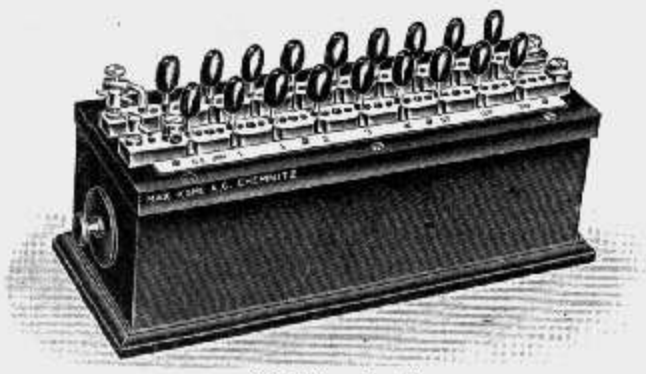
Resistances and Bridges for Scientific and Technical Purposes.

Precision Rheostats of Manganin Wire, impregnated with shellac and heated for 10 hours to 140° C. before calibration. The ends of the resistance coils are silver soldered flush on to copper pieces and the latter can be soldered with tin to the bolts which are used as conductors. The plugs have ebonite grips.

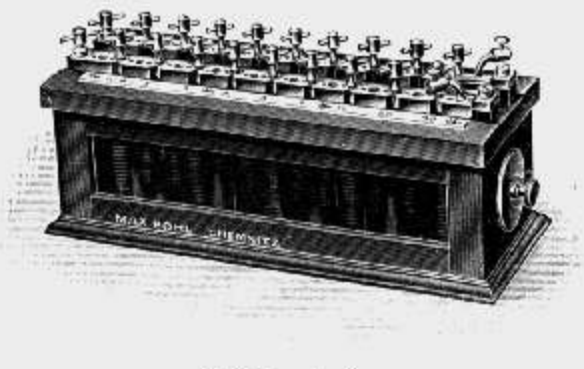
The plug blocks are provided with special plug-holes for inserting wire connected terminals so as to be able to use each resistance coil singly. The resistance coils to 5 ohms are wound bifilar (non-inductive), those above 5 ohms in accordance with Chapron's method (non-inductive and anti-capacity). Each resistance box has openings which may be closed, for steadying the temperature, and opening for taking a thermometer. The error of calibration of the precision resistances is within one part in one thousand. The resistances are calibrated in International Ohms.

The following is the permissible load:

Resistance in Ohms	0.1—0.4	1—4	100—400	1000—4000	10 000—40 000
Permissible Current, Amps.	1	0.4	0.04	0.015	0.003



61 948. 1 : 8.



61 951. 1 : 8.

Precision Series Rheostats, Figure (cf. Gan.-Man. Fig. 769; Gan.-Rein. Fig. 844).

			£	s.	d.
61,933.	— With 6 Plugs:	0.1; 0.1; 0.2; 0.3; 0.4; 1 Ohm	5.	0.	0
61,934.	— ,, 6 ,,	1; 1; 2; 3; 4; 10 Ohms	4.	4.	0
61,935.	— ,, 6 ,,	10; 10; 20; 30; 40; 100 Ohms	4.	8.	0
61,936.	— ,, 6 ,,	100; 100; 200; 300; 400; 1000 Ohms	4.	14.	0
61,937.	— ,, 6 ,,	1000; 1000; 2000; 3000; 4000; 10 000 Ohms	8.	0.	0
61,938.	— ,, 6 ,,	10,000; 10,000; 20,000; 30,000; 40,000; 100,000 Ohms	11.	0.	0
61,939.	— ,, 8 ,,	1; 1; 2; 3; 4; 10; 20; 30 Ohms	5.	10.	0
61,940.	— ,, 8 ,,	1; 2; 3; 4; 10; 20; 30; 40 Ohms	5.	10.	0
61,941.	— ,, 8 ,,	10; 10; 20; 30; 40; 100; 200; 300 Ohms	5.	10.	0
61,942.	— ,, 8 ,,	10; 20; 30; 40; 100; 200; 300; 400 Ohms	5.	10.	0
61,943.	— ,, 8 ,,	100; 200; 300; 400; 1000; 2000; 3000; 4000 Ohms	6.	10.	0
61,944.	— ,, 12 ,,	1; 1; 2; 3; 4; 10; 20; 30; 40; 100; 200; 300 Ohms	7.	0.	0
61,945.	— ,, 12 ,,	0.1; 0,1; 0.2; 0.3; 0.4; 1; 1; 2; 3; 4; 10; 20 Ohms	7.	0.	0
61,946.	— ,, 14 ,,	1; 1; 2; 3; 4; 10; 20; 30; 40; 100; 200; 300; 400; 1000 Ohms	8.	0.	0
61,947.	— ,, 14 ,,	0.1; 0.1; 0.2; 0.3; 0.4; 1; 1; 2; 3; 4; 10; 20; 30; 40 Ohms	8.	0.	0
61,948.	— ,, 18 ,,	0.1; 1; 1; 2; 3; 4; 10; 20; 30; 10; 100; 200; 300; 400; 1000; 2000; 3000; 4000 Ohms	11.	0.	0
61,949.	— ,, 18 ,,	0.01; 0.1; 0.2; 0.3; 0.4; 1; 1; 2; 3; 4; 10; 20; 30; 40; 100; 200; 300; 400 Ohms	10.	10.	0
61,950.	— ,, 22 ,,	0.1; 0.2; 0.3; 0.4; 1; 1; 2; 3; 4; 10; 20; 30; 40; 100; 200; 300; 400; 1000; 2000; 3000; 4000; 10,000 Ohms	13.	10.	0
61,951.	**Extra Price** for constructing the Rheostats with two glass side walls, Figure, for demonstrating the internal arrangement		0.	6.	0

Precision Decade Resistances of manganin, comprising 10 similar resistances totalled by a plug.

List No.	61,952	61,953	61,954	61,955	61,956	61,957	61,958
Resistance	10 × 0.1	10 × 1	10 × 10	10 × 100	10 × 1000	10 × 10,000	10 × 100,000 ohms
£	**7. 0. 0**	**6. 10. 0**	**6. 10. 0**	**6. 10. 0**	**7. 10. 0**	**9. 0. 0**	**25. 0 0**

The decimal resistances possess the advantage in accurate working that one plug only is always inserted so that the contact resistance is always the same. A second plug is supplied in order that the circuit may remain uninterrupted.

Precision Decade Resistances of manganin, grouped up to a contact handle, Figs. A and B, with covered contacts; the resistance indicated by projecting figures. Fig. B shows the contacts (covers removed).

One Decade:

List No.	61,960	61,961	61,962	61,963	61,964	61,965
Resistance	10 × 0.1	10 × 1	10 × 10	10 × 100	10 × 1000	10 × 10,000 ohms
£	**6. 0. 0**	**6. 0. 0**	**6. 0. 0**	**6. 0. 0**	**7. 0. 0**	**9. 0. 0**

Two Decades:

List No.	61,966	61,967	61,968	61,969	61,970
Resistance	10 × 0.1 & 1	10 × 1 & 10	10 × 10 & 100	10 × 100 & 1000	10 × 1000 & 10,000 ohms
£	**10. 10. 0**	**10. 10. 0**	**10. 10. 0**	**10. 10. 0**	**10. 15. 0**

Three Decades:

List No.	61,971	61,972	61,973
Resistance	10 × 0.1, 1 & 10	10 × 1, 10 & 100	10 × 10, 100 & 1000 ohms
£	**15. 10. 0**	**15. 10. 0**	**15. 10. 0**

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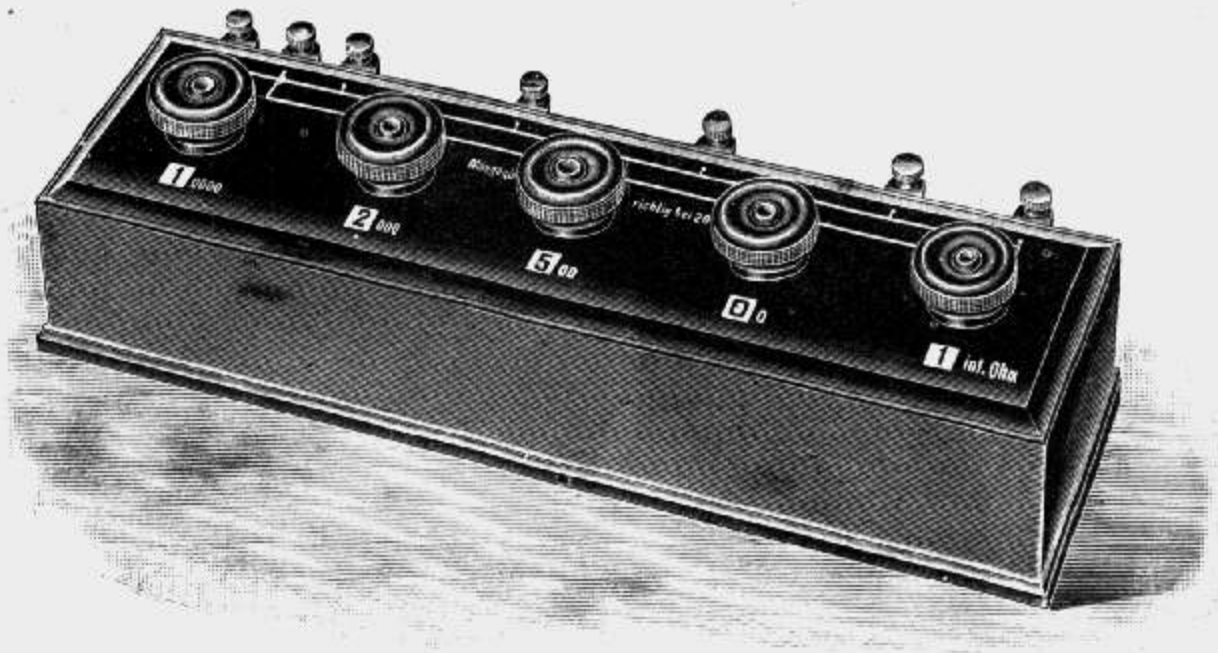
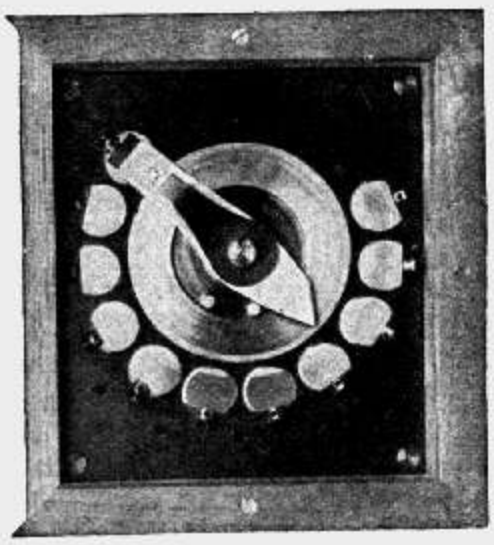
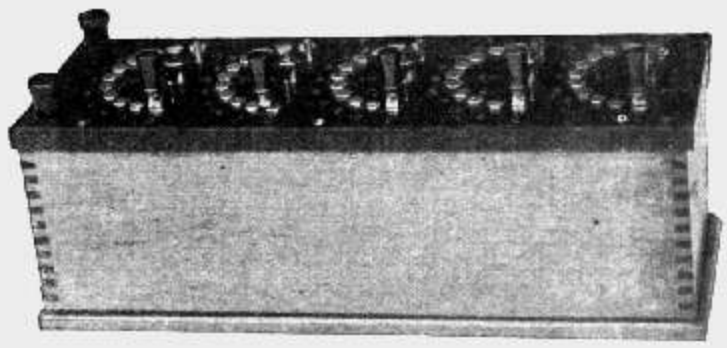


61 977 A.



61 977 B.



61 996.

£ s. d.

Four Decades:

List No.	61,974	61,975	61,976
Resistance	10×0.1, 1, 10 & 100	10×1, 10, 100 & 1000	10×10, 100, 1000 & 10,000 ohms
£	**20. 10. 0**	**20. 10. 0**	**20. 10. 0**

61,977. **Five Decades:** 10×1, 10, 100, 1000 & 10,000 ohms 25. 10. 0

Technical Decade Resistances, of Manganin, Figure, connected up to switch contacts; adjustment accurate to at least 0.5%.

One Decade:

List No.	61,979	61,980	61,981	61,982	61,983	61,984
Resistance	10×0.1	10×1	10×10	10×100	10×1000	10×10,000 ohms
£	**3. 0. 0**	**3. 0. 0**	**3. 0. 0**	**3. 0. 0**	**3. 10. 0**	**4. 10. 0**

Two Decades:

List No.	61,985	61,986	61,987	61,988	61,989
Resistance	10×0.1 & 1	10×1 & 10	10×10 & 100	10×100 & 1000	10×1000 & 10,000 ohms
£	**5. 5. 0**	**5. 5. 0**	**5. 5. 0**	**5. 5. 0**	**5. 10. 0**

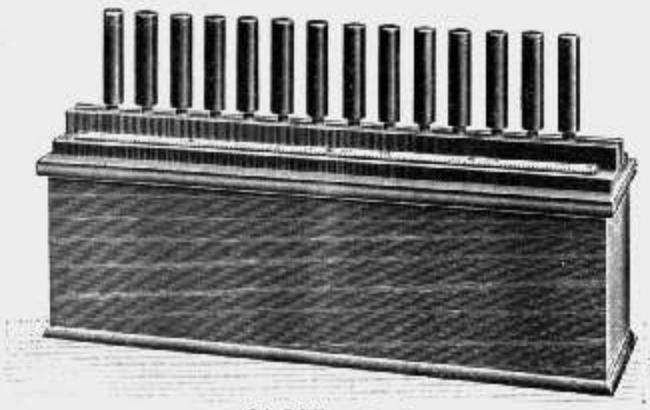
Three Decades:

List No.	61,990	61,991	61,992
Resistance	10×0.1, 1 & 10	10×1, 10 & 100	10×10, 100 & 1000 ohms
£	**7. 15. 0**	**7. 15. 0**	**7. 15. 0**

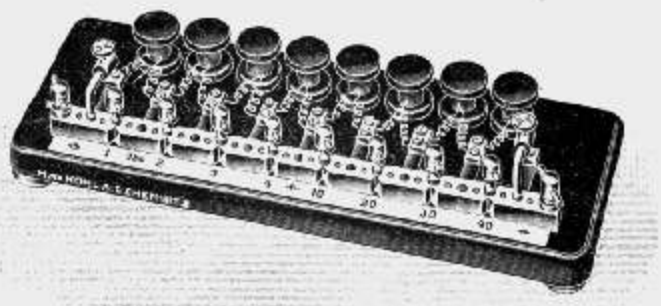
Four Decades:

List No.	61,993	61,994	61,995
Resistance	10×0.1, 1, 10 & 100	10×1, 10, 100 & 1000	10×10, 100, 1000 & 10,000 ohms
£	**10. 5. 0**	**10. 5. 0**	**10. 5. 0**

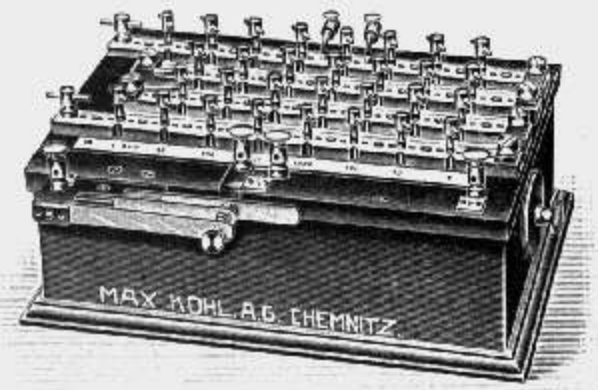
61,996. **Five Decades:** 10×1, 10, 100, 1000 & 10,000 ohms 12. 10. 0



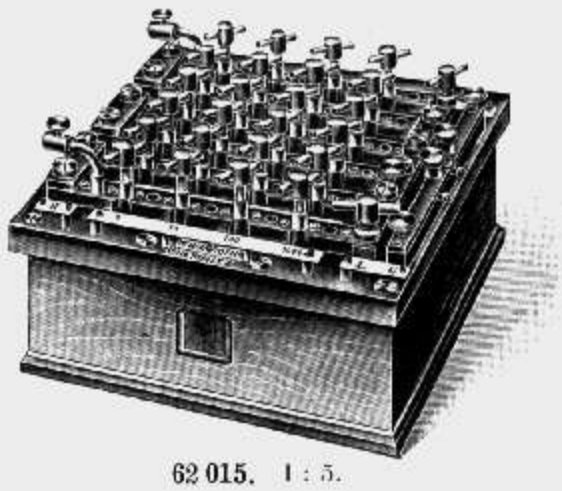
61 997. 1 : 7.



62 006. 1 : 6.



62 014. 1 : 6.



62 015. 1 : 5.

61,997. **High-Tension Rheostat,** Figure, with 14 plugs: 1, 2, 3, 4, 10, 20, 30, 40, 100, 200, 300, 400, 1000, 2000 ohms . . . . . £ 9. s. 0. d. 0

In this apparatus, which is intended to be used as an additional resistance, etc. in circuits charged with potentials dangerous to life, the metal parts are protected with ebonite against accidental contact with the hands, the plugs having long ebonite grips.

61,998. — idem, with 14 plugs: 5, 10, 20, 30, 40, 100, 200, 300, 400, 1000, 2000, 2000, 2000, 2000 ohms 9. 10. 0

61,999. **High Tension Decade Resistance** with 10 × 10,000 ohms 12. 0. 0

Each two are connected with a piece of cable, highly insulated, and plugs provided with long ebonite grips form the connection between the common rails and the individual segments. The winding is subdivided a number of times.

School Rheostats of Manganin, Figure, with resistance coils mounted open, thus securing comprehensiveness. Each plug block is provided with a conical hole for inserting shunt terminal. The accuracy of adjustment exceeds by 0.5 per cent the standard prescribed by the Physikalisch Technische Reichsanstalt for technical resistances. Two shunt terminals are given in with each resistance.

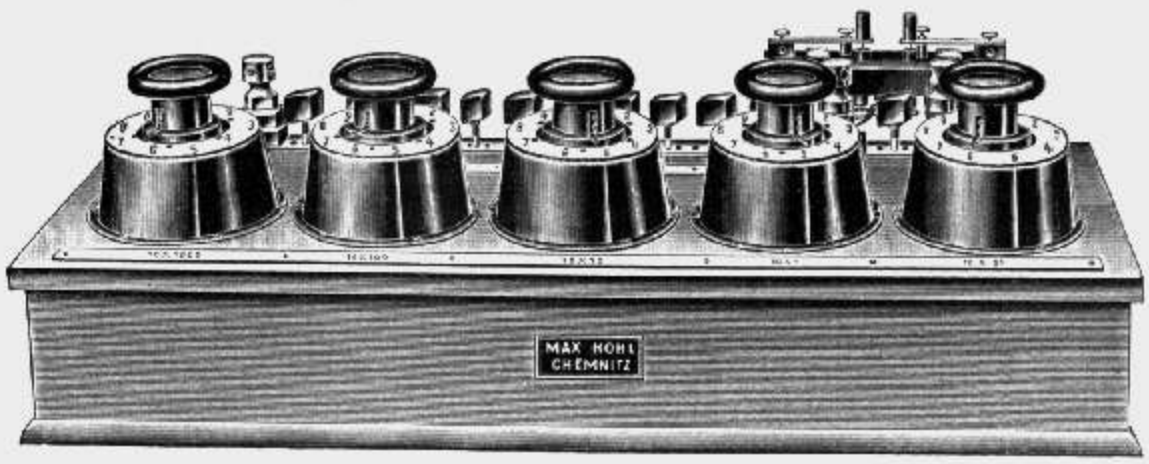
62,000. — With 4 Plugs: 0.1; 0.2; 0.3; 0.4 ohms 2. 0. 0
62,001. — „ 4 „ 1; 2; 3; 4 ohms 2. 0. 0
62,002. — „ 4 „ 10; 20; 30; 40 ohms 2. 0. 0
62,003. — „ 4 „ 100; 200; 300; 400 ohms 2. 0. 0
62,004. — „ 4 „ 1000; 2000; 3000; 4000 ohms 2. 0. 0
62,005. — „ 8 „ 0.1; 0.2; 0.3; 0.4; 1; 2; 3; 4 ohms 3. 10. 0
62,006. — „ 8 „ 1; 2; 3; 4; 10; 20; 30; 40 ohms 3. 10. 0
62,007. — „ 8 „ 10; 20; 30; 40; 100; 200; 300; 400 ohms 3. 10. 0
62,008. — „ 8 „ 100; 200; 300; 400; 1000; 2000; 3000; 4000 ohms 3. 10. 0
62,009. — „ 12 „ 0.1; 0.2; 0.3; 0.4; 1; 2; 3; 4; 10; 20; 30; 40 ohms 5. 0. 0
62,010. — „ 12 „ 1; 2; 3; 4; 10; 20; 30; 40; 100; 200; 300; 400 ohms 5. 0. 0
62,011. — „ 16 „ 1; 2; 3; 4; 10; 20; 30; 40; 100; 200; 300; 400; 1000; 2000; 3000; 4000 ohms 6. 10. 0

Wheatstone Precision Bridges of Manganin, with series plugs, cf. Fig. 62,014.

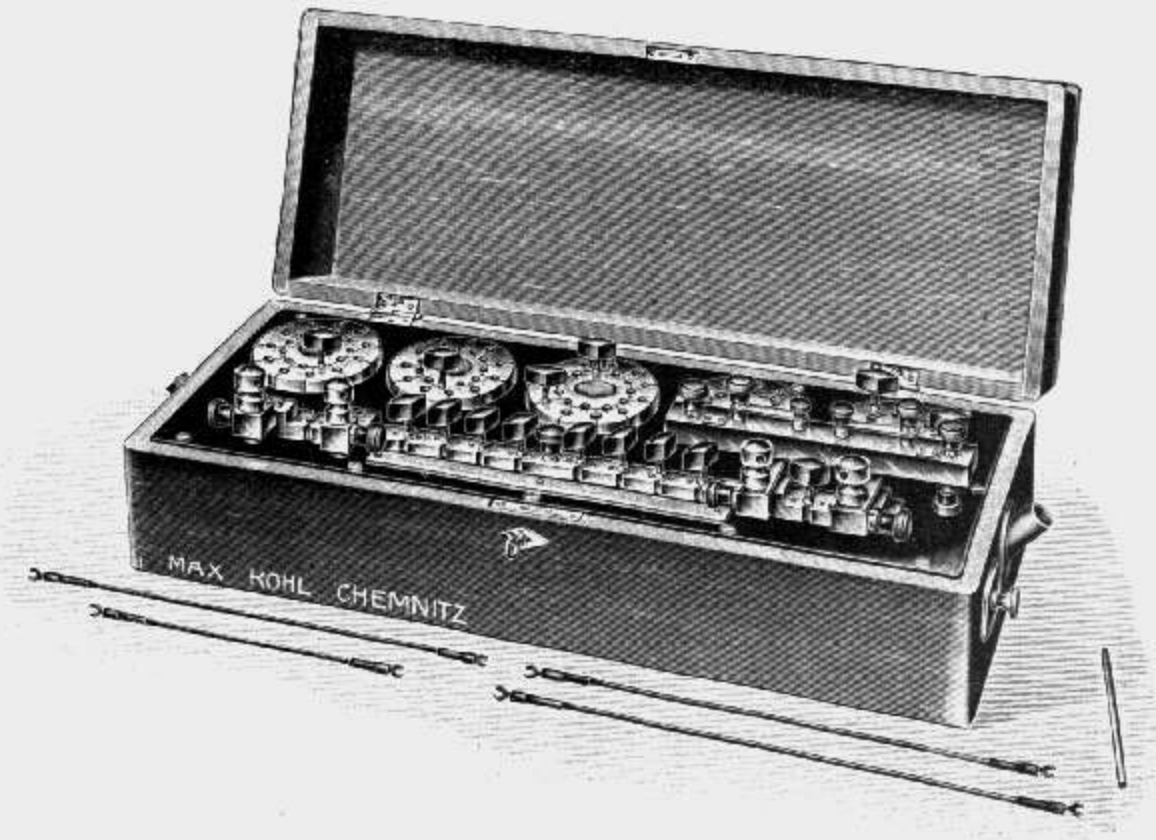
62,012. — with 20 plugs: in the ratio arms: 1; 10; 100; 100; 10; 1; in the variable arm: 0.1; 1; 1; 2; 3; 4; 10; 20; 30; 40; 100; 200; 300; 400 ohms; measuring capacity 0.001 to 111,110 ohms 14. 0. 0

Cf. 4126, 5836, 5993, 2496.

Max Kohl A. G. Chemnitz, Germany.



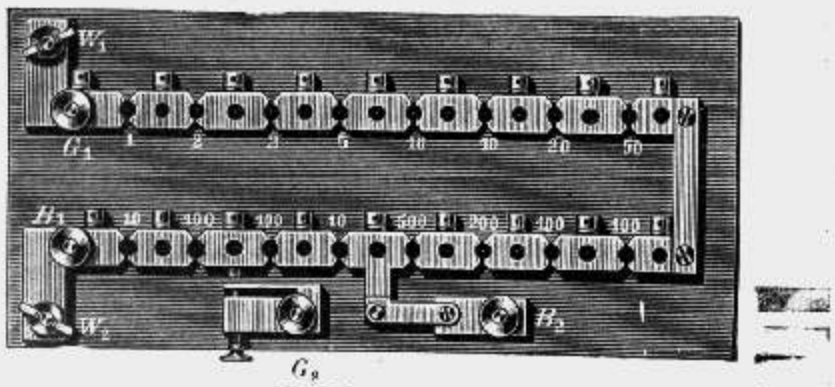
62 016. 1 : 6.



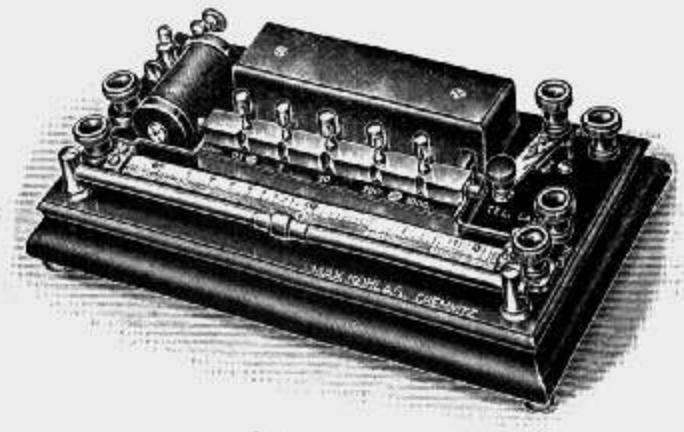
62 017. 1 : 6.

Max Kohl A. G. Chemnitz, Germany.

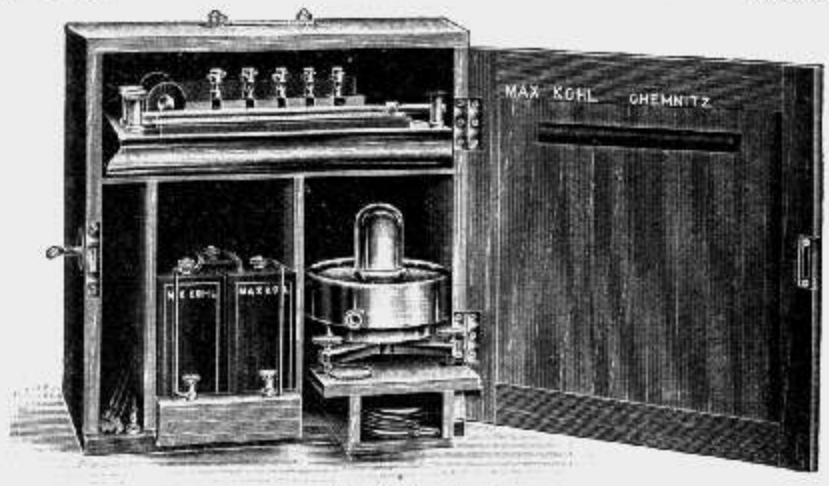
	£ s. d.
62,013. — with 22 plugs: in the ratio arms: 1; 10; 100; 100; 10; 1; in the variable arm: 0.1; 1; 1; 2; 3; 4; 10; 20; 30; 40; 100; 200; 300; 400; 1000; 2000 ohms; measuring capacity 0.001 to 411,110 ohms	15. 0. 0
62,014. — with 30 plugs, Figure; in the ratio arms: 1; 10; 100; 1000; 1000; 100; 10; 1; in the variable arm: 0.1; 0.2; 0.3; 0.4; 1; 1; 2; 3; 4; 10; 20; 30; 40; 100; 200; 300; 400; 1000; 2000; 3000; 4000; 10,000 ohms; measuring capacity 0.0001 to 21,111,000 ohms	19. 0. 0
62,015. **Precision Bridge,** Figure, compact pattern, size of case about 225 × 215 × 130 mm, especially suitable for cable measurements etc., with 24 plugs; in the ratio arms: 1; 10; 100; 1000; 1000; 100; 10; 1; in the variable arm: 1; 2; 3; 4; 10; 20; 30; 40; 100; 200; 300; 400; 1000; 2000; 3000; 4000 ohms; measuring capacity 0.001 to 11,110,000 ohms	16. 0. 0
62,016. **Large Precision Bridge** (in Decades) **with Switch Contacts,** reversible; ratio arms: 1; 10; 100; 1000; 1000; 100; 10; 1; variable arm: 10 × 0.1; 10 × 1; 10 × 10; 10 × 100; 10 × 1000 ohms, with covered contact circuits, Figure; measuring capacity 0.0001 to 11, 111,000 ohms	43. 0. 0
26,017. **Large Precision Decade Bridge with Plugs,** otherwise exactly as No. 62,016, Figure	36. 0. 0
62,018. **Wheatstone Bridge (School Pattern) of Manganin,** with resistance coils mounted open, thus being very comprehensive (cf. Fig. 62,006), with 18 plugs; in the ratio arms: 1; 10; 100; 100; 10; 1; in the variable arm: 1; 2; 3; 4; 10; 20; 30; 40; 100; 200; 300; 400 ohms; measuring capacity 0.01 to 111,000 ohms	8. 0. 0



62 021. 1 : 3.



62 023. 1 : 5.

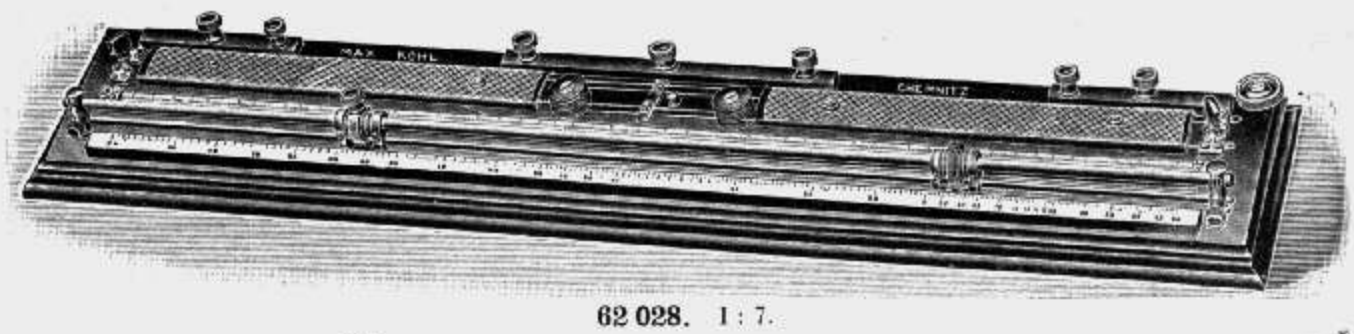


62 026. 1 : 8.

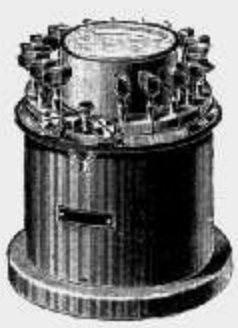
	£ s. d.
62,021. **Wheatstone Bridge** after Weinhold, Figure, with 16 plugs (W. D. Fig. 517 [490]), with ratio arms: 10; 100; 100; 10; and comparison rheostat: 1; 2; 3; 4; 10; 20; 30; 40; 100; 200; 300; 400 ohms	10. 0. 0
62,022. — idem, with 20 plugs, with the same ratio arms and with comparison rheostat: 0.1; 0.2; 0.3; 0.4; 1; 2; 3; 4; 10; 20; 30; 40; 100; 200; 300; 400 ohms	12. 0. 0
62,023. **Universal Pattern Wheatstone Bridge** after Kohlrausch, Figure, with 5 comparison resistances: 0.1, 1, 10, 100 and 1000 ohms; very practical for rapid measurements on wire resistances and electrolytic resistances	7. 10. 0
The resistances are read direct (without table) on a scale. In conjunction with a suitable galvanometer, e. g. No. 61,297 or 61,360, the apparatus serves for resistance measurements of from 0.05 to 20,000 ohms of solid conductors. By using alternating currents, generated by a small induction coil on the apparatus, and a telephone instead of the galvanometer, it is possible to determine resistances of electrolytes, the internal resistances of cells, also the contact resistances of earth plates of lightning arresters.	
62,024. **Box Telephone** for above, for determining the resistance of electrolytes, with coil wound to suit	0. 15. 0
62,025. **Kohlrausch Bridge,** without induction coil, otherwise as No. 62,023; range 0.05 to 20,000 ohms; can only be used for wire resistances by employing a suitable galvanometer, e. g., No. 61,297 or 61,360	6. 0. 0
62,026. **Portable Resistance Testing Set,** Figure, comprising Universal Bridge No. 62,023, Galvanometer No. 61,297, Telephone No. 62,024 and 3 Dry Cells, the whole in a solid lock-up oak carrying case, with handle	15. 15. 0
62,027. — idem, but with Galvanometer No. 61,360, which is independent of external magnetic influences and requires no special adjustment	13. 5. 0
62,028. **Wheatstone-Kirchhoff Bridge** without comparison resistances, Figure, with stretched wire 1 m long. The resistance of the measuring wire can be trebled by inserting wires of the same material, stretched in the open, at both ends. The Bridge has a well-guided slider with sliding contact which can be raised up, and an accurately divided millimetre rule	8. 10. 0
62,029. **Second Slider** with the slide wire, for calibrating the measuring wire and enabling the bridge to be used as a du Bois-Reymond current compensator or as a Thomson Double Bridge	1. 10. 0

Cl. 2501, 5826, 5251.

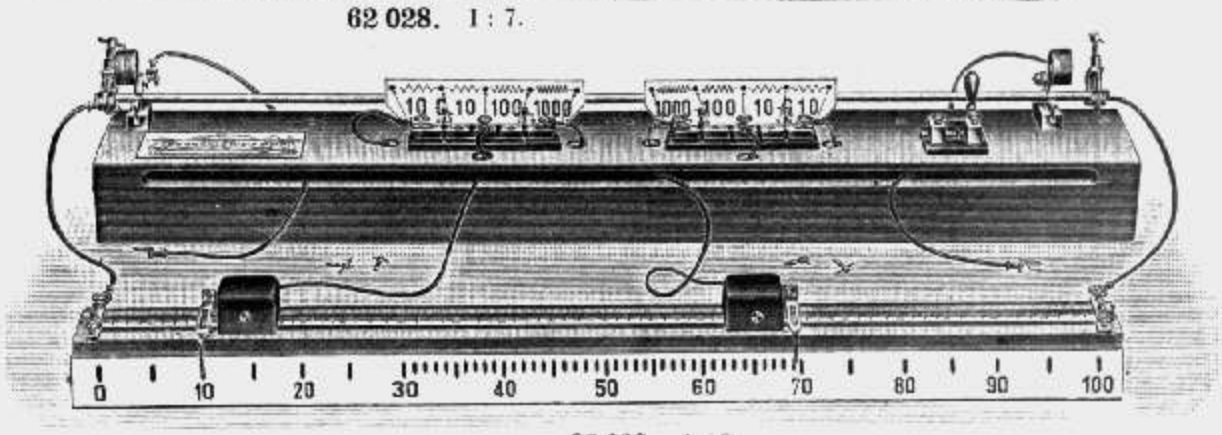
Max Kohl A. G. Chemnitz, Germany.



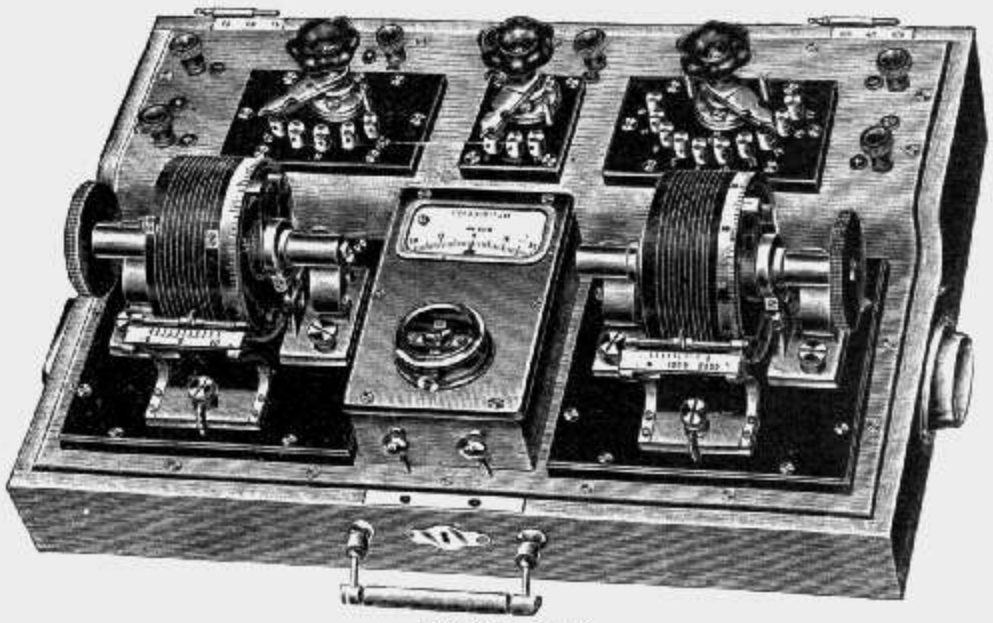
62 028. 1 : 7.



62 031. 1 : 8.



62 032. 1 : 9.



62 033. 1 : 5.

Max Kohl A. G. Chemnitz, Germany.

62,030. **Second Graduation** for reading direct the resistance, obtained from the simple measuring wire, without the additional resistances . . . . . £ s. d. 0. 12. 0

Compare also the Universal Galvanometer No. 61,362, p. 885, which can be used also as a Wheatstone Bridge.

62,031. **Portable Bridge,** Figure, comprising a plug resistance of 1 to 500 ohms, 2 shunt resistances each of 1, 10, 100 ohms, Deprez-d'Arsonval Galvanoscope, 3 dry cells and 2 keys. Range 0.1 to 100,000 ohms. With leather case and carrying strap 11. 0. 0

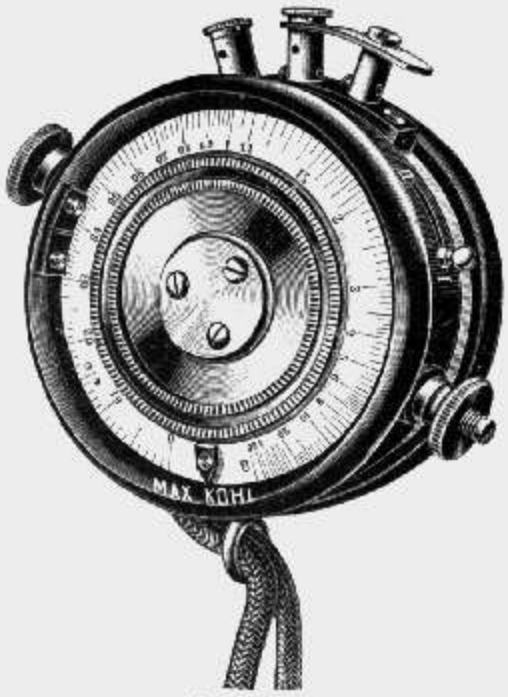
62,032. **Thomson Double Bridge** for Measuring Small Resistances, Figure 11. 10. 0

The apparatus consists of a measuring wire with millimetre scale and two knife edges, and clipping arrangement on wood base, on which are placed two shunt knife edges which can be adjusted at different distances, also two comparison rheostats having resistances of 1000, 100, 10, 10 ohms. In addition terminals, battery keys and connecting cables as well as a test bar of copper of 1100 mm length and 10 mm diameter are given in with the apparatus. The instrument can also be used as a single Wheatstone Bridge and as a du Bois-Reymond current compensator.

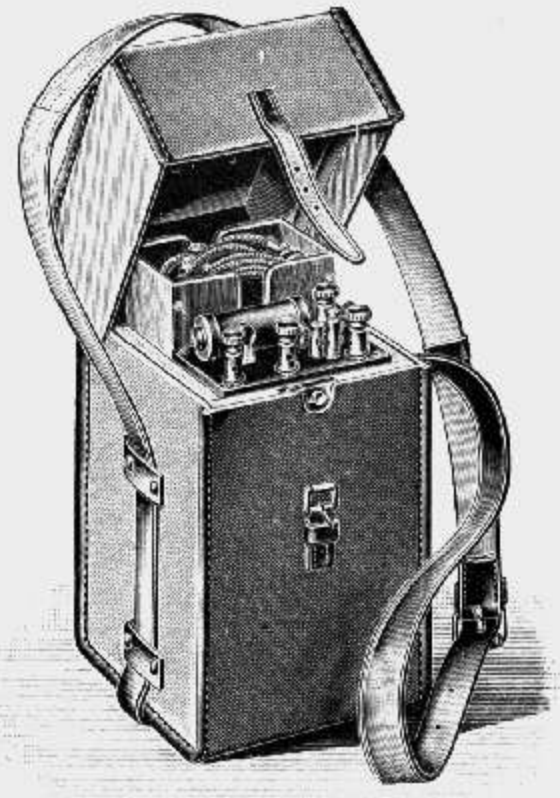
62,033. **Potentiometer** for measuring potential differences of 0.001—190 volts by comparison with a standard cell, Figure. Price **without** standard cell, but **with** galvanometer 25. 0. 0

The apparatus contains: a switch contact resistance, 2 slide wire resistances, a pointer galvanometer, a change over switch for the standard cell and the potential difference to be measured, also a galvanometer switch. In addition to measurements of potential the apparatus can, with the aid of standard resistances Nos. 61,914—61,923, be used for accurate current measurements. As standard cells, we give the preference to the use of a Weston No. 60,732, p. 845, but a Clark No. 60,731, p. 845, can also be used.

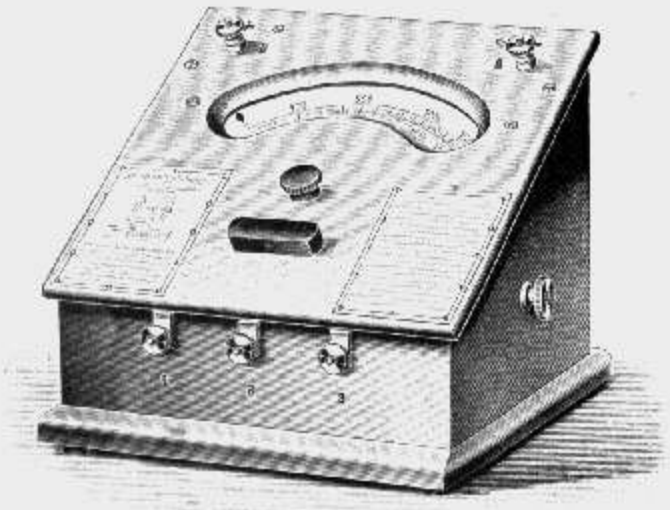
Cl. 3528, 2505, 5910 a, 5909 a.



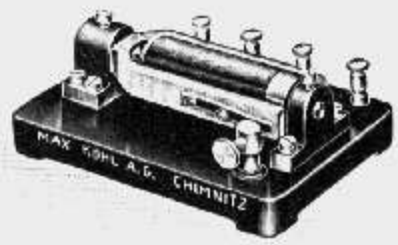
62 034. 3 : 4.



62 035. 1 : 5.



62 036 — 62 039.



62 040. 1 : 6.

62,034. **Telephone Bridge** after Nippoldt, Figure, range from 0.01 to 100 and 0.1 to 1000 ohms, comprising measuring wire, 2 comparison resistances, 1 telephone; can also be used for measurements with galvanometers and by the Wiechert method . . . . . £ s. d. 5. 10. 0

62,035. **Lightning Arrester Test Apparatus,** comprising a Nippoldt Telephone Bridge No. 62,034, an extra-current apparatus as generator of alternating currents, and dry cell, in wallnut box, with leather case and carrying strap, Figure 9. 0. 0

Ohmmeter for reading resistances direct, Figure, for connecting up to accumulators, with magnetic shunt to render the readings independent of the working voltage.

List No.	62,036	62,037	62,038	62,039
Pressure necessary, Volts	4	4	12	20
Range, Ohms	0—250 & 250—500	0—500 & 500—1000	0—2500 & 2500—5000	0—5000 & 5000—10,000
£	**7. 10. 0**	**7. 10. 0**	**8. 0. 0**	**8. 5. 0**

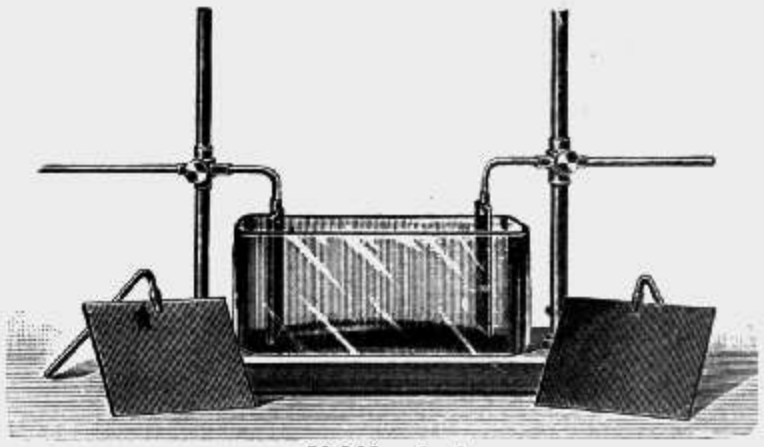
62,040. **Induction Apparatus with current-interrupting tuning fork,** after Uppenborn, Figure, for resistance-determinations of electrolytes in conjunction with a bridge and a telephone 1. 15. 0

Cl. 2515, 5908a, 55f, 5849.

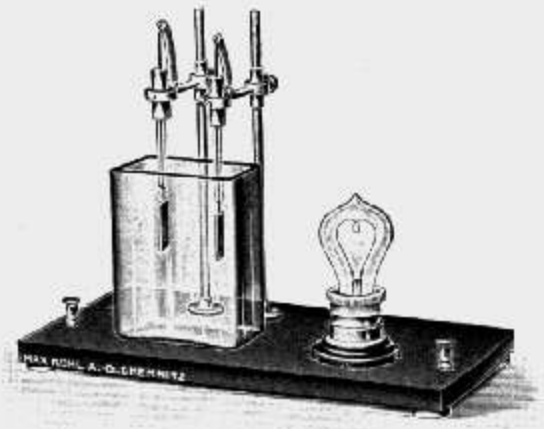
Max Kohl A. G. Chemnitz, Germany.



62 041. 1 : 3.



62 042. 1 : 8.



62 046. 1 : 6.



62 047. 1 : 6.

62,041. **Electrolytic Interrupter,** after Wehnelt-Starke, Figure (Verh. d. Deutsch. Phys. Gesellsch. 1901, p. 128) . . . . . £ 0. 15. 0

This interrupter is used as a silent exciter of pulsating currents for the determination of the resistance of electrolytes in conjunction with a bridge and a telephone, for determining capacity constants, etc. Owing to its high frequency the apparatus is well adapted for these purposes.

A mean current density of 0.02 amp. is sufficient for working this interrupter.

Resistance of Electrolytes.

62,042. **Apparatus** after Horsford **for Determining the Conducting Resistance of Liquids,** Figure (M. P. III, Fig. 405), comprising glass trough on wood board with conducting rods and three pairs of copper, zinc and lead plates 2. 0. 0

62,043. — idem, also with two platinum electrodes 80 × 80 mm 4. 10. 0

62,044. **Plate Glass Box** for experiments on Conductor Resistance, after Kolbe (Kolbe-Skellon, Introduction to Electricity, Part II, Figs. 120—122), with millimetre scale, cf. Fig. 60,747, p. 847. Without electrodes or partition wall 1. 0. 0

62,045. — idem, as No. 62,044, with 2 zinc plates (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 124), for use as a current damper and for demonstrating electrolytic resistance 1. 10. 0

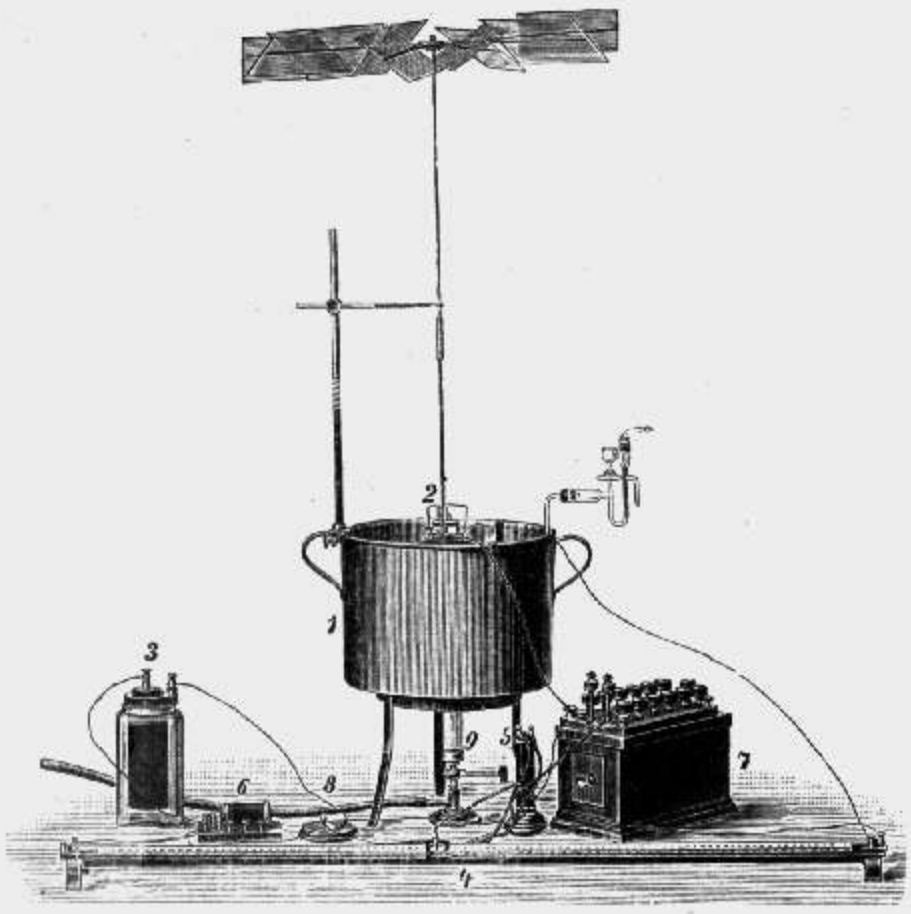
60,747. — idem, with a zinc and a carbon plate (cf. Fig. 60,747, p. 847) 1. 10. 0

60,748. — idem, with partition and a pair of extra plates, Fig. 60,748, p. 847 . . . . 2. 0. 0

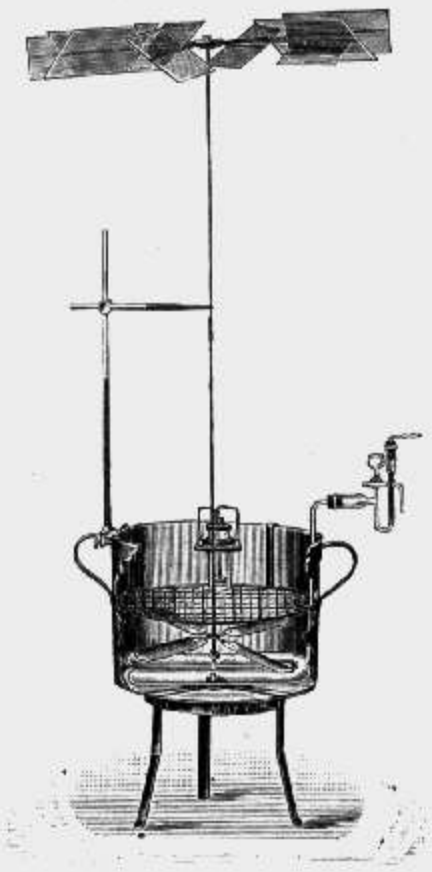
62,046. **Apparatus for Electrolytic Conduction,** after Grimsehl, for showing that pure water has a very high resistance and that only by the addition of a few drops of sulphuric acid is the current rendered appreciably conductive, Figure 1. 12. 0

62,047. **Apparatus for determining the Conductivity of Electrolytes,** Figure, after Friedr. C. G. Müller (M. T. Fig. 199), with one pair electrodes each of iron and of lead. . 0. 18. 0

Max Kohl A. G. Chemnitz, Germany.



62048, 62051, 62053, 62054, 61946, 62056, 62057, 62058, 62060. 1 : 11.



62 048. 1 : 11.



62 052. 1 : 8.

		£ s. d.
	Apparatus after Prof. Ostwald, **for Determining the Conductivity of Electrolytes,** Figures (Ostwald-Luther, Physikochemische Messungen, 2nd Edn., p. 395). The apparatus comprises:	
62,048.	**Thermostat** after Ostwald, Figure, vessel with felt insulating jacket, on tripod, with stirrer, mica vanes and gas burner (the old type of regulator is shown in the illustration)	3. 15. 0
	or	
62,049.	**Thermostat** after Ostwald, with cord pulley for motor drive	3. 12. 0
62,050.	**Thermometer,** 0—60° C. graduated in 0.1°	0. 8. 0
62,051.	**Measuring Wire** after Ostwald, with platinum-iridium wire, old pattern	1. 10. 0
62,052.	— idem, most recent pattern, Figure	1. 12. 0
62,053.	**Conductivity Vessel** after Ostwald, Figure	1. 5. 0
62,054.	**Holder** for above, for thermostat use	0. 10. 0
61,946.	**Precision Rheostat** with 14 plugs, 1—1000 ohms, total 2111 ohms	8. 0. 0
62,056.	**Induction Apparatus,** Figure, for producing buzzing sound, with adjusting resistance, thus rendering the tone minimum more sensitive.	1. 10. 0
62,057.	**Telephone Receiver** with antiphone*, round pattern	0. 12. 0
62,058.	**Current Key**	0. 6. 0
62,059.	**Measuring Accumulator**	0. 10. 0
62,060.	**Connecting Lead** with connecting ends	0. 12. 0

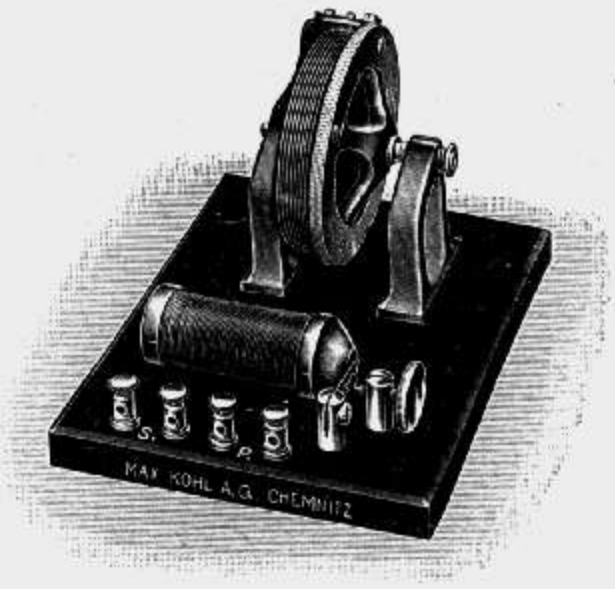
* An antiphone is a small piece of rubber for inserting in one ear while holding the telephone to the other; it holds off any external sound.

Cl. 2481, 2482, 3527.

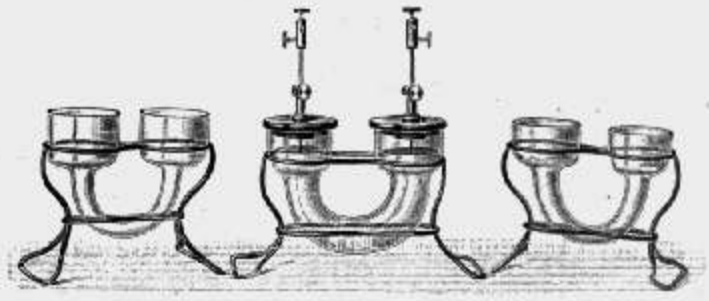
Max Kohl A. G. Chemnitz. Germany.



62 053.
1 : 3.



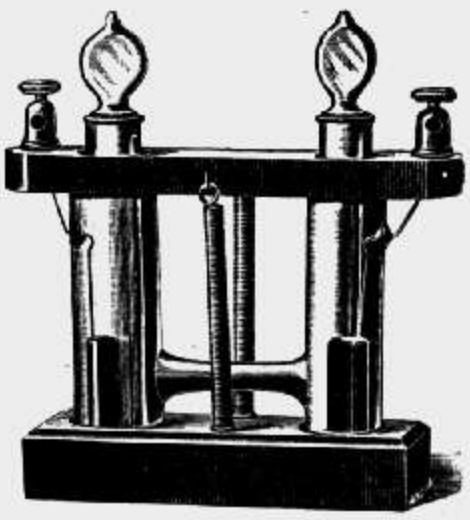
62 056. 1 : 3.



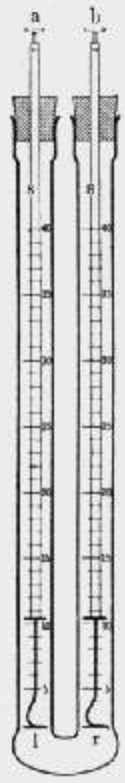
62 062. 1 : 6.



62 063.
1 : 4.



62 061. 1 : 2.



62 065. 1 : 2.



62 066. 1 : 3.

62,061. **Apparatus for Determining Conductivity,** after Ostwald, portable pattern, built into lock-up wood box, with bridge, precision resistance, 1—500 ohms, induction apparatus for producing buzzing sound in sound insulating box, round-shaped telephone with antiphone*, current key, and accumulator . . . . . £ 17. 0. 0

The Kohlrausch Bridge No. 62,023, p. 926, is also very well adapted for Determining the Conductivity of Electrolytes.

62,062. **3 Resistance Vessels for Electrolytes and 2 Platinised Platinum Electrodes,** after Kohlrausch, Figure (M. P., 10th Edn., IV., 1, Fig. 479; 9th Edn., III, Fig. 406; Gan.-Rein., Fig. 956), with tubes 8, 14 and 25 mm diameter, each vessel having a stand 4. 0. 0

62,063. **Resistance Vessel for Electrolytes,** after Kohlrausch, Figure, with thermometer and graduation on the vessel 1. 10. 0

62,064. — idem, after Kohlrausch, different pattern, Figure (M. P., 10th Edn., IV, 1, Fig. 480; 9th Edn., III, Fig. 407) 1. 12. 0

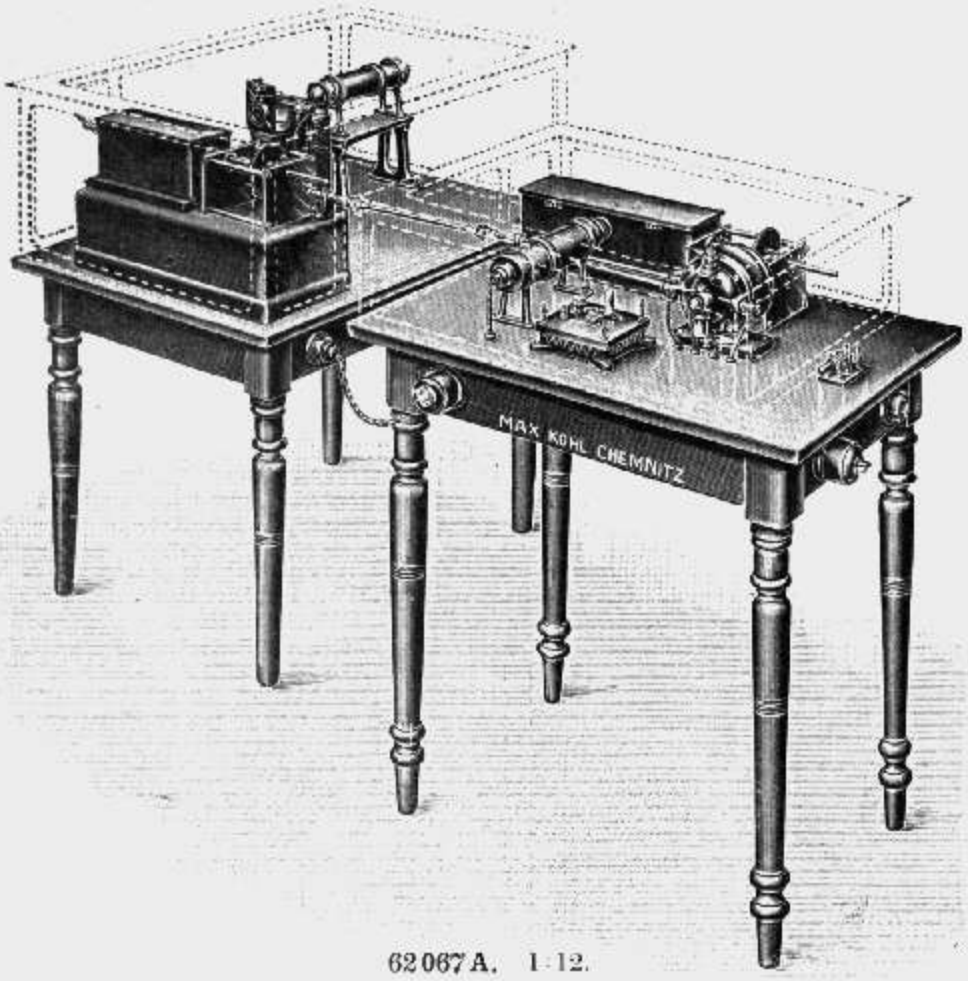
62,065. — idem, after Kohlrausch, with variable capacity, Figure (W. u. E. Fig. 304) 0. 16. 0

62,066. — idem, after Arrhenius, Figure (W. u. E. Fig. 302), with electrodes 40 mm diameter and 0.1 mm thick 2. 10. 0

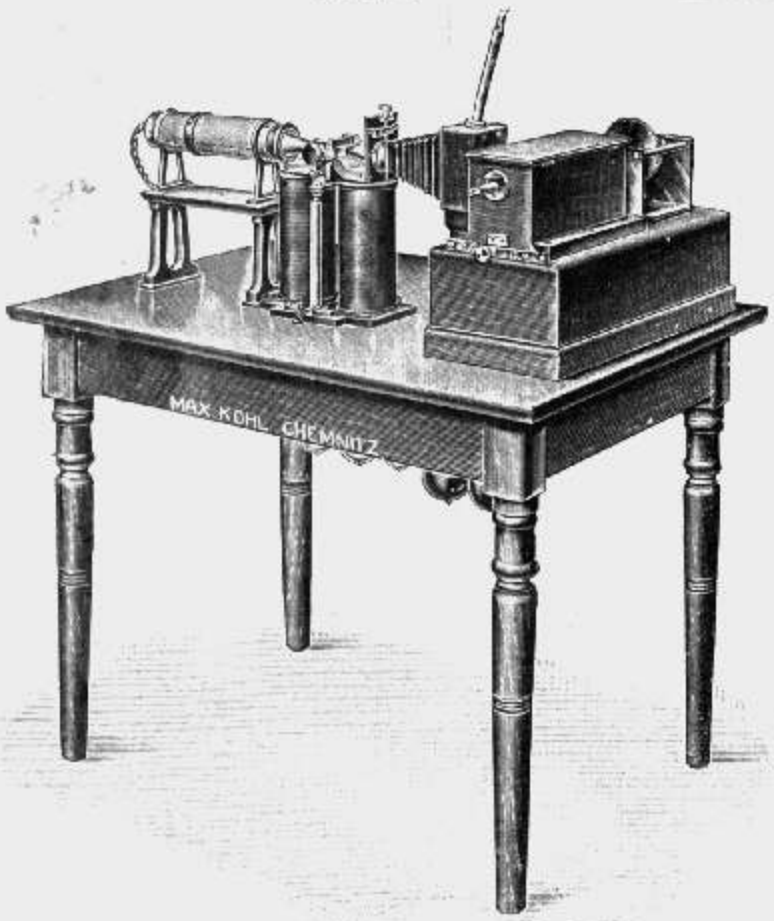
Selenium Cells and Apparatus for demonstrating the Alteration in the Resistance of Selenium by Light: see "Optics" Section.

* See note on last page.

Max Kohl A. G. Chemnitz, Germany.



62 067 A. 1 : 12.



62 067 B. 1 : 12.



62 067 C. 1 : 1.



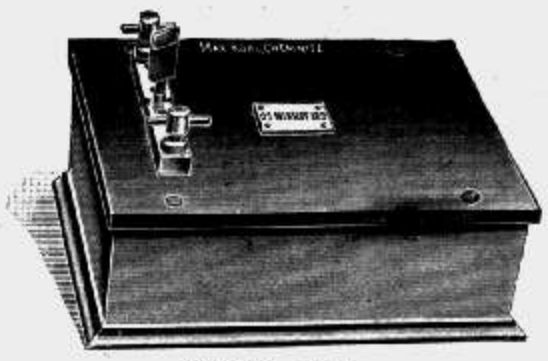
62 067 D. 1 : 1.

62,067. **Apparatus for Demonstrating Phototelegraphy,** after Korn, comprising **1 table** with complete **Transmitting Apparatus,** 110 or 220 volt D. C. Driving Motor; and **1 table** containing the complete **Receiving Apparatus,** Figs. A, B, C and D. Fig. A shows the complete apparatus, consisting of a table containing the transmitting apparatus and a table with the receiving apparatus. In Fig. B the latter is shown larger . . . . . £ s. d. 66. 10. 0

Korn's system of Phototelegraphy is based upon the property possessed by Selenium for assuming a low electric resistance when strongly illuminated and a high resistance when weakly illuminated. The

Cl. 4966, 5009, 4987, 5006.

Max Kohl A. G. Chemnitz, Germany.



62 080. 1 : 5.

Selenium Cell is illuminated through a film constructed cylindrically and arranged to move after the manner of the phonograph cylinder. The cell is connected up in common with supply at constant pressure, with the travelling lead, and at the receiving station, with the movable system of a light relay. All fluctuations caused by the successive and variable degrees of illumination of the Selenium Cell produce corresponding variations in the moving system of the light relay. The latter is placed between a Nernst lamp and a second photographic film, also cylindrical in form and arranged so as to be movable, this second film rotating synchronously with the film at the transmitting station. An opaque aluminium leaf in the moving system of the relay allows more or less light — according to the current density prevailing — to pass through a triangular diaphragm on to the photographic film, the latter being developed after completely passing the diaphragm. The apparatus works in subdued daylight. The movements of the light relay are followed by means of an observing tube (see Fig. B) and a reflecting mirror. In the foreground of Fig. A, to the right, is shown the table with the transmitting apparatus and, in the background, to the left, the table with the receiving apparatus. Fig. B contains simply the table with the receiving apparatus completely fitted up. Figs. C and D show (in actual size) the reproduction of two tele-photographs made with the demonstration apparatus. In the case of the demonstration apparatus the transmitting table is placed immediately alongside the receiving table.

The apparatus must only be used for demonstration purposes. A complete description will be sent if desired.

£ s. d.

62,068. **Two Protecting Cases,** frame of polished wood, glazed, doors and detachable tops, cf. Fig. 62 067 A 4. 15. 0

62,069. **Spare Selenium Cell** 2. 15. 0

62,070. **Diapositives of Tele-photographs** 0. 1. 0

62,071. **Baretter Set** after Béla Gáti, for measuring telephone and high frequency currents, built into portable mahogany case 14. 0. 0

The Baretters are fine wires of high temperature coefficient, being heated by the currents to be measured. Their change in resistance, which gives a measure for the current, is measured by the bridge connections of the Baretter set. In this manner it is possible to measure weak alternating currents, e. g. telephone currents, by means of a portable moving coil pointer galvanometer.

62,072. **Baretters of Platinum or Gold,** without vacuum, 0.002 mm diameter quoted for on application.

62,073. **Baretter of thin wire** or in **evacuated vessel.** Price according to sensitivity **£ 2. 0. 0** to 2. 10. 0

62,074. **Moving Coil Pointer Galvanometer** for above, 1 degree = 0.000,000,1 amp., for maximum sensitivity 10. 0. 0

This instrument requires a perfectly steady base.

62,075. **Moving Coil Pointer Galvanometer** for above, 1° = 0.000,001 amp., sufficient for most purposes, also for use on ships 10. 0. 0

62,076. **2 Measuring Accumulators** for above, built into wood case 2. 5. 0

Condensers.

For Condensers for Electrostatic Measurements, see pp. 833—834.

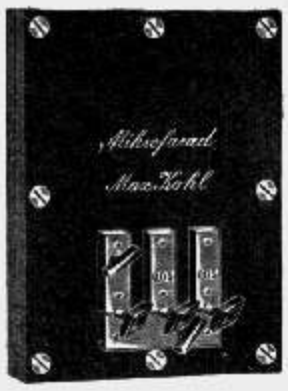
We supply two patterns of condensers for galvanic measurements. Our precision condensers are intended for accurate measurements, having as dielectric first-quality mica, the constant being scrupulously determined in our laboratory; their capacity is constant and the insulation excellent.

For technical purposes, in which the maximum accuracy is not necessary, we can recommend our paraffin-paper condensers, which can stand voltages up to about 300. The paper condensers are calibrated accurately to within about 10% and the exact capacity is stated on delivery.

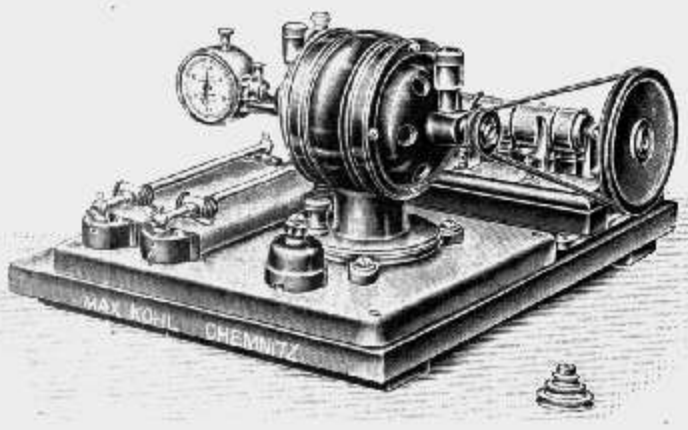
Precision Condensers with mica dielectric, with one section, Figure.

List No.	**62,077**	**62,080**	**62,081**	**62,082**
Capacity, mfds.	0.01	0.1	0.5	1
£	**4. 0. 0**	**4. 10. 0**	**8. 0. 0**	**10. 0. 0**

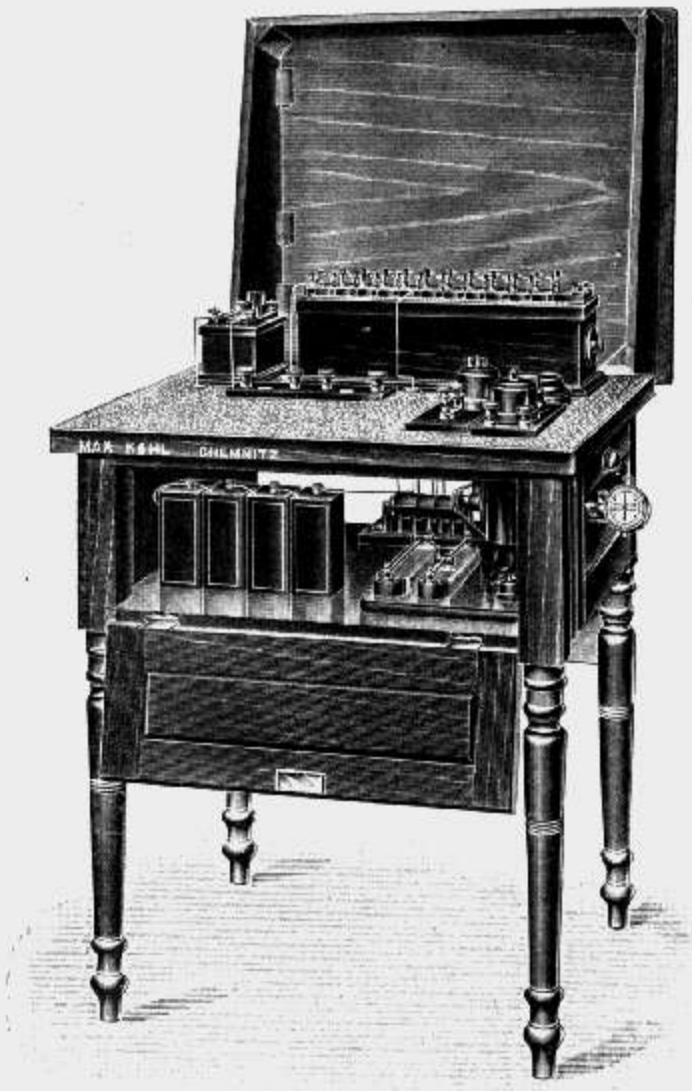
Max Kohl A. G. Chemnitz, Germany.



62 085. 1 : 5.



62 101. 1 : 8.



62 102. 1 : 12.

Precision Condensers with mica dielectric, with more than one section; the sections can be added by plugging, Figure. £ s. d.

List No.	62,085	62,086
Capacities of Sections, mfds.	0.1; 0.1	0.1; 0.1; 0.2; 0.3; 0.4
Total capacity, mfds.	0.2	1.1
£	**6. 0. 0**	**12. 10. 0**

List No.	62,087	62,088
Capacities of Sections, mfds.	0.01; 0.02; 0.03; 0.04; 0.1; 0.2; 0.3; 0.4	0.001; 0.002; 0.003; 0.004; 0.01; 0.02; 0.03; 0.04; 0.1; 0.2; 0.3; 0.4
Total capacity, mfds.	1.1	1.11
£	**15. 0. 0**	**20. 0. 0**

Condensers with paraffined paper dielectric, in mahogany box, with one section:

List No.	62,090	62,091	62,092	62,093	62,094	62,095	62,096	62,097
Capacity, mfds.	0.1	0.2	0.5	1	2	5	10	20
£	**2. 0. 0**	**2. 5. 0**	**2. 10. 0**	**3. 10. 0**	**4. 10. 0**	**6. 0. 0**	**8. 0. 0**	**10. 0. 0**

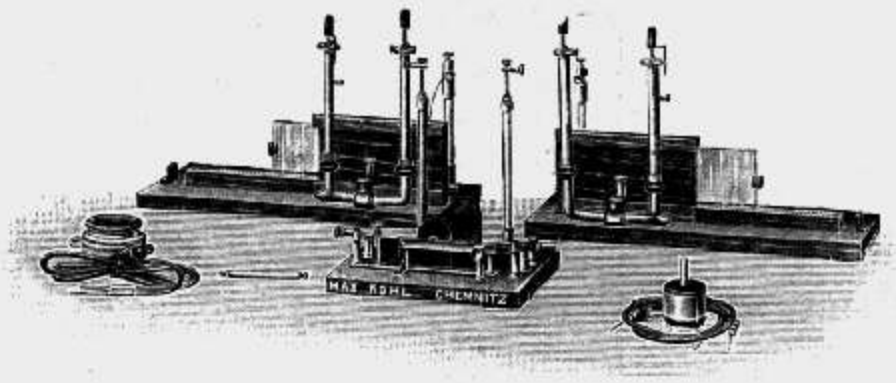
— idem, with a number of sections:

List No.	62,098	62,099	62,100
Capacities of Sections, mfds.	0.1; 0.2; 0.2; 0.5; 1	1; 2; 2	1; 2; 2; 5; 10
Total capacity, mfds.	2	5	20
£	**6. 0. 0**	**8. 0. 0**	**16. 0. 0**

If desired we also supply the paper condensers with the stages arranged in any other manner desired to suit special circumstances, and shall be glad to quote prices on application.

Cl. 2524, 4119, 4920.

Max Kohl A. G. Chemnitz, Germany.

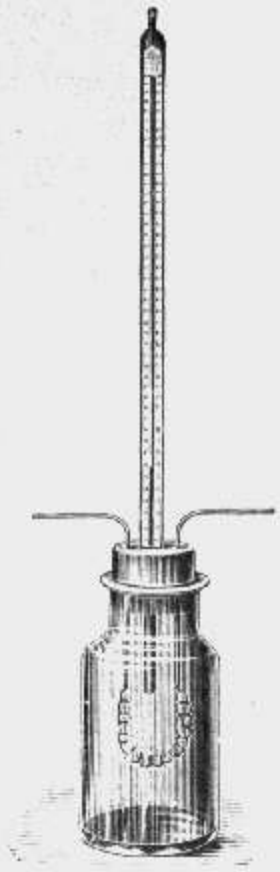


62 103 — 62 108. 1 : 9.

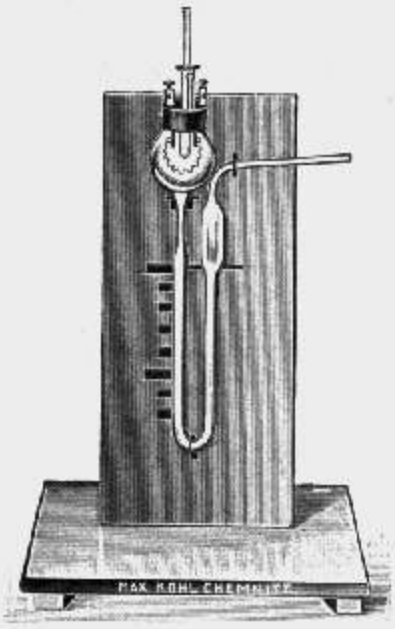
Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
62,101. **Double Commutator,** Figure, after Ayrton and Perry (Elektrot. Ztschr., 1889, p. 412), for measuring capacities and coefficients of self induction and of mutual induction by means of the Wheatstone Bridge; on board with 110 volt D. C. motor, tachometer, regulating resistances for securing wide degree of regulation, stepped pulley, switch, plug contact with plug and 2 metres flexible	16. 0. 0
The measurements can be made with much more certainty with the aid of a mirror galvanometer than with a telephone.	
62,102. — idem, **built into a table,** Figure. On the table are placed the arrangement for measuring insulation resistances as well as various instruments for measuring capacities and coefficients of induction	27. 0. 0
In addition to showing the apparatus mentioned under No. 62,101, the Figure illustrates the switch, plug boxes, 6 terminals, 1 motor switch, 1 key (all fitted to ebonite slabs), fixed on to the table-top: these articles are included in above price. Not included in the price are: the Plug Rheostat, the Cells, and the Galvanometer Shunt. The resistance coils of the precision rheostat should be wound so as to be non-inductive and anti-capacity (Chaperon's method). As a suitable Mirror Galvanometer we can recommend our Galvanometer No. 61,407, with Reading Device No. 61,409 for fitting to the ceiling.	
Apparatus for determining Dielectric Constants, chiefly of Liquids, after Nernst (Kohlrausch, Praktische Physik, 10th Edn., p. 575), Figure, comprising:	
62,103. **String Induction Coil** with shunt liquid resistances	1. 12. 0
62,104. **2 Measuring Condensers** with shunt liquids resistances	6. 10. 0
62,105. **Testing Condenser** for the liquid to be tested	0. 9. 0
62,106. **Round Pattern Telephone** with antiphone *.	0. 9. 0
62,107. **Thermometer**	0. 3. 0
62,108. **Connecting Flexibles**	0. 2. 0
Apparatus for determining Dielectric Constants of Solids, for demonstration purposes, after Grimsehl (Ztschr. f. d. phys. u. chem. U. **16,** 1903, p. 21), consisting of:	
62,109. **Condenser** with 3 Plates, the centre one being fixed and the two outer ones movable, with arrangement for carrying the plates which are to be inserted and tested . . .	2. 5. 0
62,103. **String Induction Coil** with liquid shunt resistances	1. 12. 0
62,106. **Round Pattern Telephone** with antiphone *.	0. 9. 0
62,112. **Dry Cell**	0. 3. 0
In place of No. 62,103 a small electric machine can be used, in which case the shunt resistances are formed of.	
62,113. **2 Glow Lamps with Holders,** mounted on slate	0. 6. 0

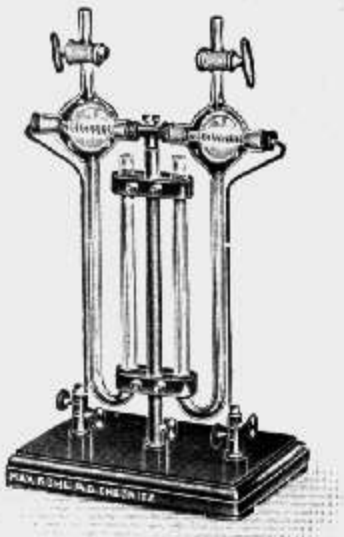
* See note on p. 930.



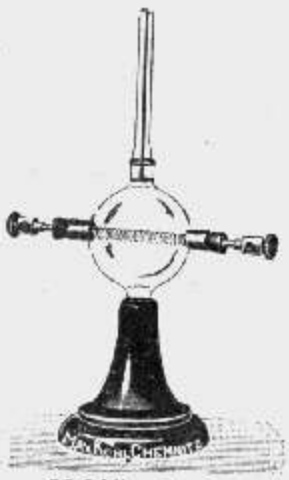
62 114. 1 : 4.



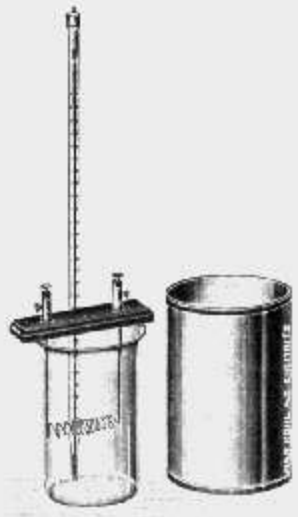
62 116. 1 : 8.



62 117. 1 : 5.



62 115. 1 : 5.



62 120. 1 : 7.

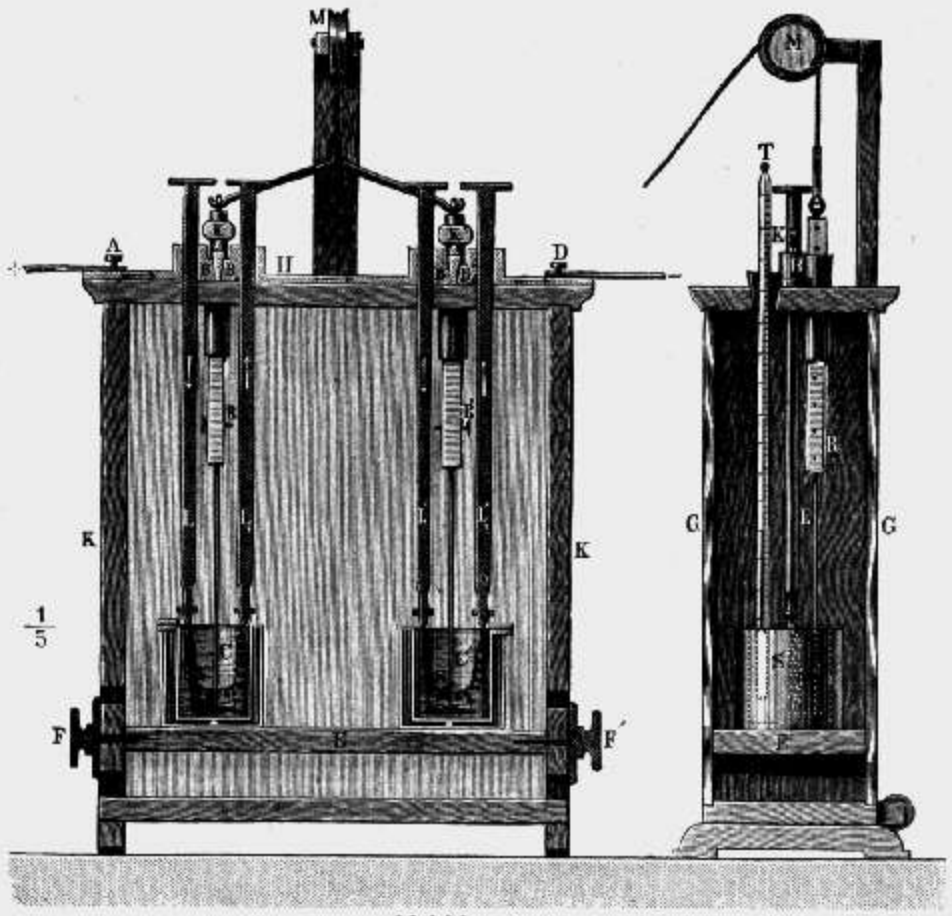
Heating Effects of the Electric Current, Joule's Law.

	£ s. d.
62,114. **Apparatus for showing the Generation of Heat by the Electric Current,** Figure (M. P., 10th Edn., IV, 1, Fig. 454; 9th Edn., III, Fig. 430), with thermometer . . .	0. 16. 0
62,115. — idem. for demonstrating objectively, Figure	0. 10. 0
62,116. **Caloriscope** after Lermantoff, Figure, for the same purpose . . . . . The apparatus can also be used as a simple thermoscope.	1. 6. 0
62,117. **Apparatus** after Foster, Figure (W. D. Fig. 531 [504]), for showing that the heating effect on a conducting wire is proportional to the resistance and as the square of the current	1. 16. 0
62,118. **Current Conductor of Silver and Platinum Wires soldered together** (M. P., 10th Edn., IV, 1, Fig. 455; 9th Edn., III, Fig. 432; W. D. p. 815 [754]), for explaining the difference in specific resistance of two metals	0. 10. 0
It is also possible to show the heating effect of the electric current and the comparison of resistances heated by the current, by the aid of Kolbe's and Looser's Thermoscopes ("Heat" Section).	
62,119. **Calorimeter for demonstrating Joule's Law,** after Friedr. C. G. Müller (M. T. Fig. 213)	0. 8. 0
62,120. **Calorimeter for demonstrating Joule's Law,** for students exercises, after Hahn, Figure (Hahn, Schülerübungen, Fig. 284), with thermometer	0. 12. 0

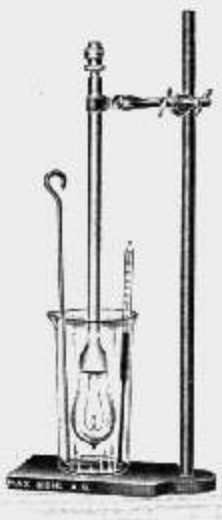
Cl. 2526, 2528, 5870, 396, 5895.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



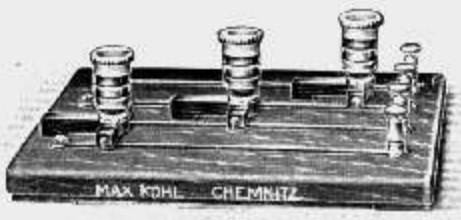
62 121. 1 : 5.



62 123. 1 : 10.



62 124.



62 122. 1 : 6.



62 125. 1 : 6.

62,121. **Current Calorimeter** after Pfaundler, Figure (Fr. phys. Techn. II. 1, Fig. 459; M. P., 9th Edn., III, p. 511) . . . . . £ 10. s. 0. d. 0.

62,122. **Apparatus for deriving Joule's Law,** after Grimsehl, Figure (Ztschr. f. d. phys. u. chem. U. **15**, 1902, p. 347; Grimsehl, p. 777) 0. 12. 0

62,123. **Glow Lamp for the numerical determination of the Electric Equivalent of Heat,** after Grimsehl, Figure, arranged to burn under water (Ztschr. f. d. phys. u. chem. U. **16**, 1903, p. 211, Fig. 1; Grimsehl, Fig. 821). The lamp can be supplied for pressures of 65—220 volts. The voltage desired should be quoted when ordering, otherwise 110 volt lamps are supplied. Price without stand, beaker, stirrer or thermometer 0. 10. 0

62,124. **Glow Lamp for demonstrating the difference between Thermal Energy and Total Energy,** after Grimsehl, Figure (Ztschr. f. d. phys. u. chem. U. **16**, 1903, p. 213, Fig. 2). The lamp is generally supplied for 15 volts, but it can be supplied for any other voltage up to 30 . . . . . 0. 9. 0

62,125. **U-shaped Tube for Demonstrating the Heating of Mercury by the Electric Current,** after Friedr. C. G. Müller, Figure (M. T. Fig. 209) 0. 4. 0

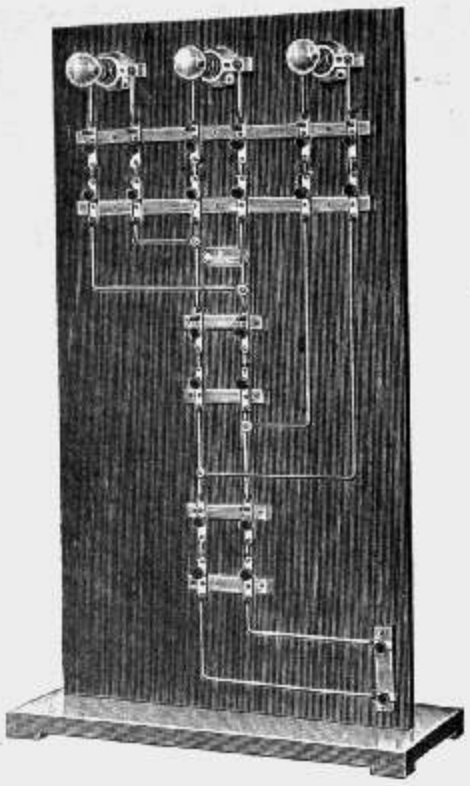
62,126. **Mercury Resistance Thermometer** after Friedr. C. G. Müller, for demonstrating Joule's Law quantitatively (M. T. Fig. 210) 0. 3. 0

62,127. **Apparatus for Proving Joule's Law** by the elongation of a wire, after Friedr. C. G. Müller (M. T. Fig. 212) 0. 16. 0

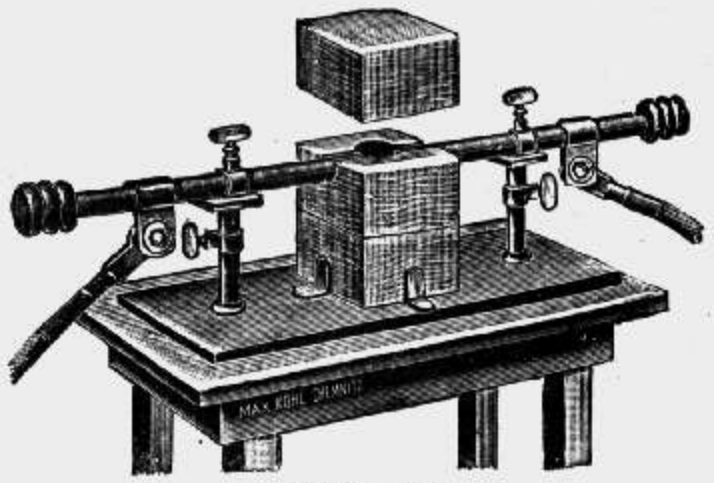
62,128. **Apparatus for the same purpose,** after Kann; can also be used as a demonstration hot-wire ammeter (Ztschr. f. d. phys. u. chem. U. **15**, 1902, p. 286) 1. 10. 0

For further Demonstration Hot-Wire Ammeters see p. 904.

Cl. 5919, 5903, 5990, 5094, 5981.



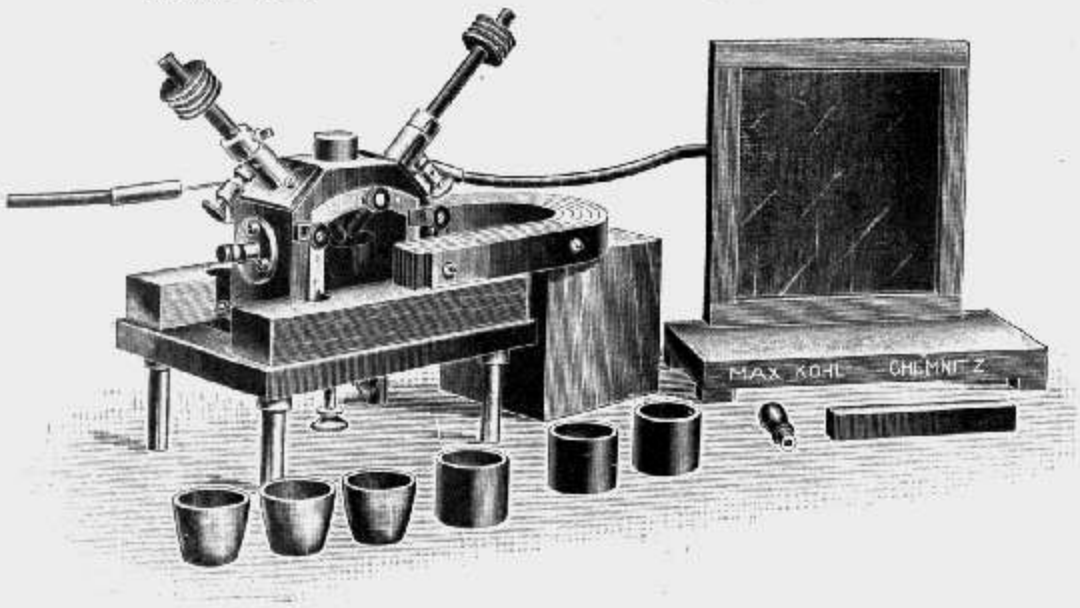
62 129. 1 : 6.



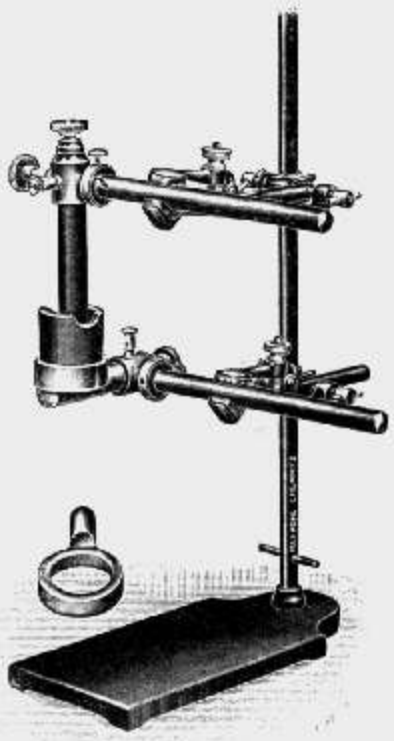
62 140. 1 : 8.



53 082. 1 : 9.



62 134. 1 : 5.

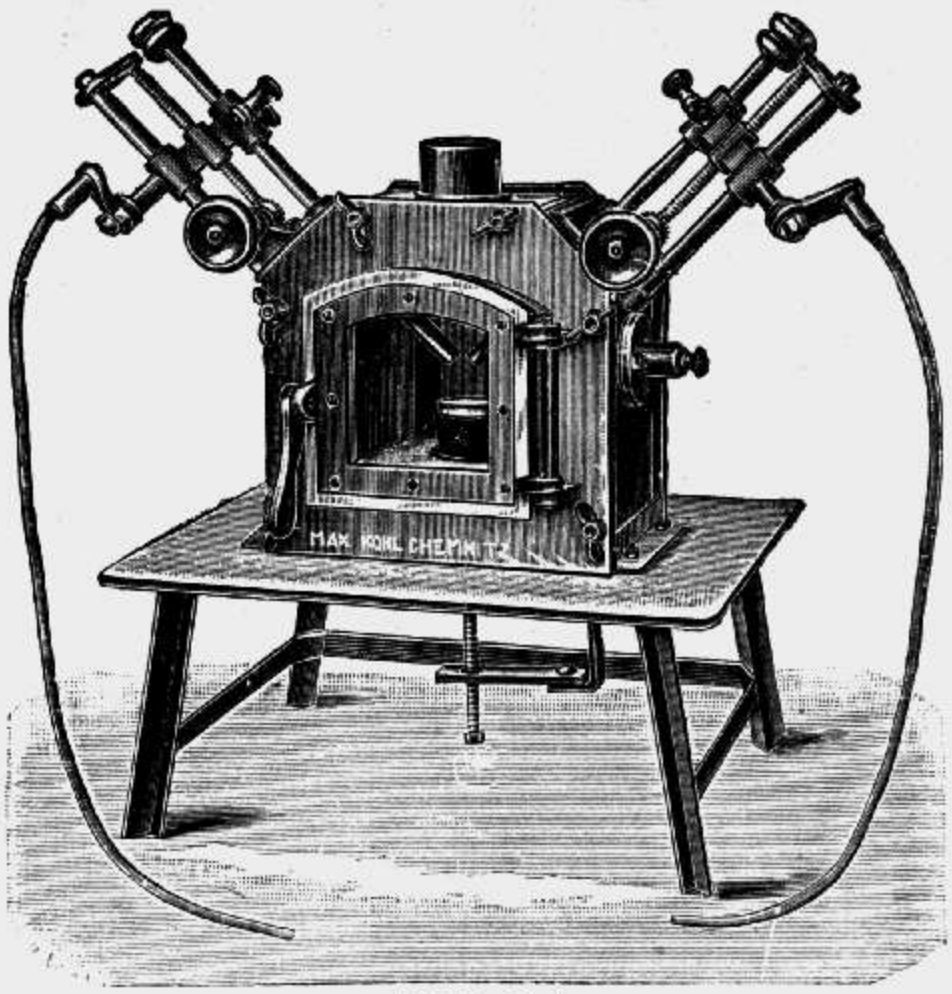


62 131. 1 : 9.

		£ s. d.
62,129.	**Apparatus** after Penseler, Figure, **for showing the mode of action of heavy current fuses** (Ztschr. f. d. phys. u. chem. U. **16**, p. 84), with 3 glow lamps with fuses for the single lamps and for the groups	2. 10. 0
53,082.	**Apparatus for Demonstrating the Arc in Vacuo,** Figure, tubulated receiver with carbon holders and clamps	1. 12. 0
62,131.	**Carbon Clamps** as suggested by Dr. Brüsch (Lübeck), with 1 thick carbon and 1 carbon crucible, for use as electrical assay furnace, Figure, without the Bunsen stand illustrated	1. 12. 0
62,132.	**Extra Carbons** for above . . . . . Each	0. 0. 3
62,133.	**Spare Carbon Crucible** for above . . . . . Each	0. 0. 6
62,134.	**Demonstration Electric Melting Furnace** for 20—30 amperes, Figure, with horse shoe magnet; without melting crucible and protecting screen	7. 10. 0

The furnace is of iron with an inner clay lining. A fire-proof block provided with an adjusting screw can be moved up and down on the hearth of the furnace. This hearth block carries the small crucible, which is made of graphite, lime, magnesite, etc. according to the operation to be carried out. The carbon electrodes, to which the current is conducted, project into the crucible. The furnace space is closed off by mica plates back and front, thus allowing the inside of the furnace and also the process of melting to be observed. By fixing a powerful magnet, as shown in the figure, the arc can be made to take the shape of a pointed flame. The furnace is intended for 20—30 amps. and 50—70 volts. The carbons are 10 mm in diameter.

Cl. 2530, 989, 128, 3529, 5293.



62 144. 1 : 7.

		£ s. d
62,135. **One Pair Cables** for above, each 1,5 m long, with cable lugs		0. 6. 0
Each further metre length per pair		0. 2. 0
62,136. **10 Pair Carbon Rods** 10 mm diameter, 200 mm long		0. 1. 0
62,137. **Melting Crucible** of graphite, 40 mm diameter	each	0. 0. 4
62,138. **Melting Crucible** of magnesite, 40 mm diameter	each	0. 1. 0
62,139. **Protecting Screen** with coloured windows		0. 6. 0
62,140. **Electric Assay Furnace,** Figure, up to 100 amps., without cable		5. 0. 0
Carbons 500 mm long, 22 mm diameter; crucible 50 mm high, 40 mm diameter.		
62,141. **1 Pair Cables** for above, each 1,5 m long, with cable lugs		0. 15. 0
Each further metre length for the pair		0. 6. 0
62,142. **One Graphite Crucible,** 50 mm high, 45 mm diameter		0. 1. 0
62,143. **One Magnesite Crucible,** 50 mm high, 45 mm diameter		0. 1. 0

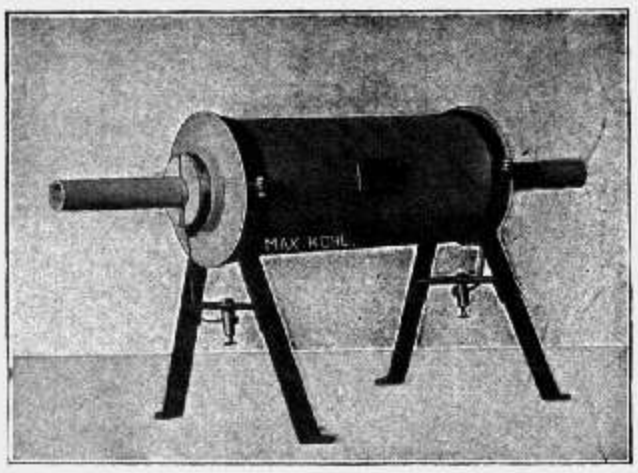
Electric Assay Furnaces with carbon adjusting device, Figure, for small melting operations, with mica window for observing the melting process.

Current, amperes		100	150	250	500
Capsule diameter, mm		65 or 100	65 or 100	100	150
Size of carbons, mm		500 × 22	750 × 30	800 × 40	1000 × 80
List No.		**62,144**	**62,145**	**62,146**	**62,147**
Price		£ **11. 0. 0**	**12. 10. 0**	**16. 10. 0.**	**30. 0. 0**
One Pair Cables for above, 1.5 m long		£ **0. 15. 0**	**1. 10. 0**	**2. 0. 0**	**3. 10. 0**
Each further metre per pair		£ **0. 6. 0**	**0. 9. 0**	**0. 10. 0**	**1. 0. 0**
Protecting Screen for above	List No.	**62,148**	**62,149**	**62,150**	**62,151**
	Price	£ **0. 15. 0**	**0. 15. 0**	**0. 15. 0**	**1. 10. 0**
1 Pair Electrode Carbons	List No.	**62,152**	**62,153**	**62,154**	**62,155**
	Price	£ **0. 1. 3**	**0. 2. 6**	**0. 4. 3**	**0. 15. 0**

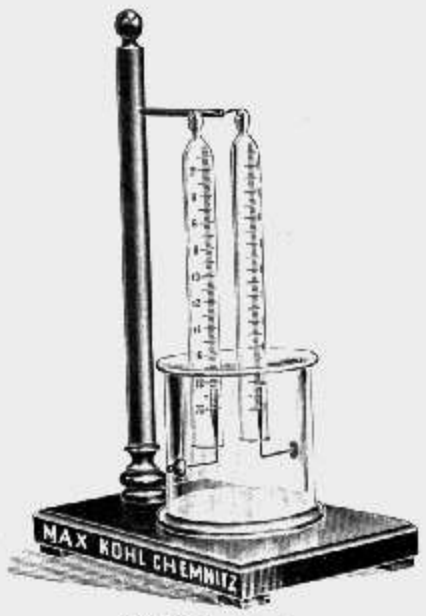
Melting Capsules for Assay Furnaces Nos. 62,144—62,147.

Diameter, mm		65	100	150
Carbon Capsules	List No.	**62,156**	**62,157**	**62,158**
	Price	£ **0. 1. 0**	**0. 1. 3**	**0. 3. 0**
Magnesite Capsules	List No.	**62,159**	**62,160**	
	Price	£ **0. 1. 0**	**0. 1. 3**	
Magnesia Capsules	List No.	**62,162**	**62,163**	
	Price	£ **0. 3. 0**	**0. 6. 0**	

The electric furnaces require a minimum pressure of 60 volts. Series resistances are necessary, prices for these being quoted on receipt of particulars as to voltage available and requisite current strength.



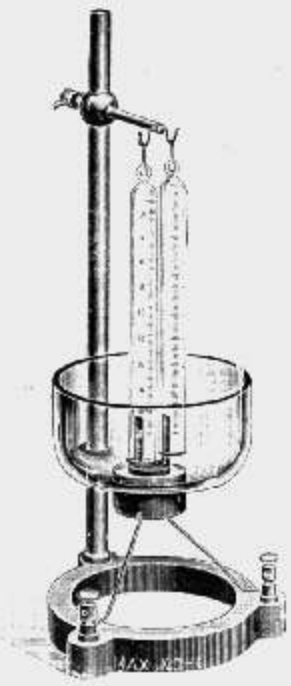
62165. 1 : 8.



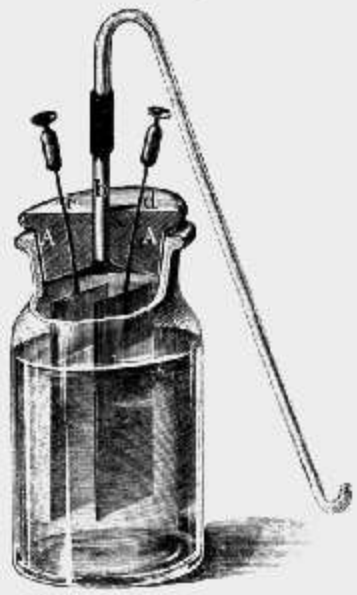
62180. 1 : 5.



62181. 1 : 6.



62182. 1 : 6.



62183. 1 : 4.

Electrically Heated Laboratory Furnaces for high temperatures, horizontal pattern, Figure, with an inner porcelain tube heated by a spiral of thin platinum sheet; for maximum temperatures of 1400° C.

List No.	Tube length	Current Consumption at 110 V.	Current Consumption at 220 V.	Price of Furnaces (without platinum) for both voltages	Heating and Regulating Resistances at 110 V. List No.	at 110 V. Price	at 220 V. List No.	at 220 V. Price
62165	60 cm	22 Amps.	11 Amps.	**90 s.** plus 9 g Platinum	**62168**	£ 5. 10	**62169**	£ 4. 16
62166	44 cm	16 Amps.	8½ Amps.	**85 s.** plus 7 g Platinum	**62170**	£ 3. 2	**62171**	£ 2. 18
62167	22 cm	10 Amps.	(For 110 V. only)	**75 s.** plus 4 g Platinum	**62172**	£ 2. 2		

1 Gram Platinum, worked up in the furnaces; price (varying according to the state of the market) . . . . . £ s. d. **£ 0. 5. 0** to 0. 8. 0

Larger Laboratory Furnaces and other Electric Furnaces quoted for on application.

Section 5: Electro-chemistry.

As regards Apparatus after Lüpke-Bose, Kohlrausch-Holborn and Hofmann, we shall be pleased to send separate price list on application.

Voltameters.

£ s. d.

62,180. **Water Decomposing Apparatus,** simple pattern on wood stand, Figure, with graduated tubes 0. 8. 0

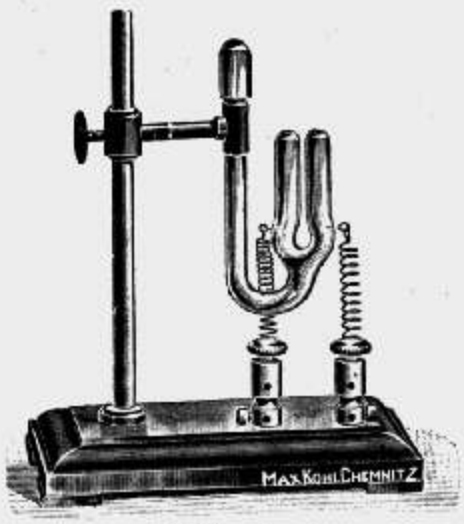
62,181. — idem, on iron stand, Figure 0. 12. 0

Cl. 2534, 2292, 2293, 2294, 2295.

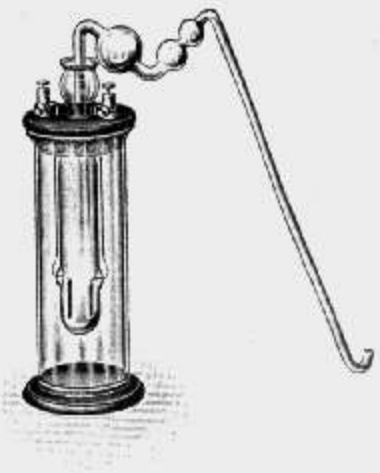
Max Kohl A. G. Chemnitz, Germany.



62 184. 1 : 5.



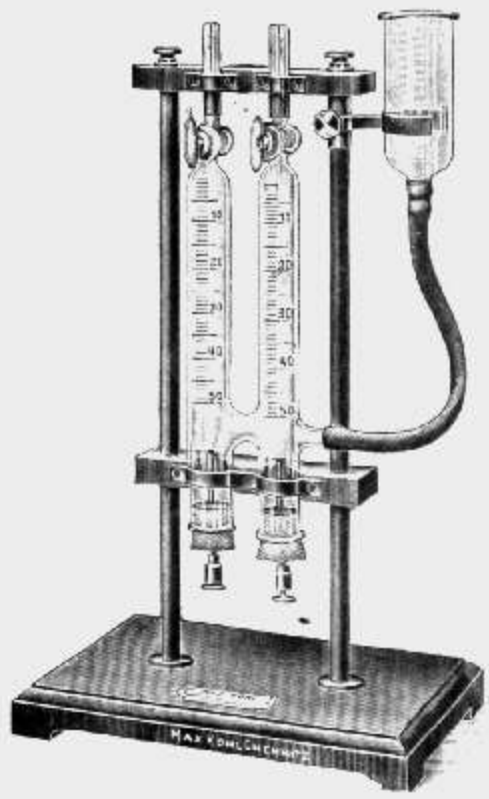
62 188. 1 : 2.



62 189. 1 : 6.



62 190. 1 : 9.



62 191. 1 : 5.

62,182. **Water Decomposing Apparatus** after Weinhold (Weinhold, Vorschule, 2nd Edn., Fig. 346), Figure (M. P., 9th Edn., III, Fig. 447; Gan.-Man. Fig. 715; Gan.-Rein. Fig. 945), with flat glass vessel, round pierced iron base and 2 glass tubes divided in ccms . . . . . £ 0.16.0

62,183. **Voltameter,** Figure (M. P., 10th Edn., IV, 1, Fig. 460; 9th Edn., III, Fig. 338), with platinum electrodes 1. 0.0

62,184. — idem, after Rebenstorff, the current being conducted by means of a mercury contact, Figure (Ztschr. f. d. phys. u. chem. U. **21**, 1908, p. 181) 1. 0.0

62,185. **Gas Measuring Jar** for above, for simple volumetric determinations on gases . . . 0. 4.0

62,187. **Eudiometer and Glass Cup** (M. P., 10th Edn., IV, 1, Fig. 461 a; 9th Edn., III, Fig. 339) 1. 0.0

62,188. **Voltameter** for Objective Demonstration, Figure (W. D. Fig. 528 [501]) . . . 0.12.0

62,189. **Voltameter** (Bunsen's), Figure (M. P., 10th Edn., IV, 1, Fig. 462; 9th Edn., III, Fig. 340) 0.18.0

62,190. **Voltameter** after Zwick, Figure 1. 6.0

The apparatus serves for producing oxy-hydrogen gas, for decomposing water (separating and measuring hydrogen and oxygen), electrolysis of Glauber salt, decomposition of copper sulphate.

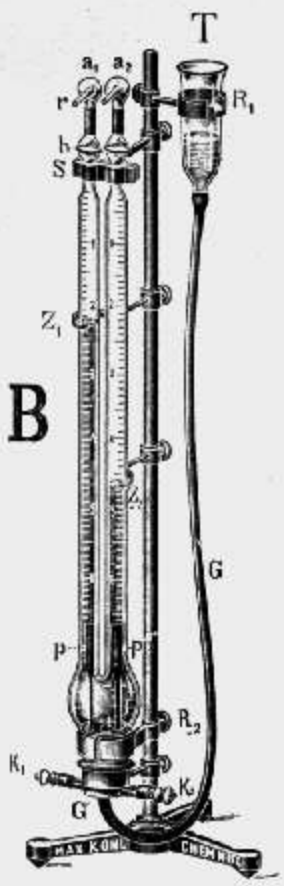
62,191. **Voltameter,** Figure, with variable level 1.10.0

Cl. 4643, 2296, 5873, 5864, 2299.

Max Kohl A. G. Chemnitz. Germany.



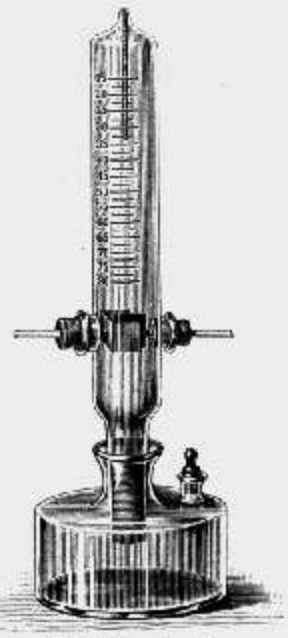
62 193. 1 : 7.



62 196. 1 : 10.



62 197. 1 : 10.



62 198. 1 : 5.



62 200. 1 : 10.

62,193. **Voltameter** after Hofmann, Figure, with platinum electrodes, with two glass tubes of 75 ccm, divided in $^1/_5$ ccm . . . . . £ s. d. 1. 12. 0

62,194. — idem, with carbon electrodes 1. 10. 0

62,195. — idem, modified by Friedr. C. G. Müller (M. T. Fig. 202) 1. 4. 0

62,196. **Voltameter** after Hofmann, improved by Kolbe, Figure (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 134 B; Ztschr. f. d. phys. u. chem. U. **14**, 1901, p. 77), with platinum electrodes 7×40×0.3 mm 2. 15. 0

62,197. **Gas Voltameter** after Kolbe, Figure (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 134 A; Ztschr. f. d. phys. u. chem. U. **10**, 1897, p. 75), for quantitative experiments, with platinum electrodes 7×40×0.3 mm 2. 10. 0

62,198. **Voltameter** after Kohlrausch, Figure (M. P., 10th Edn., IV, 1, Fig. 463; 9th Edn., III, Fig. 343), with thermometer fused in and with large platinum electrodes, can be used up to 30 amps. 3. 12. 0

This voltameter is very well adapted for quickly checking ammeters. To fill it is only necessary to invert it. The bung should be removed when in use.

62,199. **Voltameter** after Friedr. C. G. Müller, in glass jar for water cooling (M. T. Fig. 201) 0. 12. 0

62,200. **Precision Gas Voltameter** after Friedr. C. G. Müller, Figure (Ztschr. f. d. phys. u. chem. U. **14**, 1901, p. 140; M.T. p. 288), for quickly and conveniently calibrating ammeters, also well adapted for practical school work. The apparatus can remain permanently filled ready for use 2. 8. 0

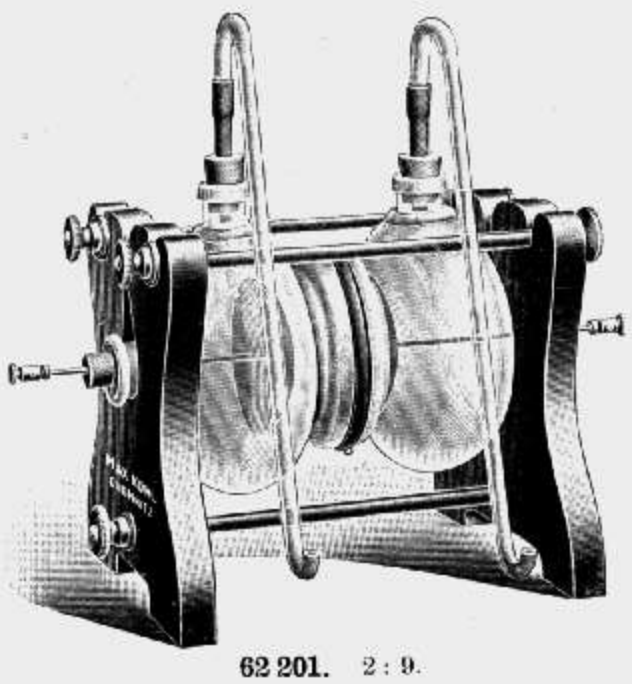
62,201. **Water Decomposing Apparatus** for large quantities of oxygen and hydrogen, Figure, for potentials of 8—20 volts (M. P., 9th Edn., III, Fig. 449) 3. 0. 0

62,202. **Voltameter** after Grimsehl, for catching separated gases; is inverted for filling; also suitable for practical school use (Ztschr. f. d. phys. u. chem. U. **18**, 1905, p. 283 Figs. 1 and 1a; Grimsehl, Fig. 852) 0. 16. 0

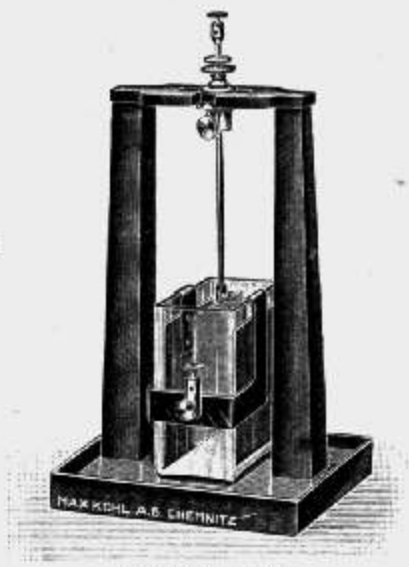
62,203. **Gas Voltameter** after Grimsehl, for trapping the gases in general; of low resistance, rapidly decomposing with 3—4 volts (Ztschr. f. d. phys. u. chem. U. **18**, 1905, p. 284, Figs. 2 and 2 a) 0. 16. 0

Six of these apparatus can be used for demonstrating Faraday's first law (cf. Grimsehl, Fig. 850).

Max Kohl A. G. Chemnitz. Germany.



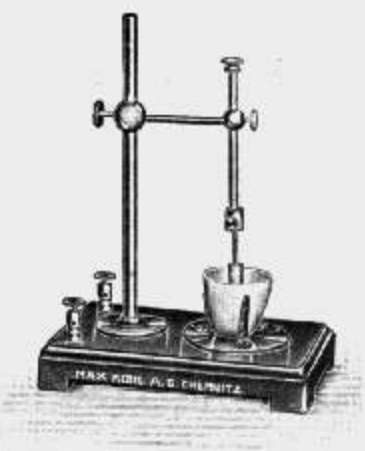
62 201. 2 : 9.



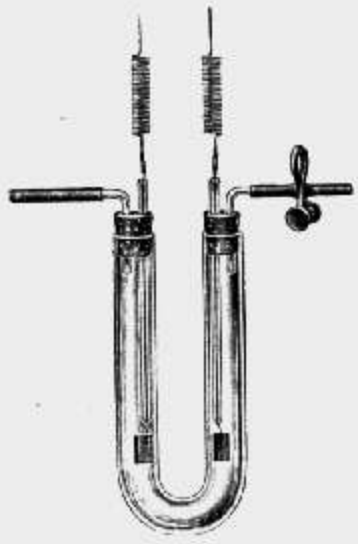
62 205. 1 : 6.



62 204. 1 : 3.



62 207. 1 : 6



62 209. 1 : 6.



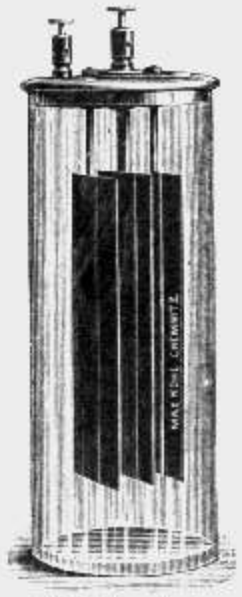
62 210. 1 : 8.



62 212. 1 : 5.



62 213. 1 : 4.



62 214. 1 : 5.

62,204. **Gas Coulomb-meter** for practical school use, Figure (Hahn, Schülerübungen, p. 381) . . . . . £ 0. 12. 0

62,205. **Copper Voltameter,** Figure, with 2 copper plates and surface of 2 sq decimetres for 1 platinum plate, for a current of 5 amperes; **without Platinum Plate** 3. 10. 0

62,206. **Platinum Plate** for above, according to weight and state of market Approximately 6. 0. 0

62,207. **Silver Voltameter,** Figure, with rod-shaped silver anode, for a current density of 0.25 ampere; without Platinum Bowl (M. P., 10th Edn., IV, 1, Fig. 468) 3. 0. 0

62,208. **Platinum Bowl** for above, according to weight and state of market Approximately 3. 8. 0

62,209. **U-shaped Decomposing Cell** with platinum electrodes, after Friedr. C. G. Müller (M. T. Fig. 204), Figure 0. 10. 0

62,210. **Electrolytic Apparatus** after Grimsehl, with lead electrodes, Figure; chiefly for decomposing water with currents of up to 20 amperes (Ztschr. f. d. phys. u. chem. U. **16**, 1903, p. 162, Fig. 3; Grimsehl, Fig. 846) 0. 10. 0

62,211. — idem, with carbon electrodes, chiefly for generating chlorine 0. 10. 0

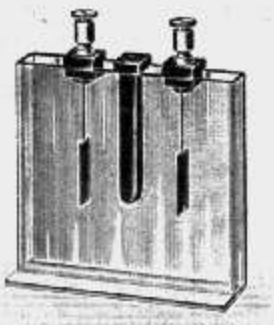
62,212. **U-shaped Glass Tube with platinum electrodes** and glass base, Figure (M. P., 9th Edn., III, Fig. 457; Gan.-Man. Fig. 717; Gan.-Rein. Fig. 946) 0. 8. 0

62,213. **Copper Voltameter,** Figure, after Friedr. C. G. Müller (M. T. p. 290) 0. 8. 0

62,214. **Copper Voltameter,** Figure, with 3 copper plates of electrolytic copper 1. 4. 0

62,215. **Grooved Glass** after Friedr. C. G. Müller, with two electrodes each of copper, lead, carbon, zinc and platinum. The latter are clamped in with the aid of clamps No. 60,172, p. 799 (M. T. p. 291), without base clamps 1. 16. 0

Cl. 2540, 5823, 5985, 5825, 4171, 5361, 5961, 4523, 2309.



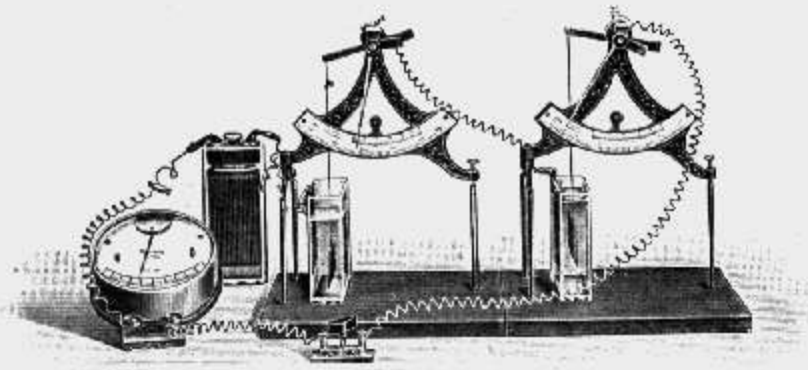
62 216. 1 : 3.



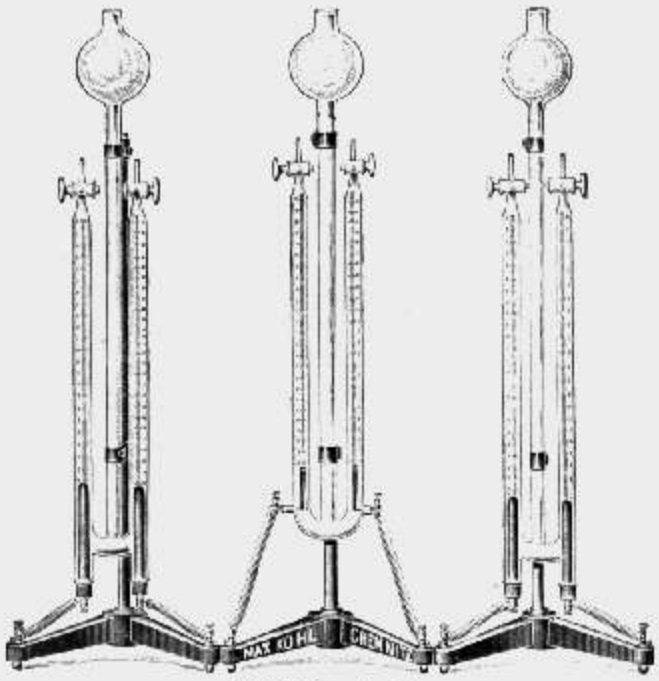
62 217. 1 : 3.



62 218. 1 : 10.



62 221.



62 220. 1 : 11.



62 225. 1 : 10.

	£ s. d
62,216. **Apparatus for Objectively Demonstrating Electrolytic Decompositions and Crystallizations,** Figure (M. P., 9th Edn., III, Fig. 459)	0.14.0
62,217. **Saturn's Tree Inset** for above, Figure (M. P., 9th Edn., III, Fig. 460)	0. 4.0
62,218. **V-shaped Glass Tube with Platinum Electrode** and stand, Figure (M. P., 9th Edn., III, Fig. 458)	0.18.0
62,219. **Electrolytic Apparatus** after Grimsehl, with gas conduit tubes, for small currents (Ztschr. f. d. phys. u. chem. U. **16**, 1903, p. 162, Figs. 1 and 2), comprising 2 glass bell jars with platinum electrodes and 1 glass bell jar with carbon electrodes and a glass jar in which the glass bells are suspended	0.14.0
62,220. **Demonstration Experiment for Faraday's second Law,** as suggested by A. W. Hofmann, Figure (M. P., 9th Edn., III, Fig. 461), consisting of 3 water decomposing apparatuses, one with platinum and the others with carbon electrodes, for decomposing muriatic acid, acidulated water and liquid ammonia	3.10.0
62,221. **Demonstration Experiment for Faraday's second Law,** Figure, without the ammeter illustrated; also without accumulator or current key (M. P., 10th Edn., IV, 1, Fig. 459)	3. 0.0
62,222. **U-shaped Decomposing Vessel** after Grimsehl, with water-cooling, for showing that in the electrolysis of dilute sulphuric acid the concentration of acid at the anode continually increases and at the cathode continuously decreases (Grimsehl, Fig. 847) . .	0.18.0
62,223. **W-shaped Decomposition Cell** after Grimsehl, for showing the migration of sulphuric acid from the cathode to the anode (Grimsehl, Fig. 848)	1. 0.0
62,224. **Sliding Resistance** for above, for 110 volts	1. 4.0
62,225. **Apparatus** after Nernst for showing the velocity of migration of violet coloured MnO_4 Ions, Figuré (M. P., 10th Edn., IV, 1, Fig. 472)	1. 4.0
62,226. **Apparatus** after Wiedemann, **for the Electrolysis of Salt Solutions and the Migration of Ions** (M. P., 9th Edn., III, Fig. 454)	2.10.0

Cl. 5964, 5969, 5684, 5958, 2545, 5444

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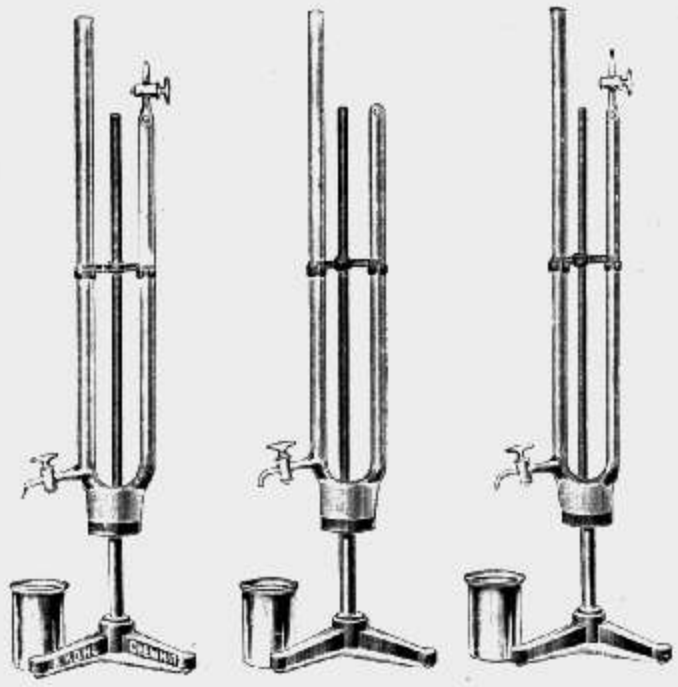
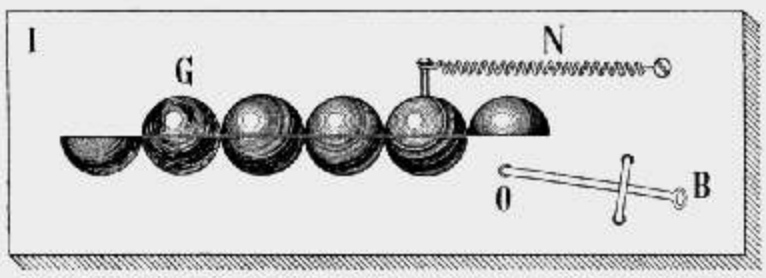
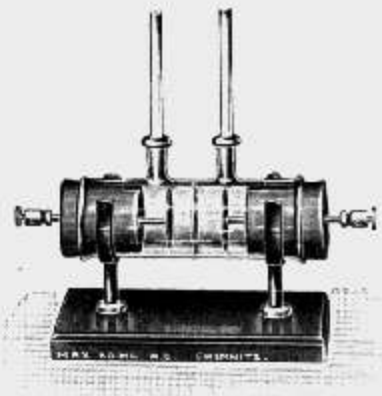


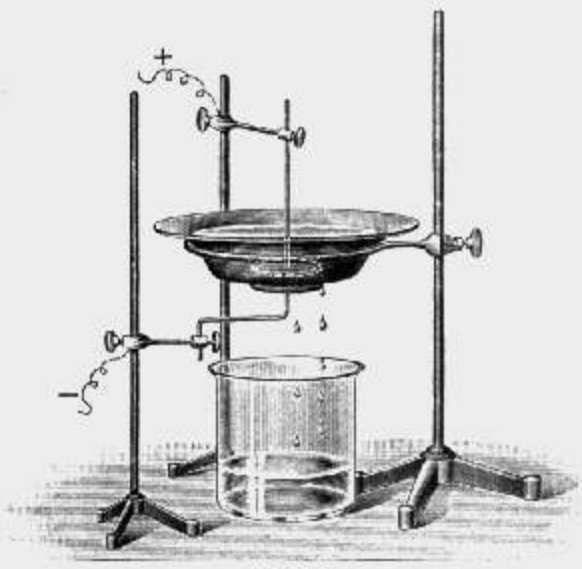
62 229. 1 : 10.



62 235. 1 : 3.



62 231. 1 : 4.



62 232.

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62,227. **Electrolytic Demonstration Apparatus,** after Hillig, for demonstrating the main processes in the electrolysis in the coloured solution of sodium chloride (Ztschr. f. d. phys. u. chem. U. **16**, 1903, p. 222) . . . . . £ s. d. 0. 18. 0

62,228. **Electrolytic Demonstration Apparatus** after Grimsehl, for explaining the mechanism of the transportation of electricity, after Hittorf (Grimsehl, Fig. 862) 0. 12. 0

62,229. **Apparatus after Hofmann,** Figure. for proving that hydrogen and oxygen combine only in the proportion in which they are developed from water 2. 16. 0

The apparatus consists of 2 U-tubes with 2 stopcocks, 1 similar tube with 1 stopcock and 3 brass stands on iron tripod with carriers and holders.

62,230. **Apparatus for Electric Endosmose,** U-shaped bent glass tube with porous partition wall (M. P., 9th Edn., III, Fig. 464) 0. 3. 0

62,231. — idem, for projection, Figure 0. 10. 0

Electrodes of sheet copper are inserted on both sides by means of rubber bungs, in a glass tube fixed horizontally on a board. A porous partition is fixed in the centre of the glass tube. A glass tube is filled on both sides and the narrow perpendicular glass tube inserted; the liquid then ascends to an equal height in both tubes. If now the current is introduced the liquid falls in one tube and ascends in the other.

62,232. **Apparatus for Electric Endosmose,** Figure, for connecting up to 110—220 volts D. C. (M. P., 10th Edn., IV, 1, Fig. 527) 1. 4. 0

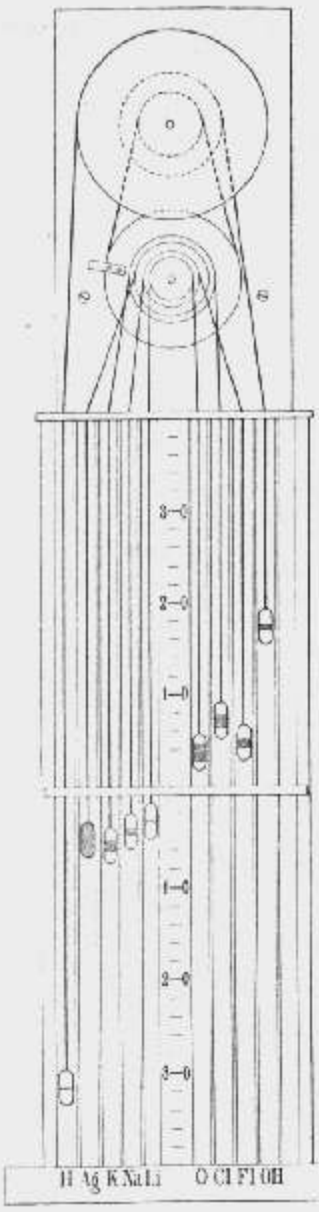
62,233. **Apparatus** after Wiedemann, for accurately measuring the liquid carried over to the negative pole (M. P., 9th Edn., III, Fig. 465), with copper cylinder 1. 10. 0

62,234. — idem, with platinum cylinder 3. 0. 0

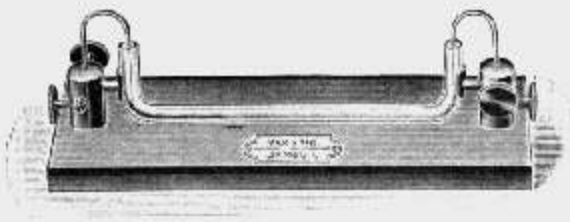
62,235. **Mechanical Model** for demonstrating Electrolysis, after Egyed, Figure 0. 16. 0

A mechanical model for separating and displacing the electrolyte molecules by the electric current.

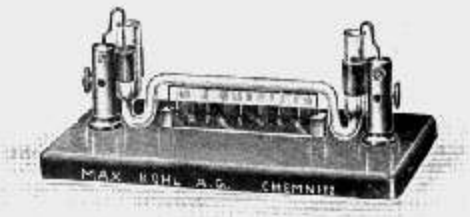
The atoms of the elements of which the electrolyte is comprised are each demonstrated as a quarter-circle. Each two of these combine to a semi-circle, which demonstrates a molecule of the electrolyte. The decomposition of the molecules is shown by the mutual displacement of the quarter-circles, so that on the left and right sides one atom each of the elements comprising the electrolyte are freed.



62 236.



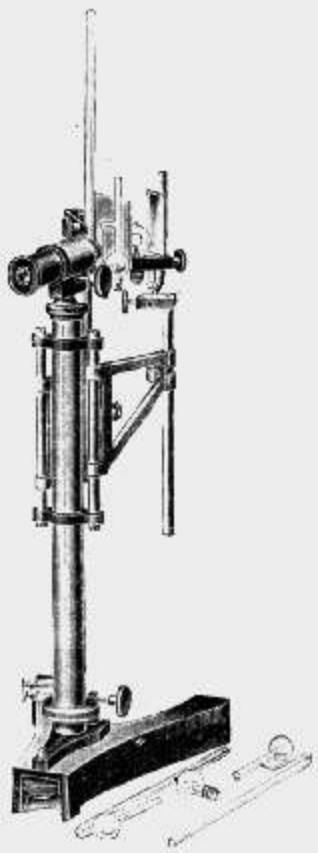
62 237. 1 : 4.



62 238. 1 : 4.



62 239. 1 : 4.



62 240. 1 : 6.

62,236. **Mechanical Model for demonstrating the velocity of migration** of the Ions, after F. Kohlrausch, Figure (Fr. phys. techn. II, 1, Fig. 481). . . . . £ 2. 10. 0

62,237. **Apparatus for demonstrating the migration of a drop of mercury** by the inequality of surface tension produced electrolytically, Figure, for projection 0. 8. 0

62,238. **Capillary Galvanoscope,** after Weinhold, for projection, Figure (W. D. Fig. 530 [503]), with glass scale 0. 12. 0

62,239. **Capillary Electrometer**, after Ostwald, Figure, vertical pattern, on stand with holder, mirror, microscope, three small tubes and 4 volt Osram lamp for illuminating 2. 10. 0

62,240. **Precision Capillary Electrometer,** after Ostwald, Figure, with fine universal adjustment, on stand, with holder, microscope, mirror, and illuminating device for gas or with 4 volt Osram lamp. The illustration deviates somewhat from the pattern now constructed 10. 0. 0

62,241. **Capillary Electrometer,** after Lippmann, Figure, with microscope (Gan.-Man. Fig. 651; Gan.-Rein. Fig. 962) 15. 0. 0

62,242. **Electrolytic Forge,** Figure (M. T. p. 299) 0. 6. 0

The beaker is filled with a 10% solution of boiling potash and the lead plate connected with the positive and the iron wire with the negative pole of a 110—220 volt network, a resistance being inserted. When the iron wire is immersed to a distance of a few centimetres the end is immediately rendered white hot and commences to drop off. The current density should be approximately 10 amps., which is not sufficient by far to alone render the iron wire incandescent.

Cl. 3533, 3845, 5021, 2551, 2551[1].

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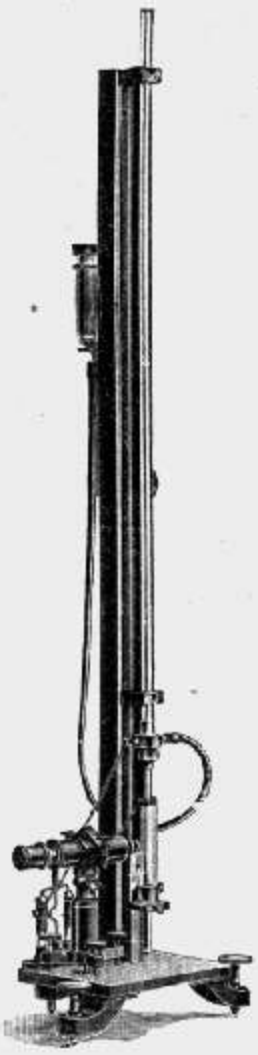
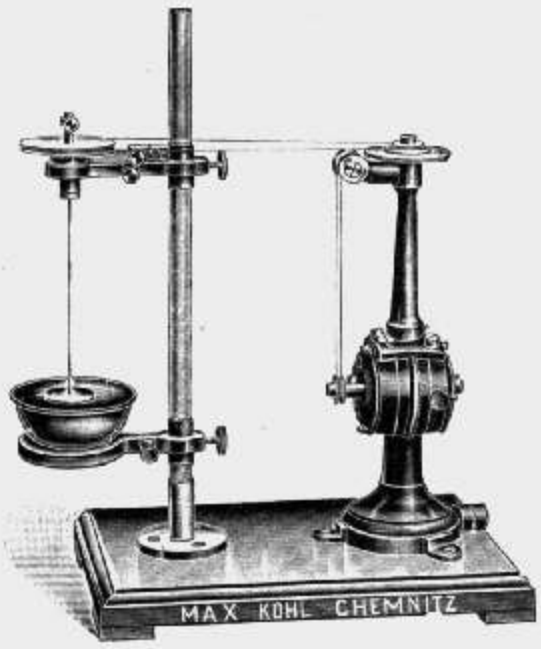


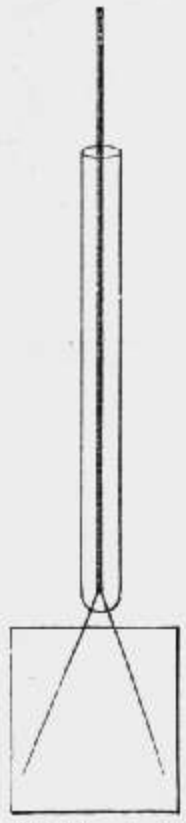
62 241. 1 : 9.



62 242. 1 : 5.



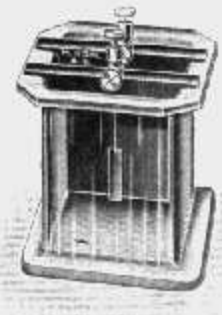
62 244. 1 : 6.



62 246. 4 : 3.



62 249. 1 : 9.

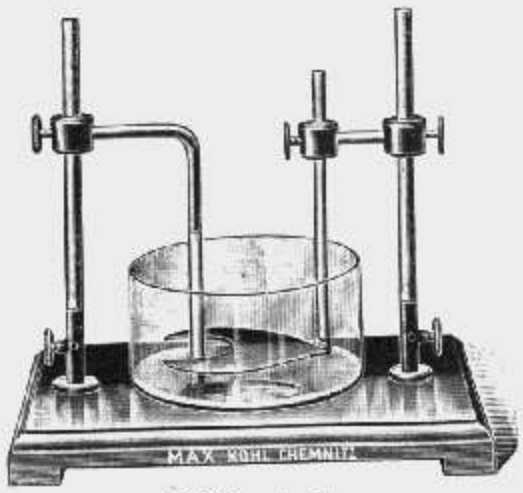


62 250. 1 : 6.

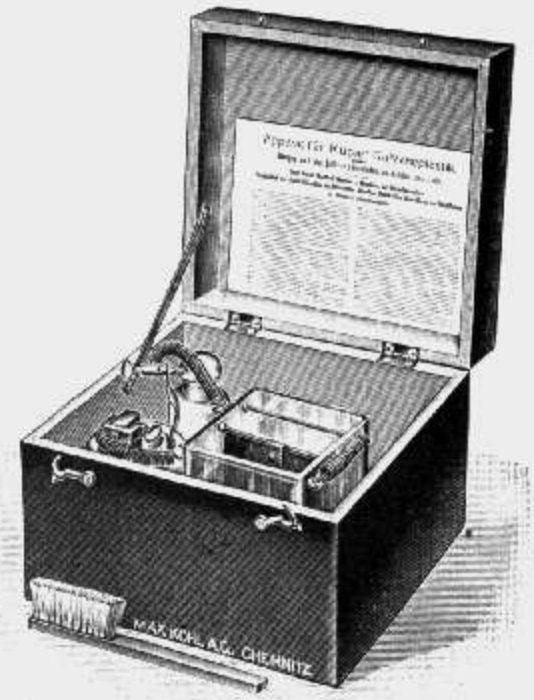
	£ s. d.
62,243. **2 Concentration Cells** after Grimsehl, on one stand (Grimsehl, Fig. 863)	0. 18. 0
62,244. **Electrolytic Stand** for Rotating Platinum Electrode, Figure; price, including motor and gearing, but excluding electrodes	4. 10. 0
The one electrode is kept continually in motion by a 110—220 volt electric motor with cord and gearing: the electrolytic processes are therefore **not** appreciably accelerated. We supply platinum electrodes and platinum dishes at as low a price possible, according to weight and with the addition of the charges for shaping.	
62,245. — idem, with larger motor so as to enable the apparatus to be used as a **Stirrer** also	5. 10. 0
62,246. **Flat Electrode,** Figure, for Laboratory experiments, with platinum sheet having a surface of 15 × 20 mm	0. 3. 0
This electrode consists of a rectangular piece of the thinnest platinum foil welded on to two forkshaped stiff platinum wires sealed in a glass tube; connection is made by a copper cord in the interior of the small glass tube.	
62,247. — idem, area 20 × 30 mm	0. 3. 6
62,248. — idem; area 30 × 40 mm	0. 4. 0
62,249. **Stand for above Platinum Electrodes,** Figure. Price without Electrodes	1. 2. 0
The rods on the insulating stand, for clamping the electrodes, can be adjusted both vertically and laterally.	
62,250. **Apparatus for demonstrating Nobili's Colour Rings,** Figure (M. P., 9th Edn., III, p. 576), with platinum electrode	0. 14. 0



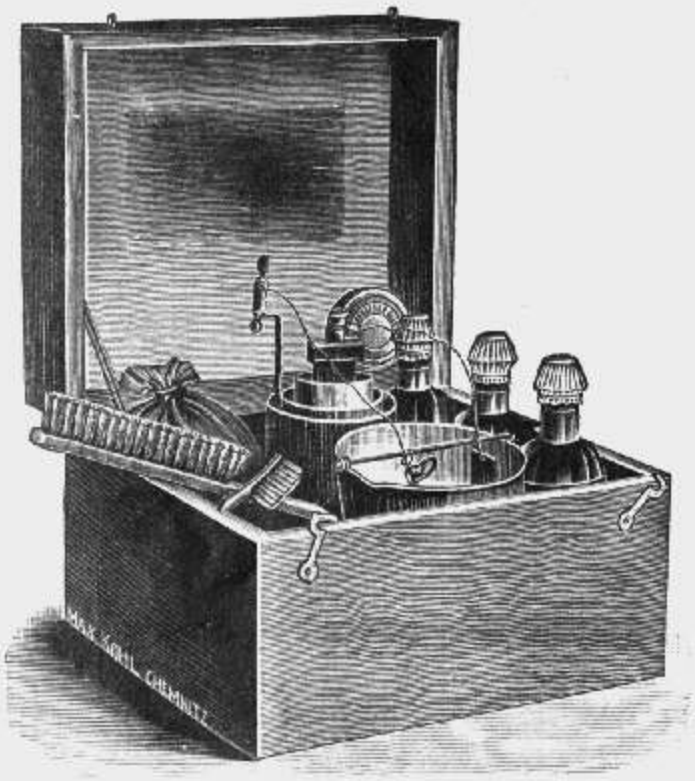
62 251. 1 : 6.



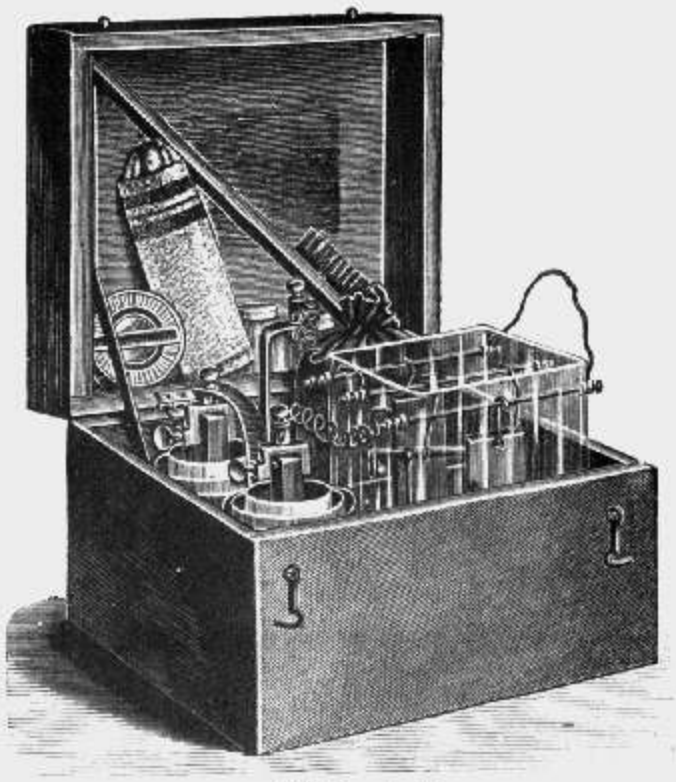
62 252. 1 : 6.



62 256. 1 : 8.



62 258. 1 : 6.



62 259. 1 : 6.

62,251. **Electro-plating Apparatus,** simple, Figure, consisting of glass vessel with lid, porous pot, zinc cross and copper plate; working without special current supply (Grimsehl, Fig. 870) . . . . . £ 0. 7. 0

The matrices, preferably of gutta-percha, are laid on the copper plate.

62,252. **Copper-plating Apparatus,** Figure 0. 14. 0

The apparatus requires a special source of current. The rod-shaped cathode enclosed in a glass tube, is placed on the edge of the matrix.

62,253. **Matrices (Reprints of Coins, Medals),** for obtaining galvanic deposits, of paraffin Each 0. 0. 7

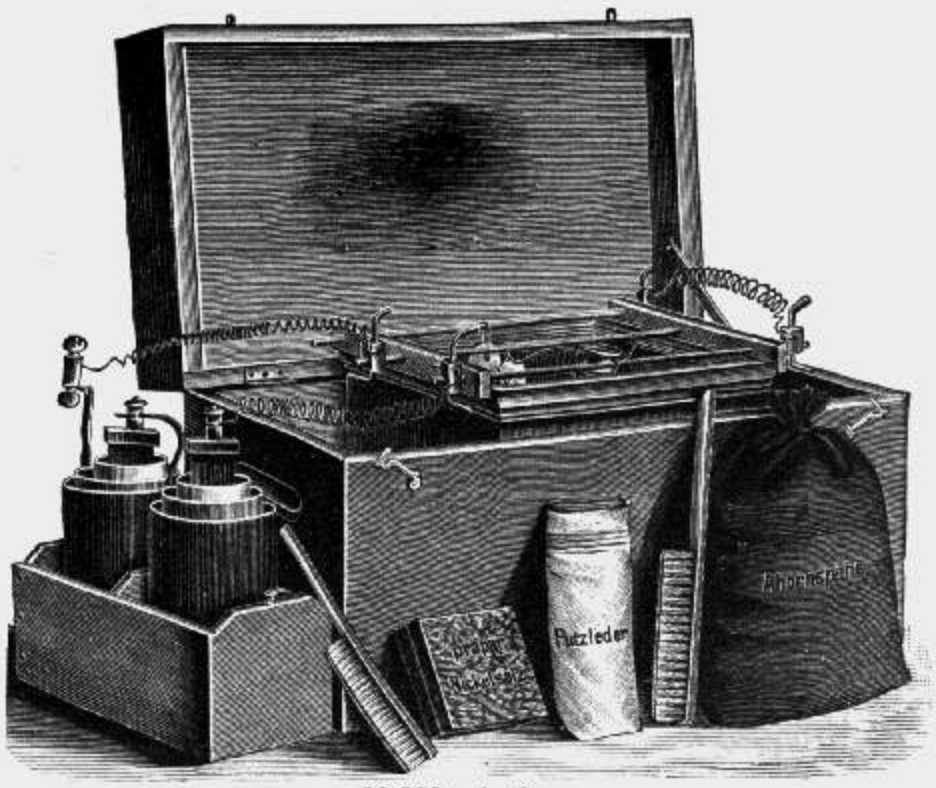
62,254. — idem, of gutta-percha . . . . . Each 0. 1. 0

62,256. **Electro-plating Apparatus for Copper Deposits,** Figure, comprising: 1 Bunsen cell, 1 glass trough 10 × 10 × 12 cm, 1 anode rod with connecting screws, 2 earthenware rods with connecting screws, leads, copper-sulphate, copper anode, galvano-graphite, black lead brush, and directions, in lacquered box 1. 0. 0

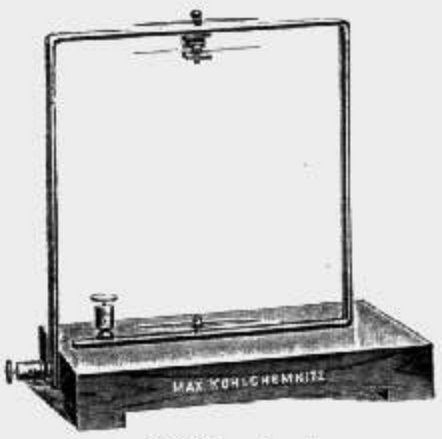
62,257. — idem, **larger,** with earthenware trough 20 × 20 × 20 cm 1. 10. 0

Cl. 5970, 2564, 5984, 2565, 2566.

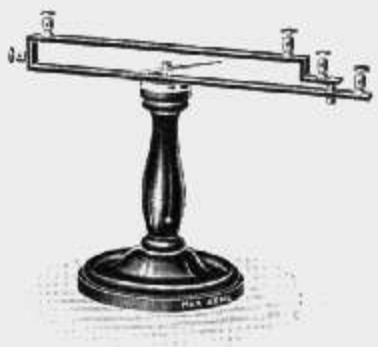
Max Kohl A. G. Chemnitz, Germany.



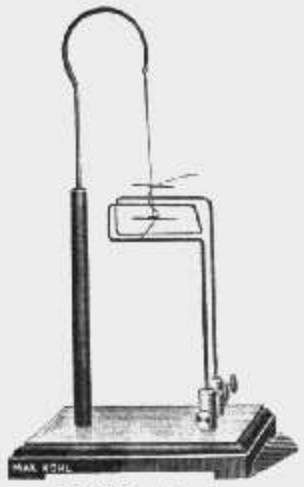
62 260. 1 : 6.



62 261. 1 : 4.



62 262. 1 : 6.



62 263. 1 : 7.

62,258. **Complete Apparatus for Silvering and Gilding,** Figure, comprising: 1 Bunsen cell, 1 enamelled dish, copper wires, copper, silver and gold bath, brush for removing grease, hand scratching brush, pumice stone, sawdust, scouring leather, and directions, in lacquered box . . . . . £ 1. 5. 0

62,259. **Complete Apparatus for Nickel-plating,** Figure, comprising: 2 Bunsen cells, 1 glass trough 10 × 10 × 15 cm, 2 anode rods with clamping screws, 1 earthenware rod with clamping screws, leads, prepared Nickel Salts, Nickel anodes and nickel hook, brush for removing grease, pumice stone, sawdust, scouring leather, and directions, in lacquered box . . . . . £ 1. 4. 0

62,260. — idem, **larger,** with earthenware trough 20 × 20 × 20 cm . . . . . £ 1. 15. 0

Electrolytic Rectifiers: see p. 863.

Section 6: Electro-magnetism and Electro-dynamics.

Deflection of the Magnetic Needle.

62,261. **Oersted's Apparatus for the Deflection of the Magnetic Needle by the Electric Current,** Figure (M. P., 9th Edn., III, Fig. 471; cf. Gan.-Man. Fig. 727; Gan.-Rein. Fig. 823), with 2 magnetic needles . . . . . £ 0. 18. 0

62,262. — idem, different pattern, Figure . . . . . £ 0. 16. 0

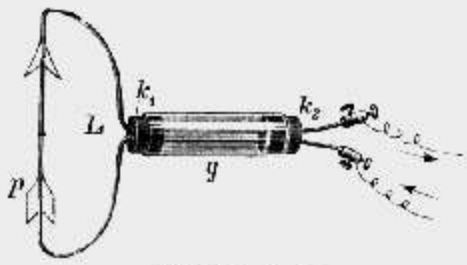
The apparatus has 5 terminals so as to allow the most varied parts of the rectangle to act on the needles.

62,263. **Apparatus with two astatically arranged Magnetic Needles,** Figure, for showing deflection by the electric current . . . . . £ 0. 18. 0

Cl. 2567, 2568, 5966, 2570.



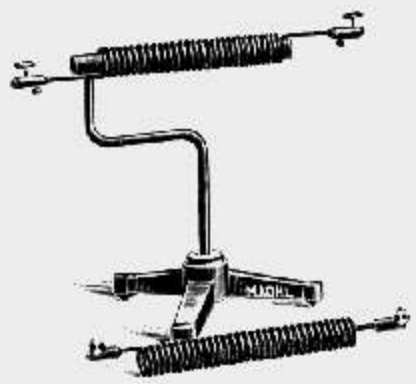
62 264. 1 : 6.



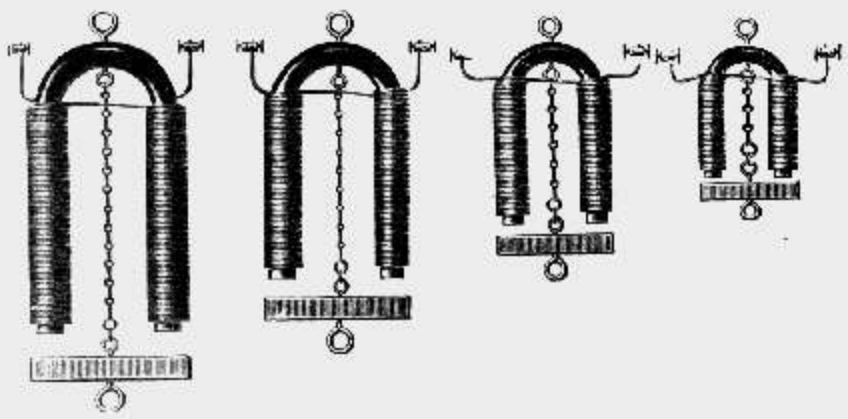
62 265. 1 : 6



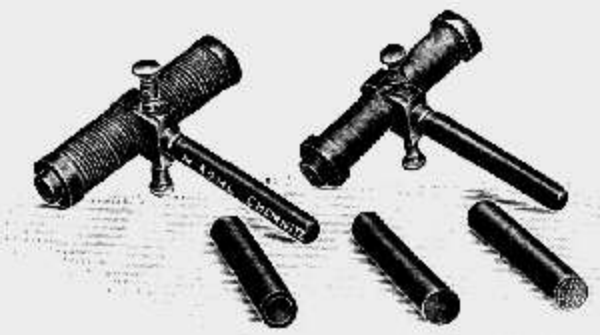
62 266. 1 : 5.



62 268. 1 : 7.



62 269/72. 1 : 8.



62 273. 1 : 6.

62,264. **Apparatus for Deflecting the Magnetic Needle by the Electric Current,** Figure, comprising a voltaic cell, a brass stirrup and a magnetic needle on stand . . . . . £ s. d. 0. 16. 0

62,265. **Current Conductor for Experiments on the Deflection of the Magnetic Needle by the Electric Current,** after Kolbe, Figure (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 105) 0. 8. 0

Suitable Magnetic Needles and Stands for above: see Nos. 60,043—60,046 and 60,058, p. 786.

Electromagnets.

Unless stated to the contrary, the Electromagnets are provided with a winding of thick wire for connecting up with Bunsen Cells or Accumulators.

62,266. **Magnetising Spiral,** Figure (M. P., 9th Edn., III, Fig. 517), wood reel wound with wire 2 mm thick, with iron core which can be drawn out 0. 16. 0

62,267. — idem, smaller and wound with wire 1 mm thick 0. 10. 0

62,268. **Iron Bar on Stand and 2 Wire Spirals wound in contrary dierctions,** Figure, for showing the reversal of the magnetic poles when the current-direction is reversed . . 0. 12. 0

Electromagnets, Figure, horse-shoe shaped, with suspension ring and armature (cf. Gan.-Man. Fig. 757; Gan.-Rein. Fig. 909).

List No.	62,269	62,270	62,271	62,272
Length of Limbs mm	100	150	200	250
£	0. 8. 0	0. 12. 0	0. 16. 0	0. 20. 0

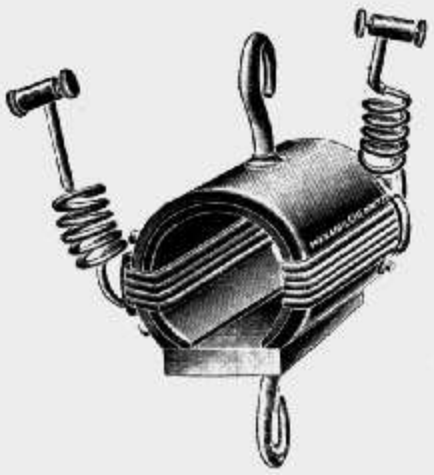
The armature is fastened to a chain, as suggested by Grimschl, to prevent its falling down.

62,273. **2 Coils with winding of different thickness, with handles, and with 2 solid, 2 hollow soft iron cores for same; 2 hollow cylinders of thin sheet iron, 1 steel wire bundle and 1 soft iron wire bundle,** Figure, after Friedr. C. G. Müller (M. T. Fig. 187), for electro-magnetic experiments 1. 0. 0

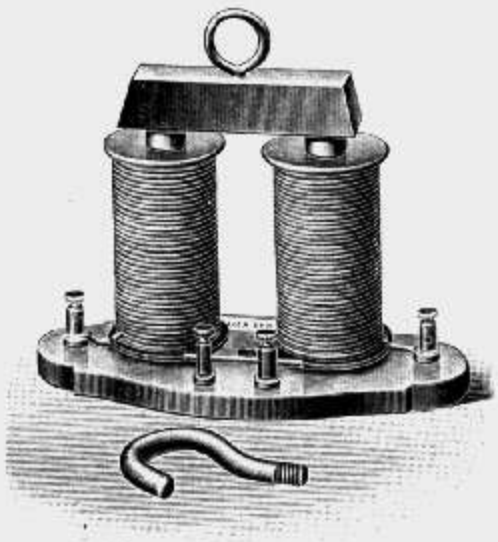
Solenoid on Stand for Electro-magnetic Experiments with the Hartl Pointer Balance: see No. 51,600, p. 240.

Cl. 5973, 2572, 2573, 2574, 2576, 4166.

Max Kohl A. G. Chemnitz. Germany.



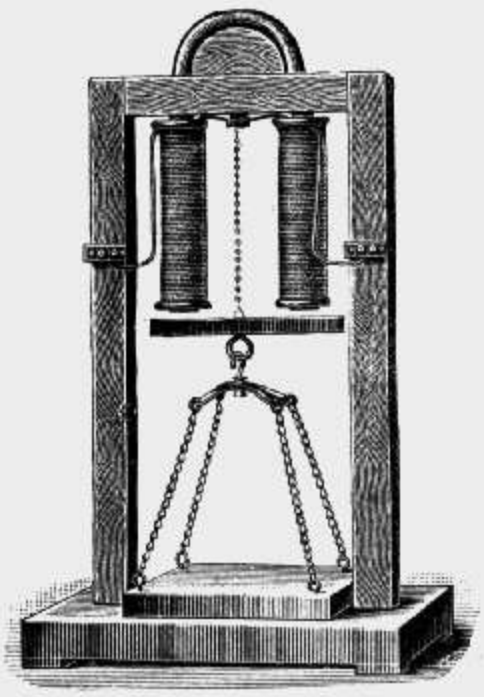
62 274. 1 : 3.



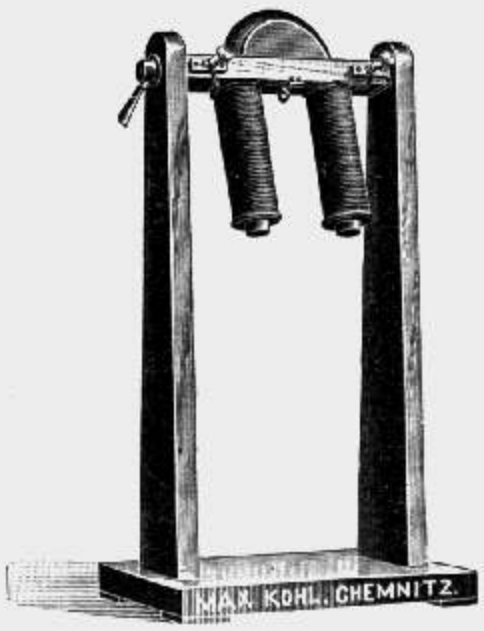
62 275. 1 : 4.



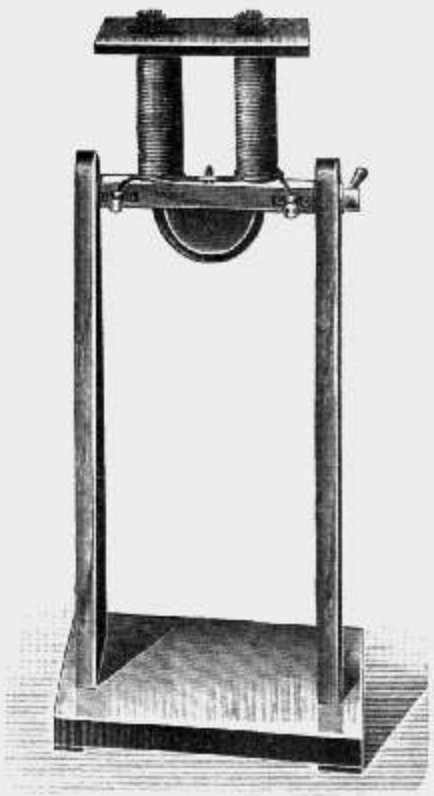
62 276. 1 : 8.



62 277. 1 : 9.



62 278 A. 1 : 9.



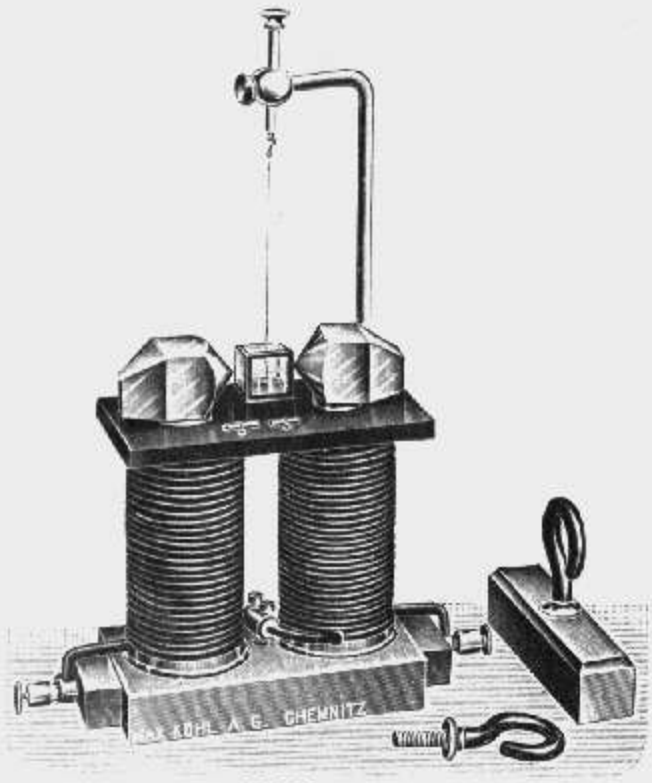
62 278 B. 1 : 9.

	£ s. d.
62,274. **Joule's Electromagnet,** with broad, flat pole surfaces (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 104 B), of horse-shoe section, with suspension rings and armature, Figure; carrying capacity when supplied with current by an accumulator or a bichromate cell, about 120 and 70 kg respectively; own weight 1 kg	0. 18. 0
62,275. **Elektromagnet,** Figure, with suspension ring and armature . . . . . The electromagnet carries 50 kg.	1. 4. 0
62,276. **Electromagnet carrying 50 kg,** in wood frame, Figure, arranged to rotate about the horizontal axis, with armature, balance pan and armature chain (Gan.-Rein. Fig. 907) . . . . . As the electromagnet can be removed from the fillet by loosening two screws it is possible to use the magnet alone — without frame.	1. 4. 0
62,277. **Electromagnet carrying 100 kg,** Figure, in wood frame, with limbs 250 mm long, armature and balance pan . . . . . The armature is, as in the preceding item, fastened to a chain in accordance with Grimsehl's suggestion.	1. 18. 0
62,278. — idem, **arranged so as to rotate,** Figs. A and B, with wood frame stretched with cardboard, armature and balance pan . . . . . In addition to being used in experiments on carrying capacity this Electromagnet can be employed for other purposes, e. g., for demonstrating the lines of force by using the wood frame intended for the purpose, cf. Fig. 62 278 B.	2. 4. 0

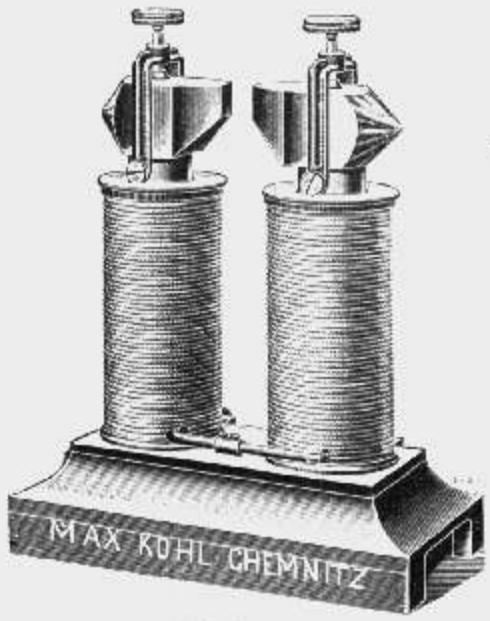
Cl. 3472, 2577, 2578, 2579, 2580, 2581.



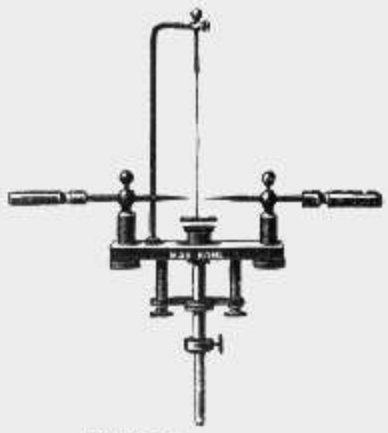
62 279. 1 : 10.



62 280. 1 : 4.



62 281. 1 : 6.



62 282 A. 1 : 10.



62 282 B. 1 : 6.

62,279. **Electromagnet carrying 150 kg,** Figure, with lever stand for measuring the carrying capacity (M. P., 9th Edn., III, Fig. 520) . . . . . £ 6. s. 0. d. 0

62,280. **Electromagnet** after Weinhold, Figure (W. D. Figs. 551—553 [524—526]), with armature. Suited both for experiments on the carrying capacity of magnets and for para- and diamagnetic experiments with the Projection Lantern. For the latter experiments we supply along with the magnet: **2 half-armatures** with conical poles; **1 ebonite slab with arm** for suspending the bismuth and nickel rods; and a **small glass tube** for filling with ferric chloride; **1 glass cube** 2. 4. 0

62,280 a. **v. Waltenhofen's Pendulum,** suitable for No. 62,280, with plain and toothed copper piece 1. 10. 0

62,281. **Electromagnet for Experiments on Diamagnetism and Paramagnetism,** Figure, with upright magnet coils 200 mm height and 100 mm diameter, magnet core 225 mm length, 60 mm diameter; with 1 pair pole pieces tapered on one side and truncated on the other 8. 0. 0

Auxiliary Apparatus for preceding Electromagnets:

62,282. **Device for Experiments on Paramagnetism and Diamagnetism,** Figs. A and B, comprising **one stand** for suspending the objects experimented on, **one stage** with vertical adjustment, for setting up the glass cube and the Faraday glass parallelepiped, **1 pointed holder** for the experiments on the separation of the aureole of sparks, **1 Light Holder** for diamagnetic investigations of the flame, and **1 case** of test bodies 2. 10. 0

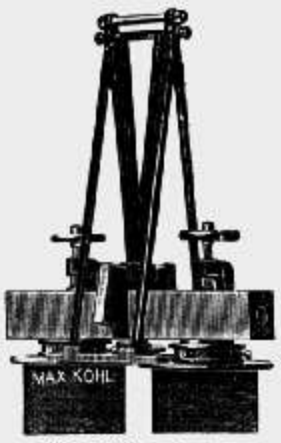
We supply the following test material along with the apparatus: 8 bars of iron, nickel, aluminium, bismuth, antimony, zinc, platinum, silver; 1 wood rod; 1 lead glass rod; 1 glass tube for filling with liquid; also 1 small dish for liquids and 1 plate glass hollow cube of 35 mm length of side for holding off air currents when the bars are swinging.

62,283. **v. Waltenhofen's Pendulum,** Figure, for showing the damping effect of induction, with plain and toothed copper piece 2. 10. 0

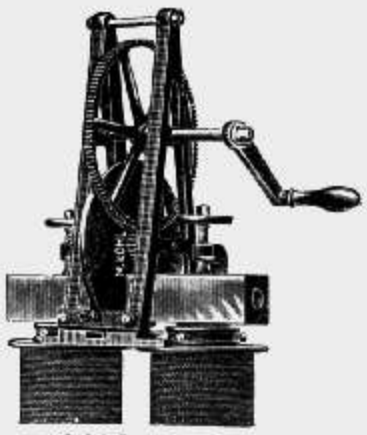
62,284. **Foucault's Rotating Copper Disc,** Figure, with wheel gearing, for demonstrating eddy currents and the heating of the disc when rotated between the magnetic poles 3. 0. 0

● Cl. 2583, 2590, 5429, 2585, 2591.

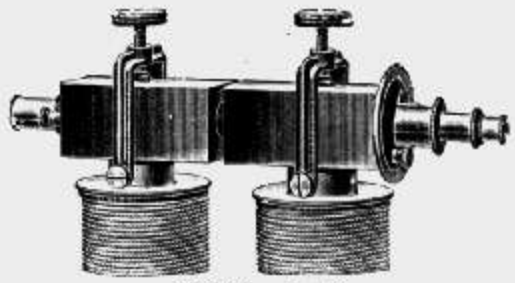
Max Kohl A. G. Chemnitz, Germany.



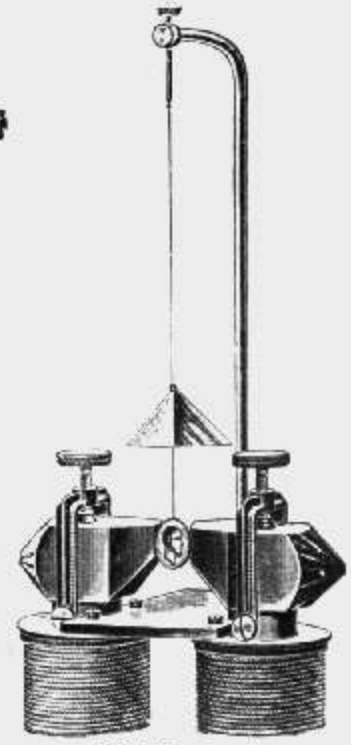
62 283. 1 : 8.



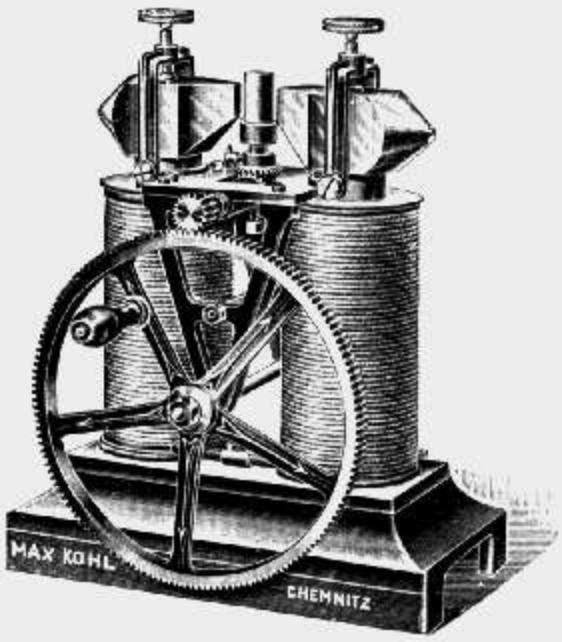
62 284. 1 : 8.



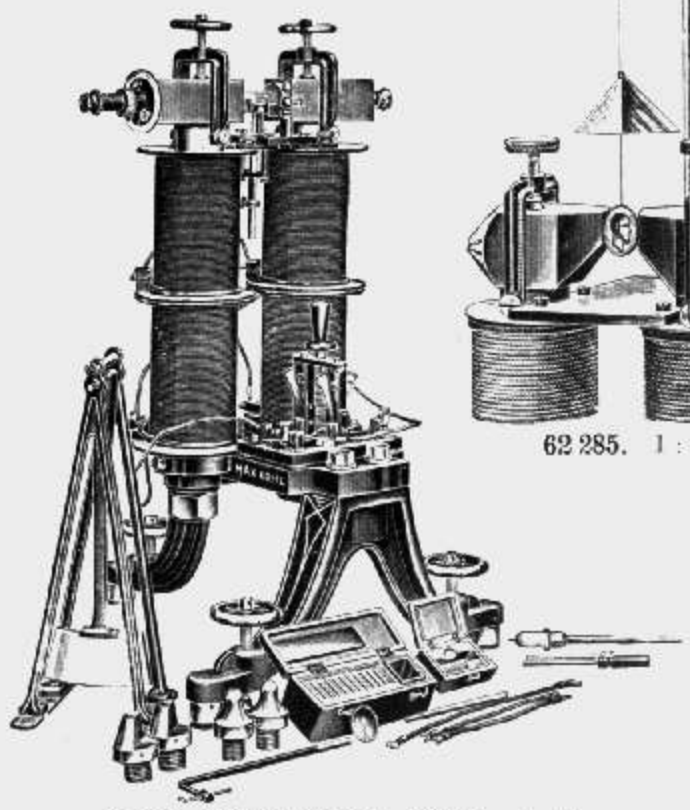
62 287. 1 : 6.



62 285. 1 : 6.



62 281, 62 286. 1 : 6.



62 288, 62 282, 62 283, 62 287. 1 : 10.

Max Kohl A. G. Chemnitz. Germany.

	£ s. d.
62,285. **Silver Coin with Pyramid Mirror,** after Tyndall, for showing damping of a metallic body when rotated in the magnetic field, Figure (Tyndall, Heat [Die Wärme], 4th German Edn., p. 87), with suspension device	1. 4. 0
62,286. **Device for Melting easily Liquefying Metals** by rotating in the magnetic field, after Tyndall, Figure (Tyndall, Heat [Die Wärme], 4th German Edn., p. 91)	4. 10. 0

A copper bush filled with solid metal is rotated rapidly between the pole pieces of an electromagnet: after short time the metal is melted by the eddy currents present.

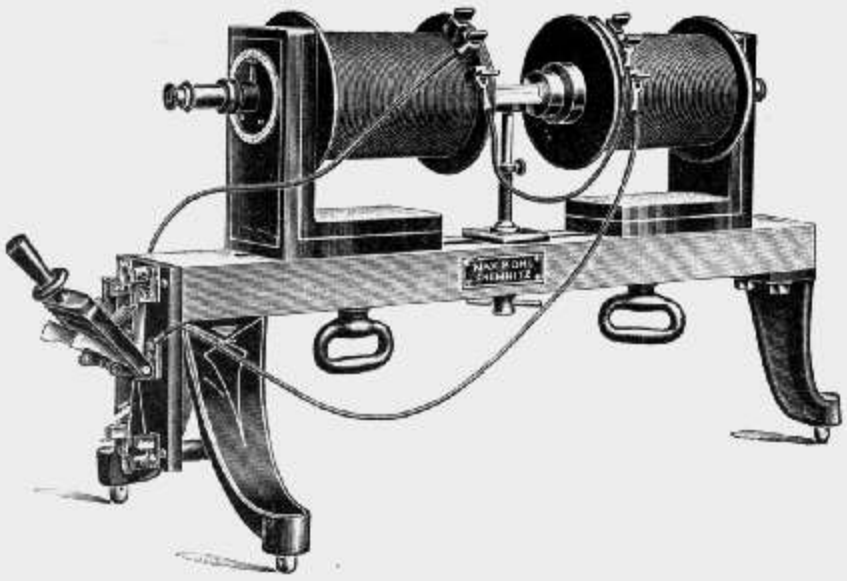
62,287. **Polarisation Apparatus,** Figure, for showing the Rotation of the Plane of Polarisation by magnetizing forces, with two nicols 12 mm, one double quartz plate and divided circle with index: Faraday Glass Parallelepiped 70×18×18 mm, in box with two pierced pole pieces	5. 0. 0

Bismuth Spirals for measuring Field Density: see Nos. 62,306 and 62,307, p. 956.

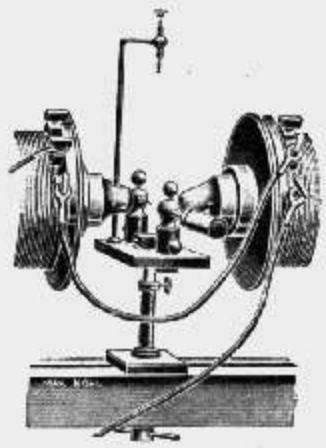
62,288. **Large Electromagnet,** Figure, **for all paramagnetic and diamagnetic experiments,** with magnets vertically arranged, with 4 coils with device for putting the windings in series or parallel, with commutator and interrupter, frame running on rollers. Length of magnet cores 430 mm, diameter 67 mm; length of each coil 200 mm, diameter 130 mm; with massive pierced pole pieces and two pair differently shaped conical attachments for same	30. 0. 0

The electromagnet is constructed for momentary loads of 30 amps. which are applied when the windings of the electromagnet are in series and connected direct to 65 volts D. C. working pressure. If the working pressure is 110 volts a proportionate resistance should be inserted in series. If desired, and at an extra cost of £1, the electromagnet is also supplied for connecting direct on to 110 or 220 volts. The maximum current density is then correspondingly lower, but the number of windings higher, so that the total number of ampere-turns is approximately the same.

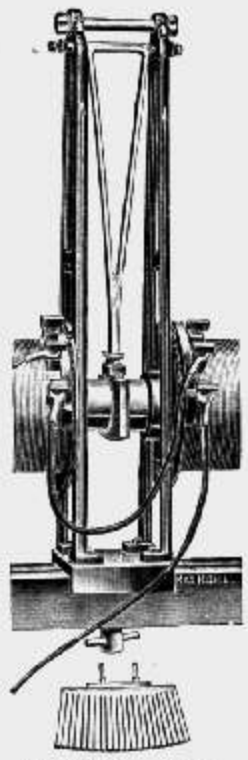
As Accessories we recommend the same as those for Electromagnet No. 62,281; the prices being the same as in that case.



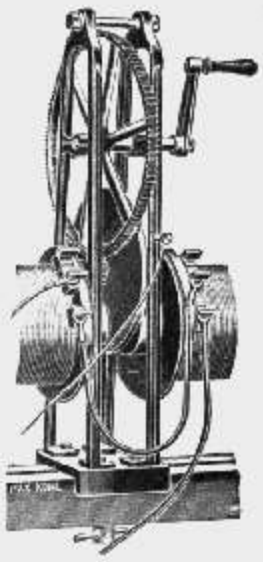
62290. 1 : 10.



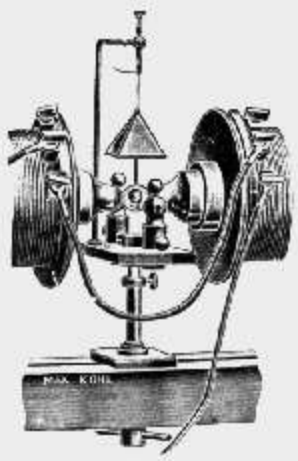
62282C. 1 : 8.



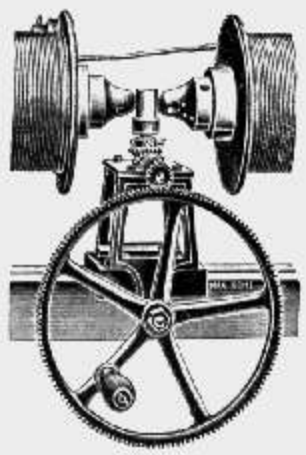
62283C. 1 : 8.



62284C. 1 : 10.



62285C. 1 : 8.



62286C. 1 : 8.

62,289. **Electromagnet with Vertical Magnet Limbs,** somewhat smaller pattern; magnet limbs 350 mm long and 52 mm diameter; length of each coil 160 mm, diameter 100 mm . £ 22. s. 10. d. 0

The electromagnet is built for a maximum momentary current density of 25 amperes in conjunction with 65 volts. As regards other voltages and accessories, the same remarks hold as for No. 62,288.

62,290. **Large Electromagnet** after Ruhmkorff, Figure, **for para- and diamagnetic experiments,** with horizontal magnet limbs 70 mm diameter and 220 mm length, pierced for taking the polarisation apparatus; coils 200 mm long and 130 mm diameter, with two pair different shaped pole-pieces, with pole commutator and interrupter (M. P., 9th Edn., III, Fig. 854). 25. 0. 0

As to current density and voltage all the remarks made under No. 62,288 hold good here also.

The accessories are also the same as for No. 62,281 and are supplied at the same price. Figs. 62,282 C to 62,286 C show the construction of these accessories for No. 62,290.

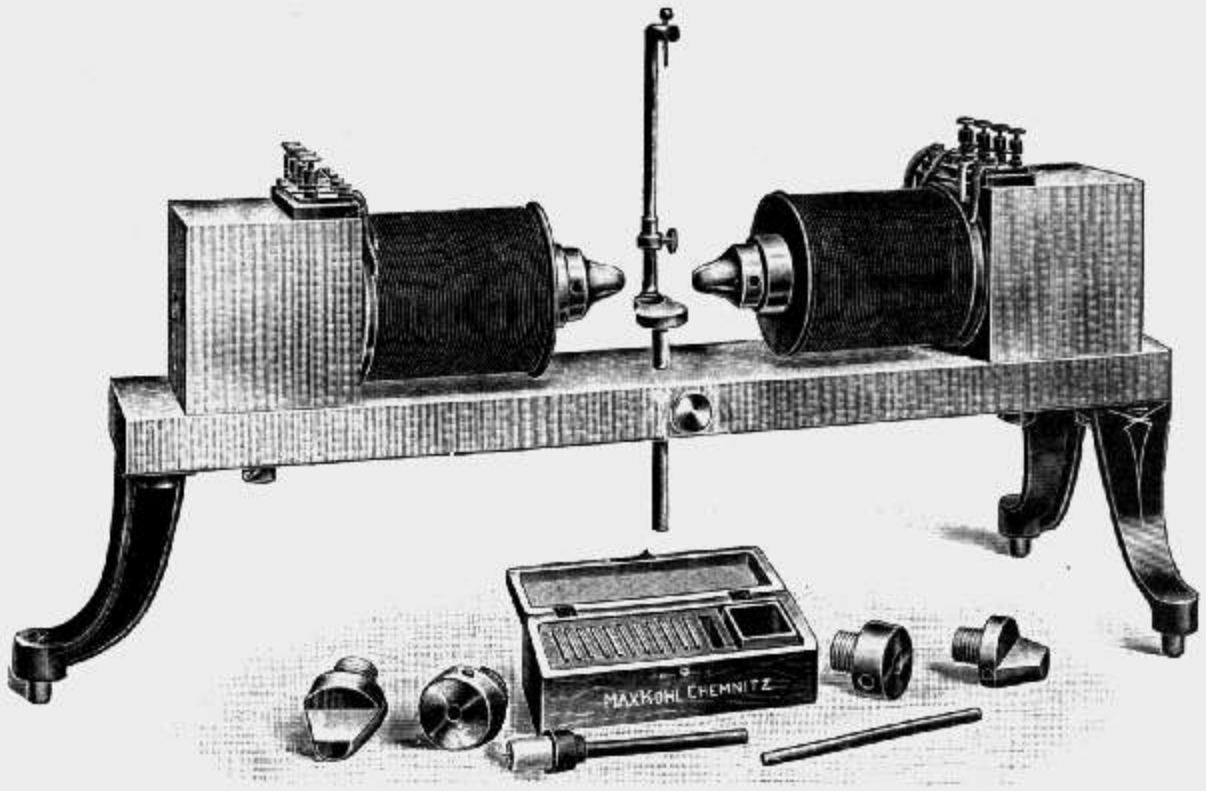
62,291. **Electromagnet,** Figure, with arrangement for enabling the magnet limbs to be used vertically and horizontally: coil 150 mm length, 120 mm diameter; magnet limbs 170 mm long, 60 mm diameter 24. 0. 0

As regards current and voltage, also accessories: cf. remarks under No. 62,288.

62,292. **Large Half-ring Electromagnet** after du Bois, cf. Fig. 62,299, p. 956; with arc-shaped magnet limbs on a massive base-plate forming the yoke; with one pair cylindrical and one pair conical pole pieces, one distance piece for 1 mm pole distance of the conical pole pieces, Stand and Spanners (Ztschr. f. Instrumentenkunde, 1899, p. 357) 75. 0. 0

By loosening the fixing screws the limbs can be moved apart and rotated with reference to each

Max Kohl A. G. Chemnitz, Germany.



62 291, 62 282. 1 : 7.



62 294. 1 : 4.



62 296.

other. The entire magnet can be tilted over and employed, in conjunction with the levelling screws supplied, with lines of force running perpendicularly. £ s. d.

The stage fixed between the magnet limbs is rotary, can be adjusted in the plane and can also be screwed in laterally in the baseplate. 2 iron cores are inserted above in the magnet limbs and can removed for optical experiments.

The winding is arranged for **20 amperes**, consists of 2500 turns, and when in series has a resistance of approx. 3.3 ohms and is intended for connecting up to 65 volts.

With the conical pole pieces the pole distance is about 1 mm (30 sq. mm cross section) and with 40,000 ampere-turns the field is approx. 38,000 gauss.

Accessories for preceding Electromagnet.

62,293. **One Pair Cylindrical Pieces of Dynamo Steel** with attachment pieces worked in, for making further pole pieces 2. 10. 0

62,294. **Universal Slider** with rotating plate and correcting device, micrometrically adjustable in both planes, Figure 4. 15. 0

62,295. **v. Waltenhofen's Pendulum** with gallows and interchangeable suspension for various objects 3. 10. 0

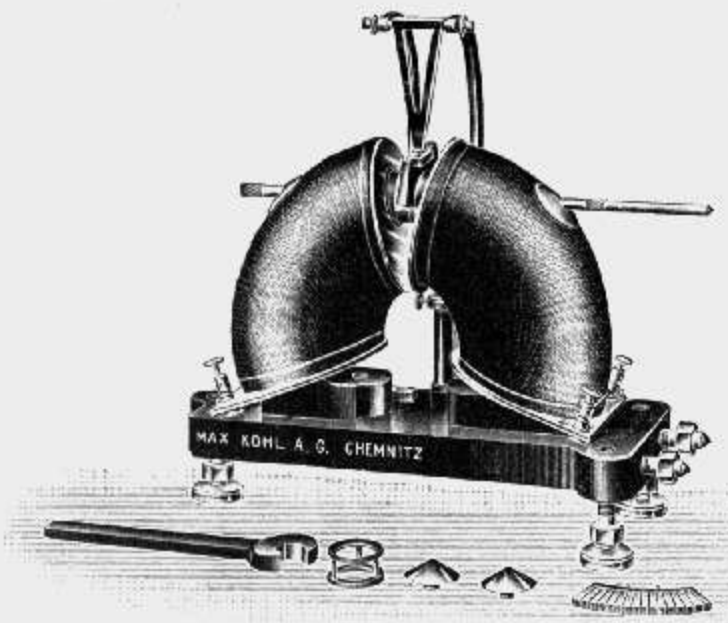
62,296. **Flat Induction Coil** of about 5 mm diameter, with intermediate pole piece, Figure, for measuring field-densities with a ballistic galvanometer 3. 0. 0

62,297. **Polarisation Apparatus** with divided circle, fitting the tappings of the magnet limb, with **Faraday's Glass Block** 7. 15. 0

62,298. **Holder** for one Bismuth Spiral 0. 10. 0

For Bismuth Spirals for measuring Field Densities, see Nos. 62,306 and 62,307.

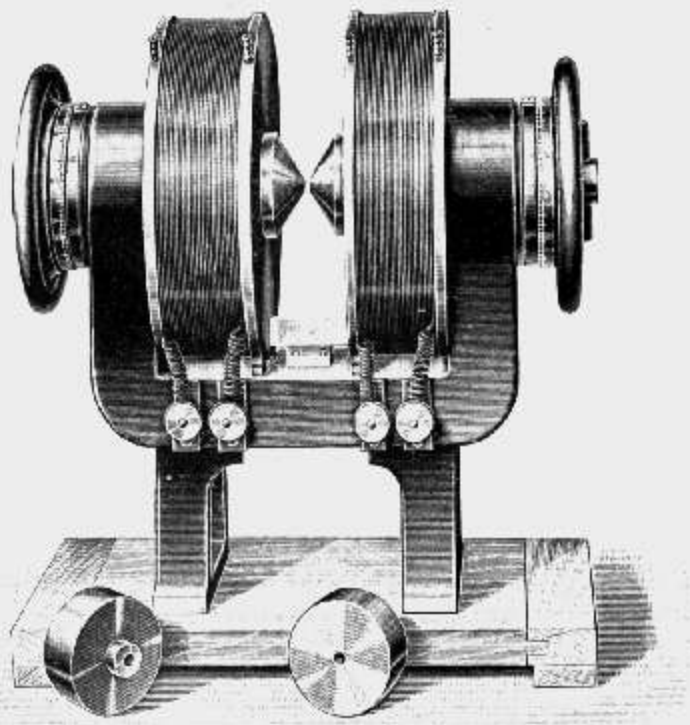
Cl. 2602, 5514, 5381



62 299, 62 302. 1 : 7.



62 306. 1 : 4.



62 308. 1 : 7,5.

62,299. **Small Half-Ring Electromagnet** after du Bois, Figure, with one pair cylindrical and one pair conical pole pieces, one distance piece for 1 mm pole distance of the conical pole pieces, Stand and Spanner (Ztschr. f. Instrumentenkunde, 1899, p. 363) . . . . £ 36. 5. 0

This magnet is constructed in a similar manner to No. 62,292 but is of only half the linear dimensions. The winding is arranged for 8 amps., and when the coils are in series the resistance is approximately 4 ohms; the apparatus can therefore be conveniently connected up to 32 volts.

Accessories for preceding Electromagnet.

62,300. **One Pair Cylindrical Pieces** for making additional pole pieces, of dynamo steel . . £ 1. 10. 0

62,301. **Universal Slider,** cf. Fig. 62,294 . . . . . 4. 15. 0

62,302. **v. Waltenhofen's Pendulum** 3. 0. 0

62,303. **Flat Induction Coil,** cf. Fig. 62,296 . . . . . 3. 0. 0

62,304. **Polarisation Apparatus** with divided circle and **Faraday's Glass Block** 7. 5. 0

62,305. **Holder** for a Bismuth Spiral 0. 10. 0

62,306. **Bismuth Spiral** after Lenard, Figure, for determining the Field Density of Magnetic Fields by the change in the Conducting Resistance which bismuth undergoes in the field; in case, with calibration curve; approx. 20 mm diameter 3. 0. 0

62,307. — idem, 5 to 6 mm diameter 3. 0. 0

The bismuth spirals afford a very convenient means of measuring the field densities by means of a resistance measurement with a Wheatstone Bridge. The thickness of the spirals is only about 1 mm so that they can be introduced into very narrow fields, e. g. between armature and pole pieces of a dynamo. An average change of resistance of 5% is produced by 1000 lines per sq. cm; accurate data can be obtained from the calibration curve supplied with each spiral.

62,308. **Electromagnet** after Prof. P. Weiss, with coils for water cooling which can be loaded twice as much as in the case of air cooling; Figure; diameter of pole pieces 100 mm; with one pair cylindrical and one pair conical pole pieces; on stout wood board . . £ 87. 10. 0

The pole pieces can be adjusted by a micrometer motion. The coils are arranged as near as possible to the pole pieces and the cross section of the iron increases steadily from the pole pieces up to the centre of the magnetic circuit, so that leakage is avoided as much as possible and a very high degree of magnetization attained. Unless otherwise requested the winding is dimensioned for 120 volts. A great advantage lies in the fact that the entire apparatus remains quite cool.

62,309. — idem, arranged to rotate on iron base so that the magnet can easily be placed in any position, with horizontal divided circle . . . . . £ 105. 0. 0

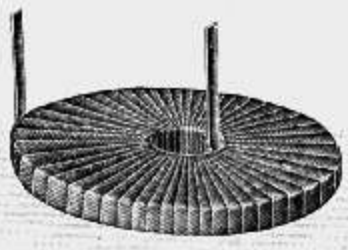
62,310. **Electromagnet** after Prof. Weiss, as No. 62,308, but with pole pieces 92 mm diameter £ 73. 10. 0

62,311. — idem, on tripod, as No. 62,309 . . . . . £ 85. 0. 0

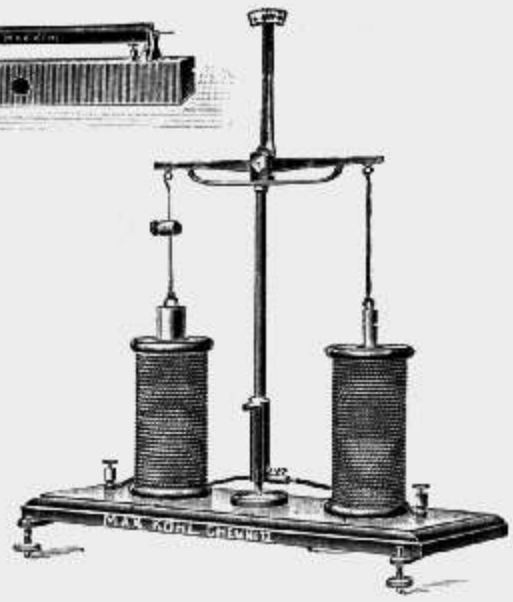
Max Kohl A. G. Chemnitz, Germany.



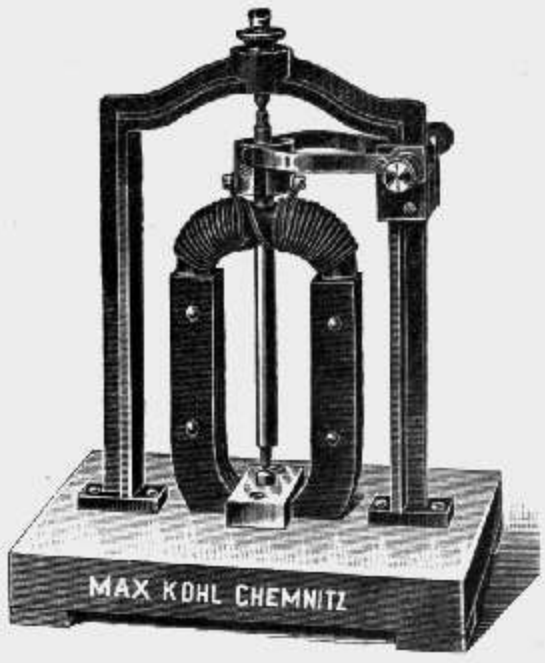
62 315. 1 : 12.



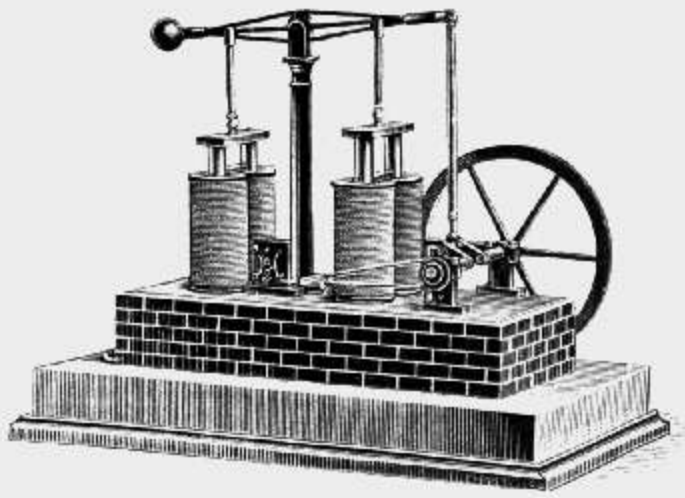
62 314. 1 : 6.



62 316. 1 : 9.



62 317. 1 : 3.



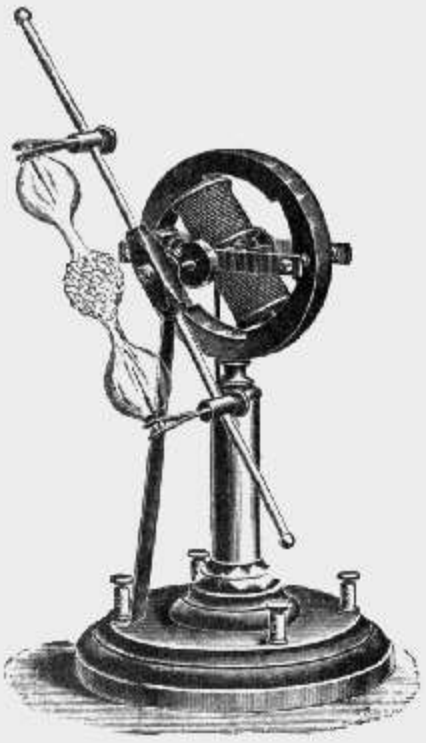
62 319. 1 : 9.

Max Kohl A. G. Chemnitz, Germany.

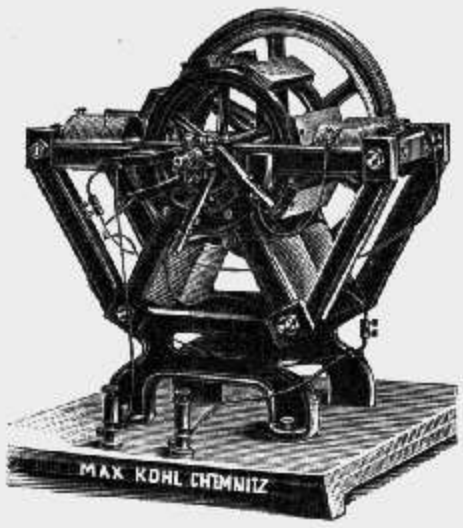
	£ s. d.
62,312. **Electromagnet** after Prof. Weiss, as No. 62,308, but with pole pieces 80 mm diameter	52. 10. 0
62,313. — i d e m, on iron base, as No. 62,309	62. 10. 0

The Weiss Electromagnets Nos. 62,308—62,313 can be fitted with the same accessories as the Half-ring Electromagnet No. 62,292 for the same price.

62,314. **Band Spiral for magnetizing** (M. P., 9th Edn., III, Fig. 526), F i g u r e	1. 4. 0
62,315. **Apparatus** after Wertheim, F i g u r e, for the singing of steel when magnetized (M. P., 9th Edn., III, Fig. 530)	2. 10. 0
62,316. **Apparatus** after v. Waltenhofen, F i g u r e (M. P., 9th Edn., III, Fig. 891; Fr. phys. Techn. II, 1, Fig. 650), for demonstrating saturation, in accordance with which thin iron tubes become more magnetic at low current densities than massive bars; the reverse takes place, however, when the current densities are high	4. 10. 0
62,317. **Electromagnetic Motor** after Ritchie (**Ritchie's Top**), F i g u r e (M. P., 9th Edn., III, Fig. 540)	1. 10. 0
Contrary to the illustration the apparatus is constructed with a 4-pole armature.	
62,318. **Electric Motor** after Ritchie	1. 12. 0
This is constructed exactly like the preceding, but it has an electromagnet instead of the permanent magnet.	
62,319. **Electromagnetic Motor** after Page, F i g u r e (M. P., 9th Edn., III, Fig. 607), with 4 upright coils	6. 0. 0



62 321. 1 : 3.



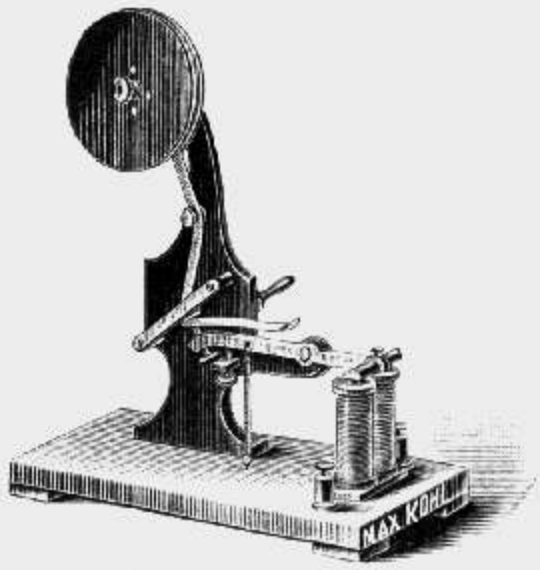
62 320. 1 : 5.



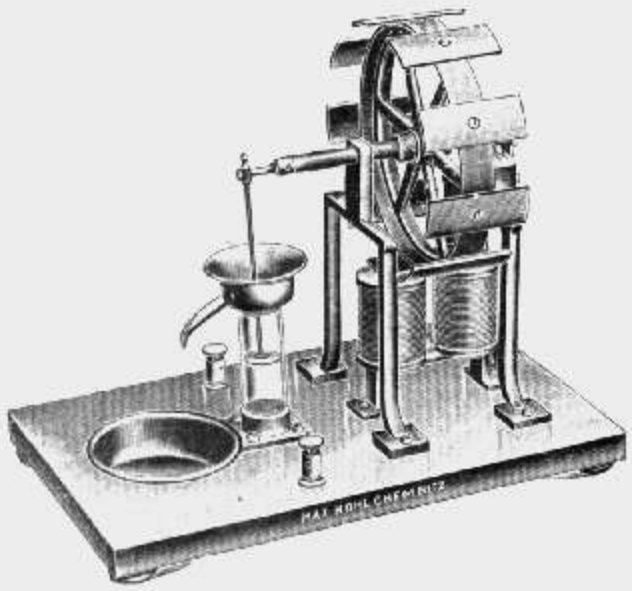
62 323 B. 1 : 6.



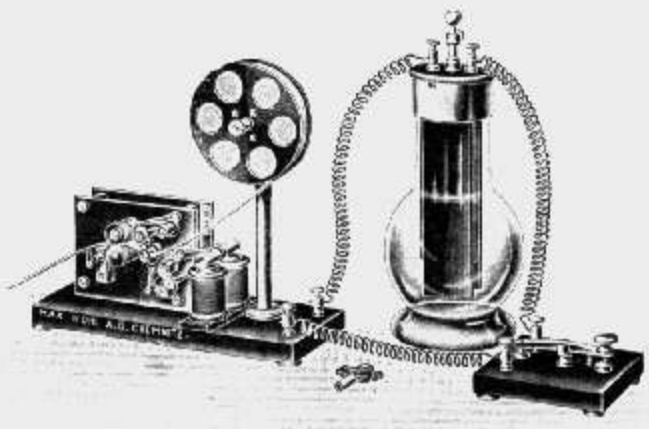
62 323 A. 1 : 6.



62 324. 1 : 4.



62 322. 1 : 4.



62 325. 1 : 5.

62,320. **Electromagnetic Motor** after Froment, Figure (M. P., 9th Edn., III, Fig. 542), large pattern . . . . . £ 8. 0. 0

62,321. **Electromagnetic Motor** for rotating Geissler Tubes of up to 20 cm length, Figure, without tube illustrated 0. 16. 0

62,322. **Electromagnetic Motor** with suction pump, Figure 2. 0. 0

Electro-magnetic Telegraphy.

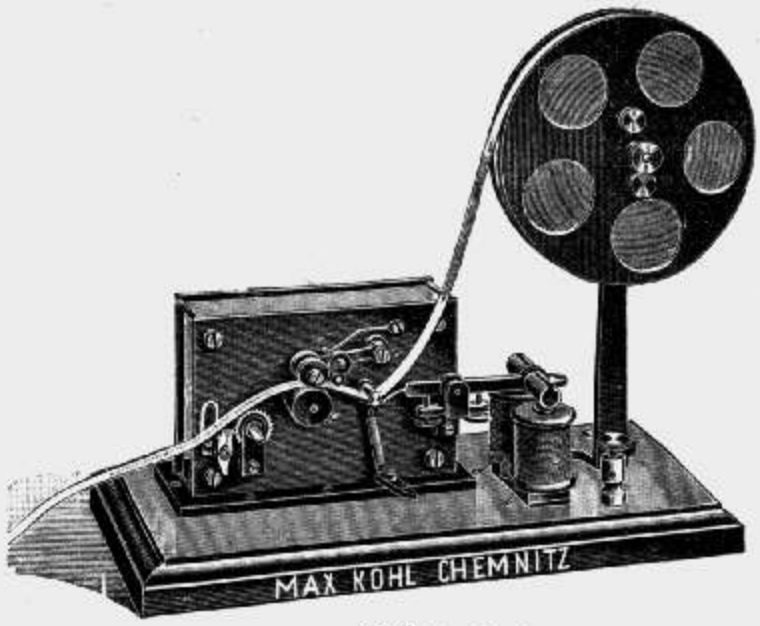
62,323. **Needle Telegraph,** Figs. A and B, with a signal transmitter and a receiver, letters visible at a distance 3. 10. 0

62,324. **Morse Telegraph,** Figure, small, for rotating with the hand 1. 0. 0

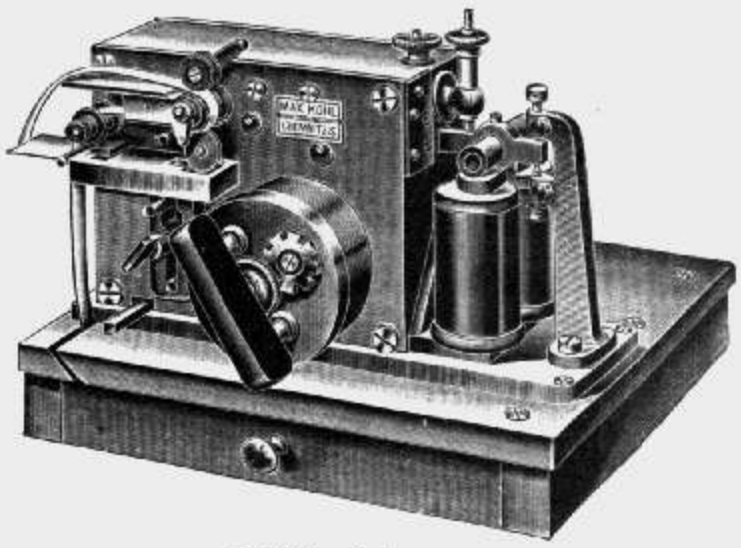
All Morse Telegraphs have a coloured pin in place of the ordinary printing pin, the resultant writing appearing in colour.

Cl. 2609, 2613, 2610, 2612, 2614. 923, 5968.

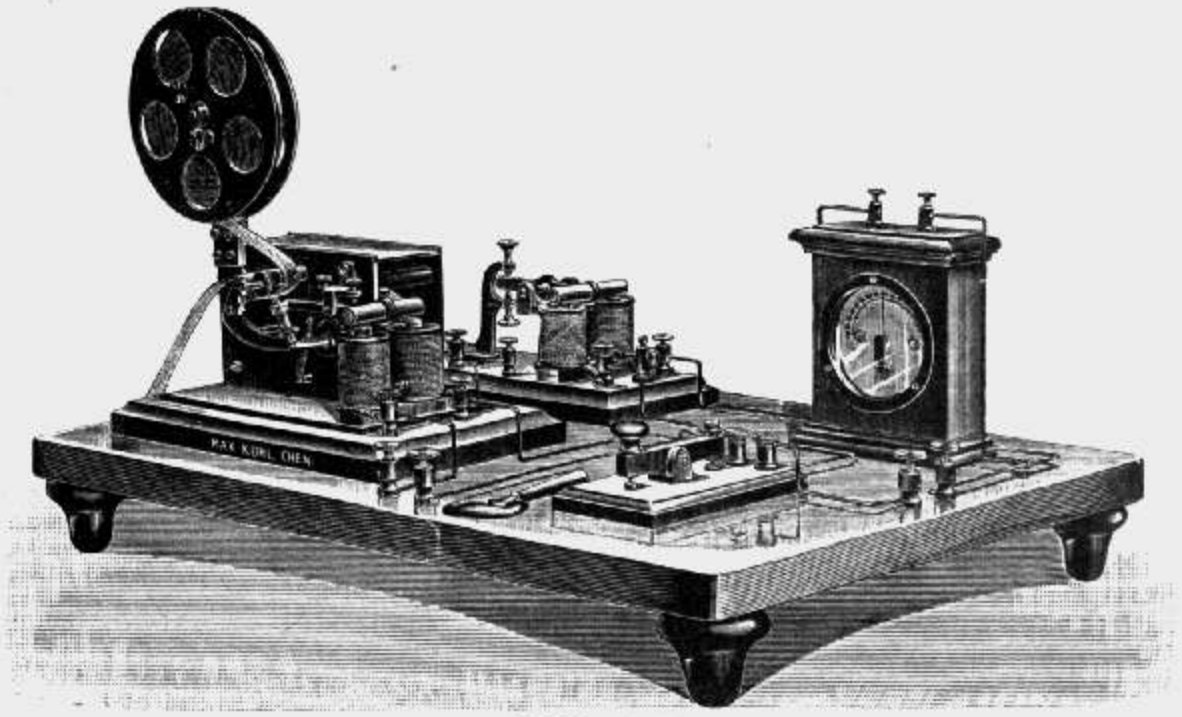
Max Kohl A. G. Chemnitz, Germany.



62 327. 1 : 4.

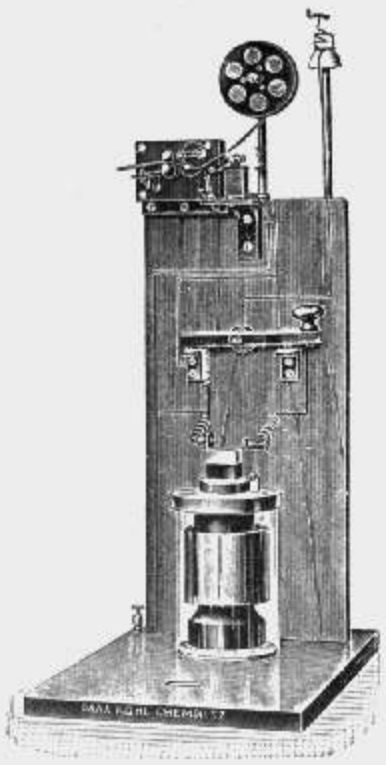


62 329. 1 : 5.

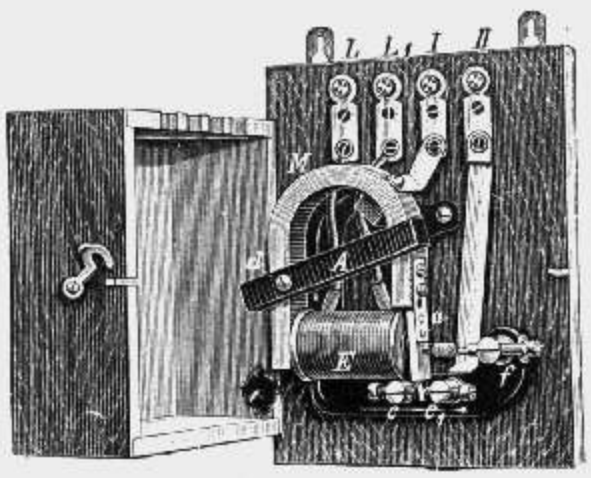


62 328. 1 : 7.

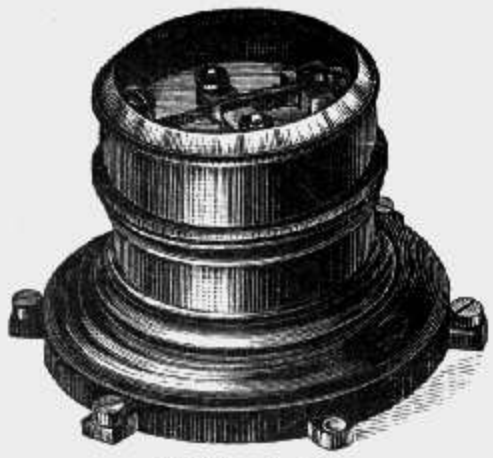
	£ s d
62,325. **Morse Telegraph for Schools** (Ink Writer), with open clockwork, key, and wet cell, Figure	2. 4. 0
62,326. — idem, without cell	2. 0. 0
62,327. **Morse Ink Writer,** Figure, with clockwork under glass, on polished mahogany board (cf. Gan.-Man. Fig. 847; Gan.-Rein. Fig. 925)	4. 0. 0
62,328. **Model of a Telegraph Station,** Figure, comprising a Morse Ink Writer, a comprehensive relay, a Morse key and a galvanometer with open wire connections to show plainly the course of the current. The connections are so arranged that the station works in itself. If desired the connections are so arranged that two such stations can be worked reciprocally	10. 0. 0
62,329. **Standard Ink Writer for direct Printing,** model of the Prussian State Railway, Figure, with removable spring drum, horizontal detachable paper roll in the base; on polished mahogany board, for open current; resistance of magnet coils 15 ohms . .	12. 10. 0
62,330. **Extra price** for insulated translator pillar	1. 5. 0
62,331. **Extra price** for adjustable magnet system	0. 12. 0
62,332. **Extra price** for automatic release, especially for wireless telegraphy	1. 10. 0



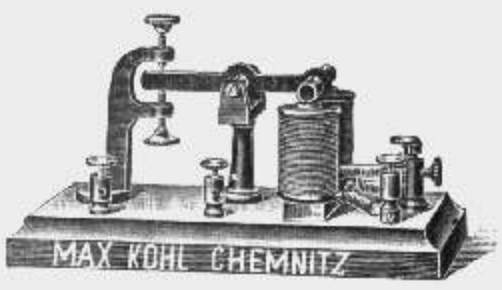
62 340. 1 : 10.



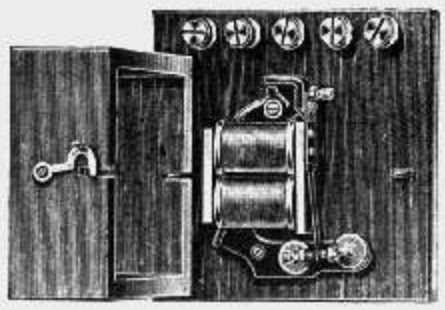
62 348. 1 : 3.



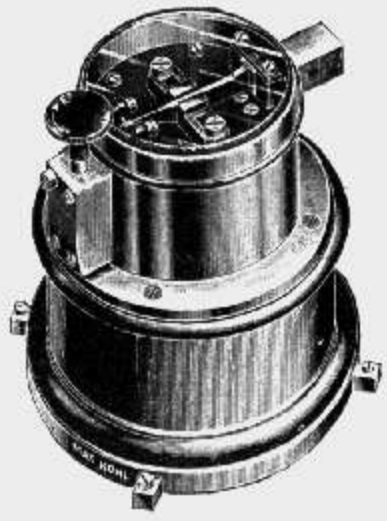
62 345. 1 : 2.



62 347. 1 : 3.



62 349. 1 : 3.



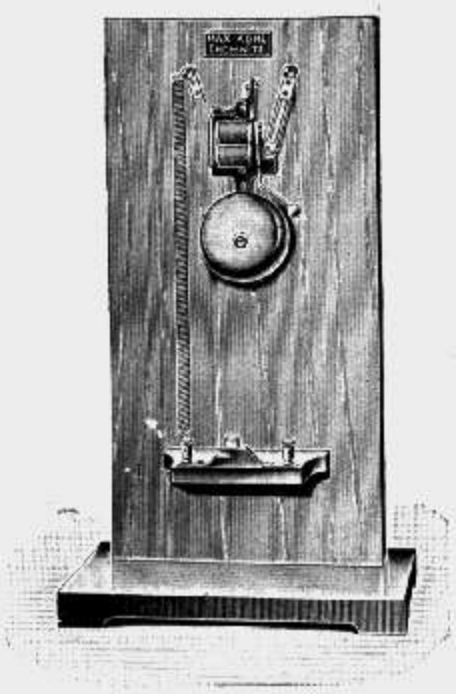
62 346. 1 : 5.

Max Kohl A. G. Chemnitz, Germany.

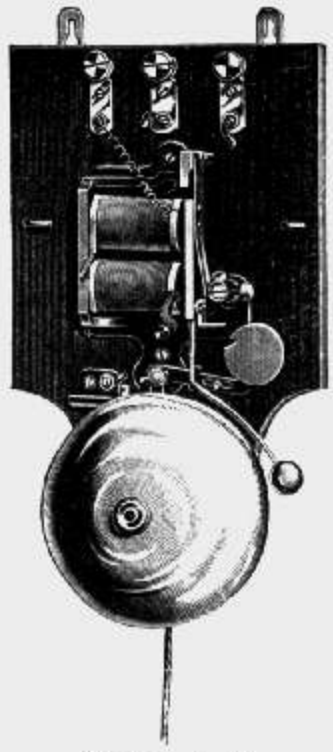
	£ s. d.
62,340. **Morse Telegraph** for instruction purposes, Figure . . . . 2 stations together On a polished stand are conveniently arranged the Morse Apparatus with clockwork under glass, the key, a porcelain insulator and a cell, and provided with different coloured leads. By this arrangement and the employment of two stations the understanding is aided considerably in following the processes of telegraphing.	6. 10. 0
62,341. **Morse Telegraph for instruction purposes** as preceding, without clockwork, for rotating with the hand by means of wheel gearing. 2 stations together	5. 0. 0
62,342. **Morse Telegraph,** as No. 62,340, each station with relay for open circuit and provided with 2 cells. 2 stations together	10. 0. 0
62,343. **Morse Telegraph,** as No. 62,341, each station provided with relay for open circuit and with 2 cells. 2 stations together	8. 10. 0
61,147. **Morse Key,** Figure on p. 868, fitting apparatus Nos. 62,324—62,327 (Gan.-Man. Fig. 846; Gan.-Rein. Fig. 927)	0. 10. 0
62,344. **Morse Key,** large pattern	1. 0. 0
Morse Keys for heavy current; see "Radio-telegraphy" Section.	
62,345. **Polarised Relay,** Figure, in metal case with glass lid, for telegraph purposes, for open or closed circuit current	3. 0. 0
62,346. **Polarised Relay,** highly sensitive, Figure, with resistance of approximately 7000 ohms, chiefly for wireless telegraphy, for open or closed circuits	9. 0. 0
62,347. **Relay,** Figure, very comprehensively arranged, can be used on closed or open circuits (cf. Gan.-Man. Fig. 853; Gan.-Rein. Fig. 928)	2. 8. 0
62,348. **Polarised Relay,** simple, with adjustable sensitivity, resistance 150 ohms, in walnut case, for closed or open circuit working, Figure	1. 0. 0

Cl. 2620, 5832, 59*, 2622, 2624, 58*, 3056.

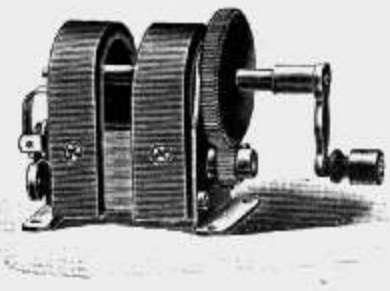
Max Kohl A. G. Chemnitz, Germany.



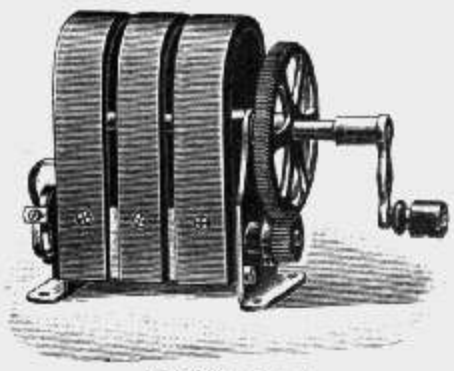
62 350. 1 : 8.



62 355. 1 : 3



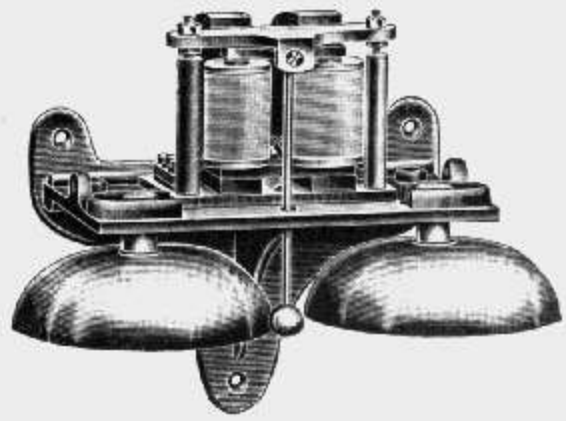
62 358. 1 : 4.



62 359. 1 : 4.



62 351. 1 : 8.



62 357. 1 : 5.

	£	s.	d.
62,349. **Simple Relay** for closed or open circuit, Figure, approx. 100 ohms resistance	0.	6.	0
62,350. **Electric Bell,** fitted with key on stand, Figure	0.	16.	0
62,351. **Electric Bell,** Figure, on stand (Gan.-Man. Fig. 852)	0.	8.	0

The bell can be arranged either as a striking or trembling bell. In the first case the two terminals visible to the left of the figure are used, these leading to the magnet winding; in the latter case the two outer terminals are connected, thus putting into circuit the automatic interrupting device of the bell.

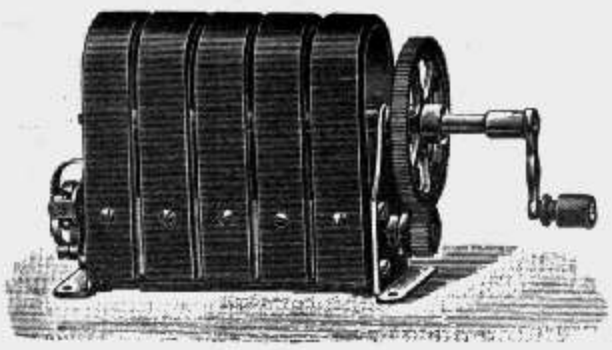
Electric Bells, for House Telegraph Connections, in polished walnut case

List No.	62,352	62,353	62,354
Diameter of Bell Dome	60	80	100 mm
£	**0. 2. 0**	**0. 2. 6**	**0. 4. 0**

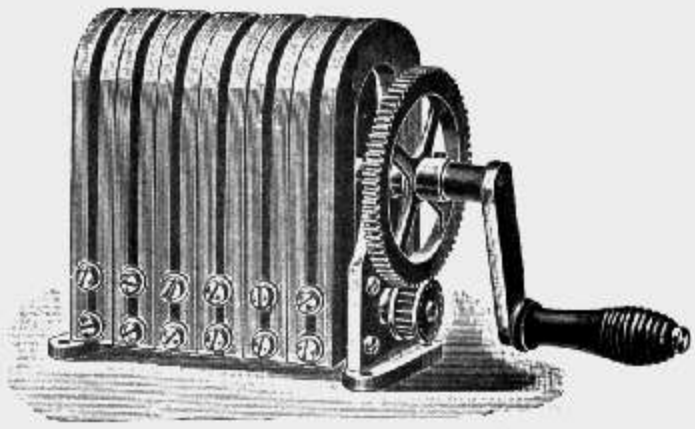
62,355. **Electric Bell with indicator disc drop** and continuously ringing contact, Figure	0.	7.	0

For suitable Cells for House Telegraphs: see Nos. 60,787—60,800, p. 850.

62,356. **Waxed Wire** for House Telegraph and Experimental purposes, 0,9 mm copper diameter, approx. 170 m to 1 kg. Price per kg	0.	4.	0
62,357. **Alternating Current Bell** in walnut case, for working with magneto generators; internal arrangement similar to Fig. 62,357	0.	10.	0
62,358. **Magneto Generator** for alarm installations, Figure, open, with two magnets, with automatic short circuiting contact by displacing the crank axis	0.	15.	0
62,359. **Magneto Generator,** with three magnets, Figure, German Post Office pattern, Figure	1.	3.	0



62 360. 1 : 4.



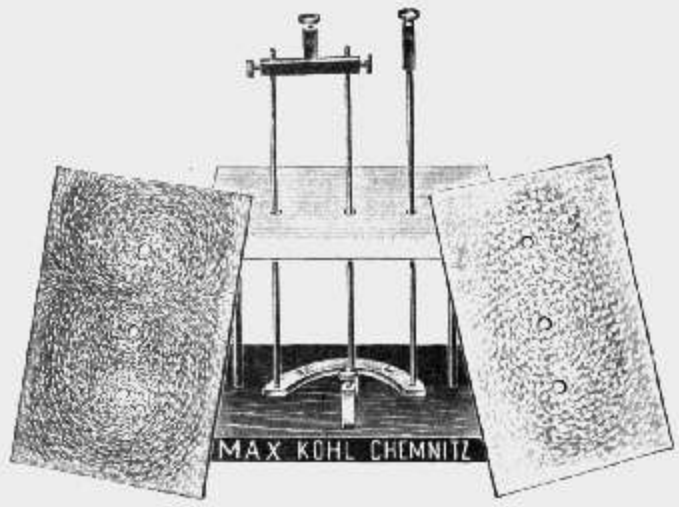
62 361. 1 : 4.



62 365. 1 : 4.



62 367, 62 368. 1 : 4.



62 369. 1 : 5.

	£ s. d.
62,360. **Magneto Generator** with five magnets, Figure	1. 16. 0
62,361. **Magneto Generator,** large, with six magnets, Figure	3. 5. 0
62,362. **Sections of Telegraph Cables,** for subterranean and submarine laying, each £ **0. 10. 0** to £ **1. 0. 0.**	

Apparatus for Phototelegraphy, Prof. Korn's system, constructed by us, quoted for on application.

Theory of Lines of Force.

62,363. **Wood Frame,** 400 mm side, stretched with cardboard, for demonstrating lines of magnetic force, with sieve and filings, for use with permanent magnet and electromagnets . . . 0. 3. 0

62,364. **20 Steel Spheres,** 3,5 mm diameter, for demonstrating lines of force curves (W. D. Fig. 549 [522]) . . . 0. 2. 0

62,365. **Apparatus** after Töpler, Figure, for demonstrating objectively the existence of the magnetic curves between the poles of an electromagnet . . . 1. 4. 0

The glass trough is filled with glycerine, and finely powdered iron (previously uniformly mixed with some glycerine) is distributed in same. The curves form when the circuit is closed.

62,366. **Model for explaining the Direction** in which the lines of Magnetic Force encircle a Conductor (W. D. Fig. 548 [521]) . . . 0. 15. 0

62,367. **Wire Coil,** can also be used for Ampere's stand No. 62,383, Figure (W. D. Fig. 537 [510]), without zinc plates . . . 0. 8. 0

62,368. **Zinc Plate** for above, in two parts, for producing lines of force, Figure, to be used in conjunction with No. 62,367 (W. D. Fig. 547 [520]) . . . 0. 4. 0

Cl. 60 F, 64 F, 5869, 4524, 2631.

Max Kohl A. G. Chemnitz, Germany.

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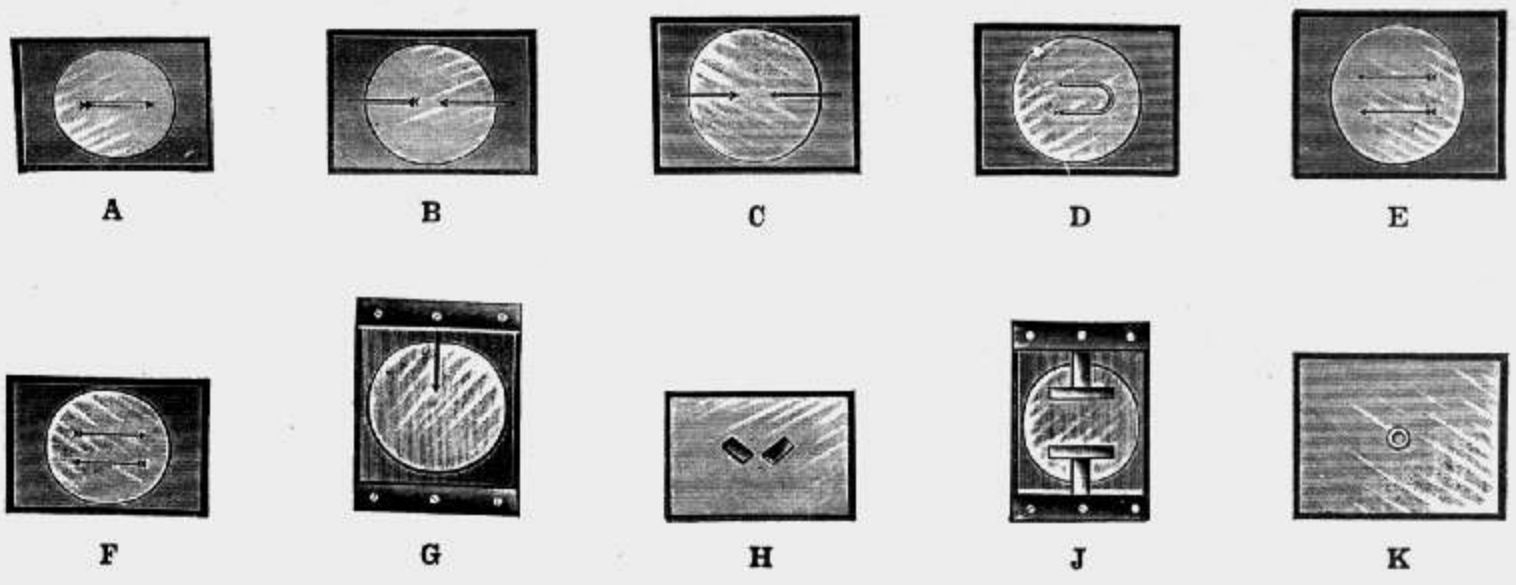


62 370. 1 : 8.

62,369. **Apparatus for demonstrating the Lines of Force of Current Conductors,** after Bauernberger, Figure . . . . . £ s. d. 0. 18. 0

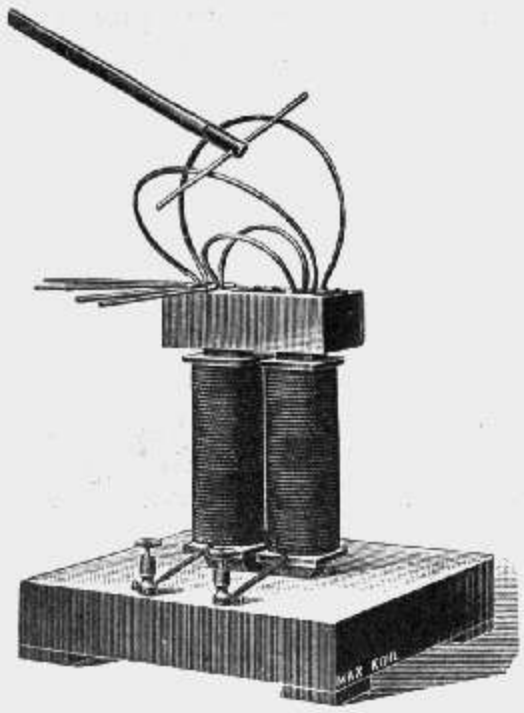
62,370. **1 Set Apparatus for explaining the Lines of Force Theory,** after Berghoff, Figs. A—S 4. 0. 0

For producing the magnetic fields use is made firstly of needle-shaped magnets and secondly of copper wires, traversed by the current, and bent to correspond. The former are enclosed between two glass plates size 130 × 180 mm; in the latter case a glass plate of the same size is mounted in a wood frame and drilled out to correspond with the shape of wire; the wood frame also carries the terminals for connecting up the current.

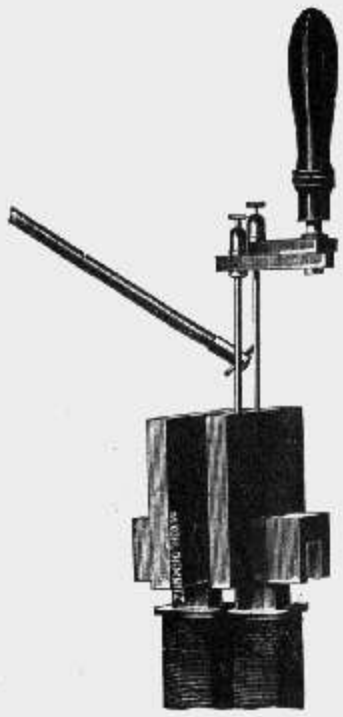
Constructed in this manner the apparatus are durable and can be easily cleaned. By strewing iron filings on the glass plates the lines of force can be demonstrated visibly. We recommend for use in these experiments ordinary iron filings carefully strained to different sizes; it is less advantageous to use ferrum alcoholisatum.

The following pertain to the complete set: (1) 1 bar magnet, Fig. A; (2) 2 magnets, the opposite poles being opposite each other, Fig. B; (3) 2 magnets whose similar poles are opposite each other, Fig. C; (4) horse-shoe magnet, Fig. D; (5) 2 parallel magnets whose poles of similar name are alongside each other, Fig. E; (6) 2 parallel magnets whose dissimilar poles are alongside each other, Fig. F; (7) deformation of lines of force, Fig. G and H; (8) homogeneous field, Fig. J and K; (9) magnetic field of a current, Fig. L and M; (10) magnetic field of a current perpendicular to direction of current, Fig. N; (11) magnetic field of two parallel currents flowing in opposite directions, Fig. O; (12) magnetic field of two parallel currents flowing in same direction, Fig. P; (13) magnetic field of a number of circuits in series (of a solenoid), Fig. Q; (14) solenoid with a number of windings, Fig. R; (15) earth's magnetic field, Fig. S.

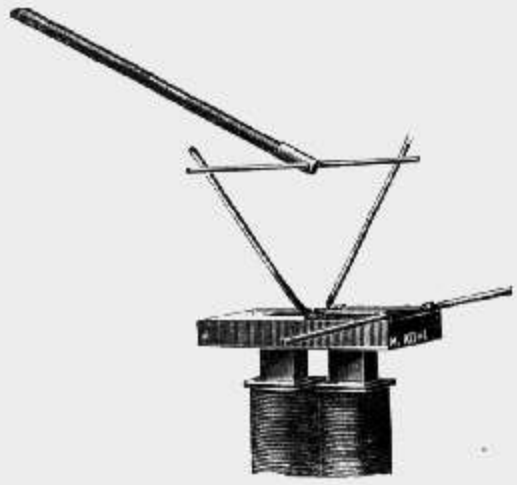
For objective demonstration it is necessary to use an Apparatus for horizontal projection (List Nos. 51,032 to 51,039) or a Megadiascope.



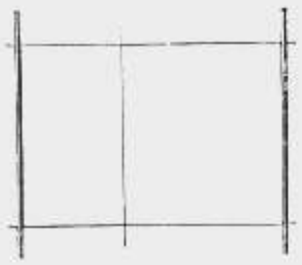
62 371 A. 1 : 7.



62 371 B. 1 : 6.



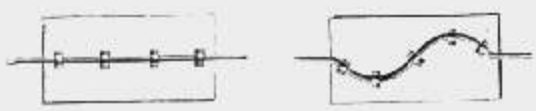
62 371 C. 1 : 6.



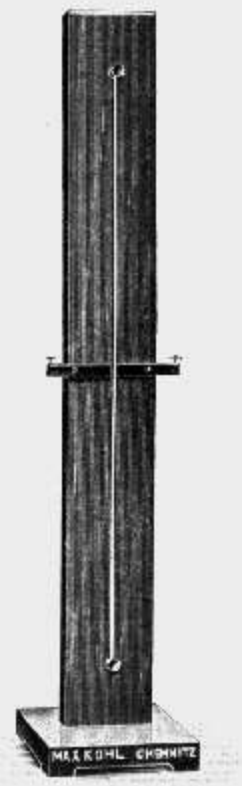
62 371 D. 1 : 30.



62 372. 1 : 8.



62 373. 1 : 12.



62 374. 1 : 10.

62,371. **Apparatus for explaining the Theory of Lines of Magnetic Force,** after Szymansky, Figs. A—D (Ztschr. f. d. phys. u. chem. U., **7**, p. 10). The best galvanometer to use is Szymansky's, No. 61,342 . . . . . £ 3. 10. 0

(1) Horse-shoe shaped electromagnet Fig. A.

(2) 2 Attachments for the magnet and 2 small rectilinear adjustable parallel slide rails with 2 small sliding conductors, nickelled, Fig. B.

(3) 1 Set lines of force rails, Fig. A, nickelled.

(4) Diverging slide rails with sliding conductors, nickelled, Fig. C.

(5) 2 Large slide rails with large sliding conductor, for explaining the earth's magnetic field, nickelled, Fig. D.

62,372. **Apparatus for Demonstrating the Lines of Force Image of Lineally Directed Currents,** perpendicular to the axis, after Friedr. C. G. Müller (M. T. Fig. 173). Figure . . 0. 12. 0

62,373. **2 Sheets Cardboard** with conducting wires, after Friedr. C. G. Müller (M. T. p. 253), for demonstrating the magnetic field of straight and bent conductors parallel to the axis, Figure 0. 2. 0

62,374. **Apparatus for Demonstrating the Magnetic Field of Lineally Directed Currents,** after Götze, with two magnetic needles, Figure 1. 10. 0

Cl. 2656, 2657, 2658, 2659, 4811, 4141, 4142, 4129.

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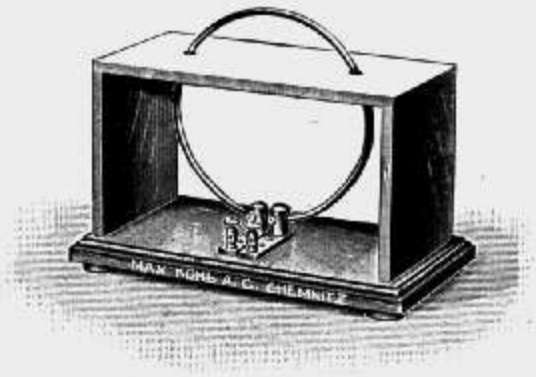
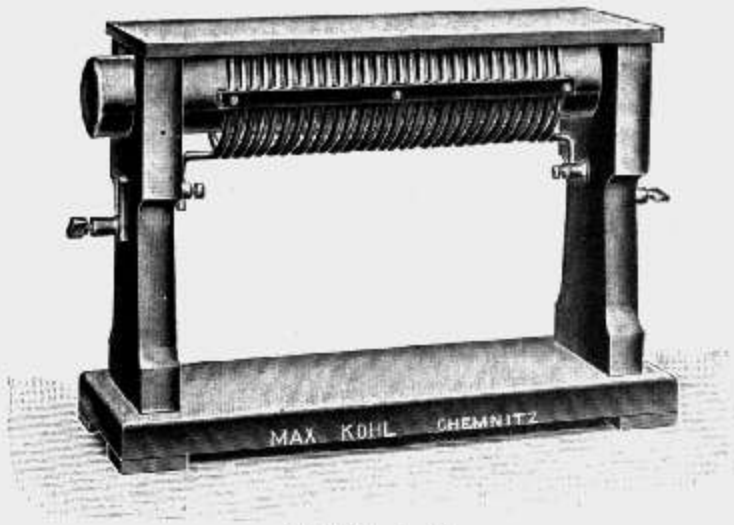
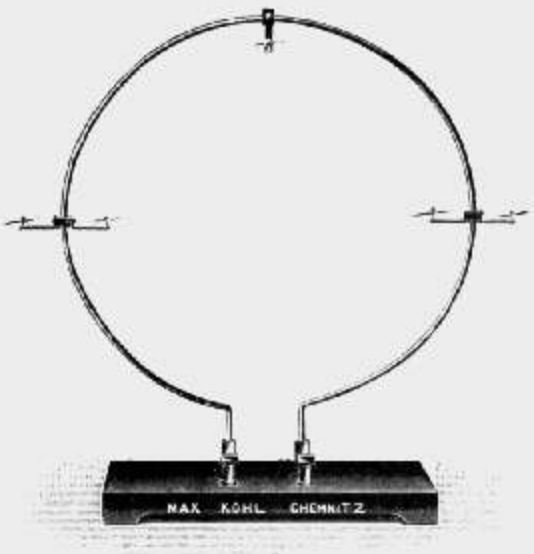


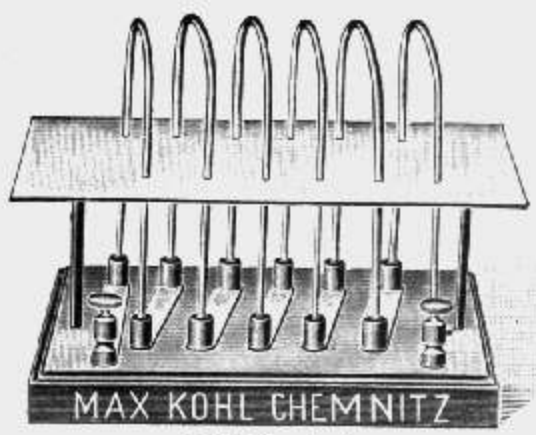
62 376. 1 : 6.



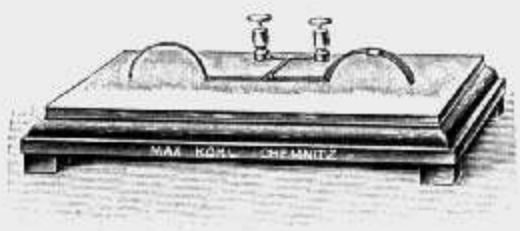
62 379. 1 : 6.



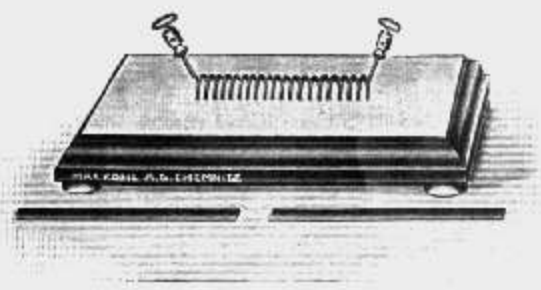
62 377. 1 : 11.



62 380. 1 : 4.



62 378. 1 : 5.



62 381. 1 : 5.

62,375. **2 Wire Coils** on wood frame, for demonstrating the magnetic fields of a single conductor, of two parallel currents in the same and two parallel currents in opposite directions (W. u. E., phys. prakt. 4th Edn., p. 492). A current density of only 1—2 amps. is necessary . . . . . £ 2. 5. 0

62,376. **Apparatus for the Magnetic Field of a Circular Current,** Figure 0. 18. 0

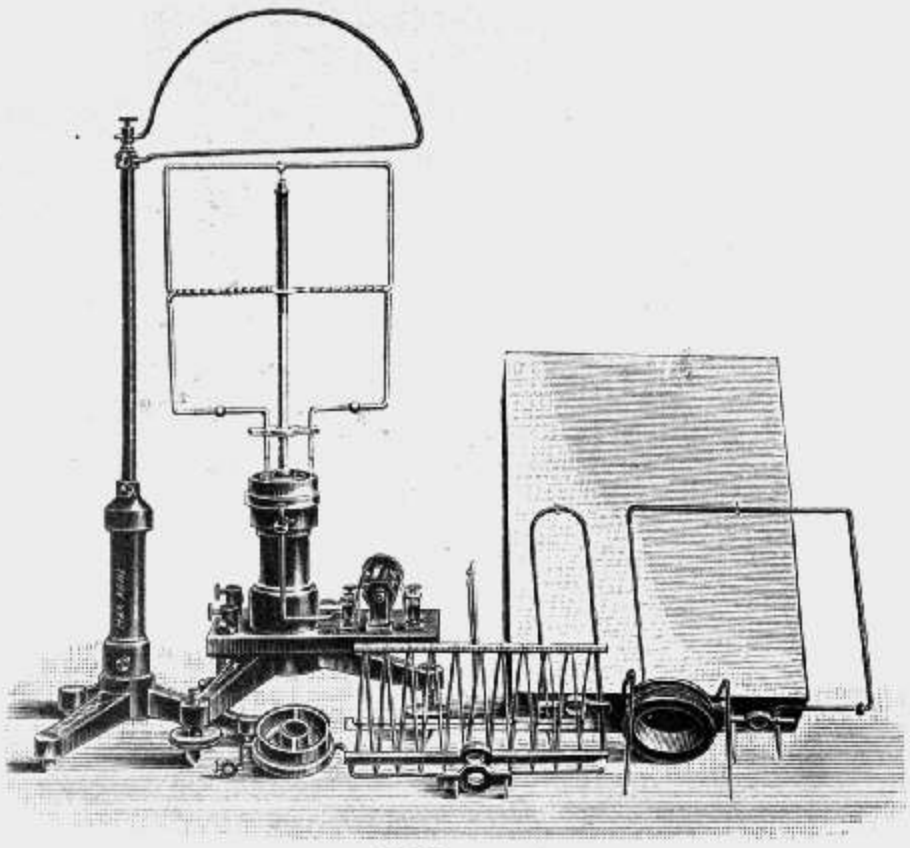
62,377. **Demonstration Apparatus for Field of an Annular Conductor,** after Götze, with five magnetic needles, Figure 2. 10. 0

62,378. **Apparatus for Demonstrating the Multiplication of the Current Effect** when a Magnetic Field is generated, after Friedr. C. G. Müller, Figure (M. T. Fig. 176), with a single and a quintuple coil 0. 10. 0

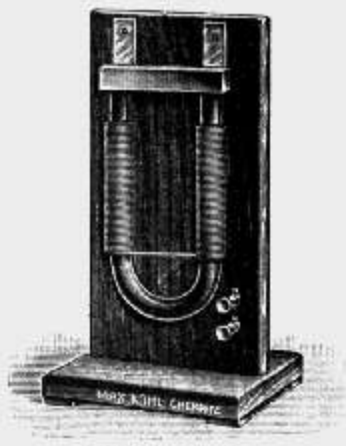
62,379. **Demonstration Apparatus for the Magnetic Field of a Solenoid** and of a bar-shaped Electromagnet, after Götze, Figure. The iron core can be taken out 3. 10. 0

62,380. **Apparatus for Demonstrating the Flow of the Magnetic Field in a Solenoid,** after Bauernberger, Figure 1. 4. 0

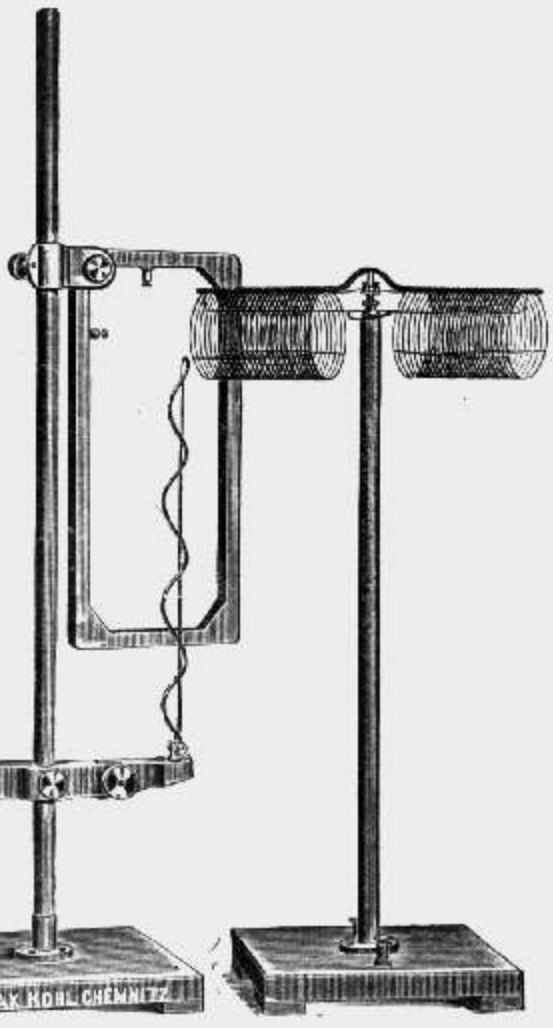
62,381. **Apparatus for the Magnetic Field of a Solenoid,** after Friedr. C. G. Müller, Figure (M. T. Fig. 177) 0. 10. 0



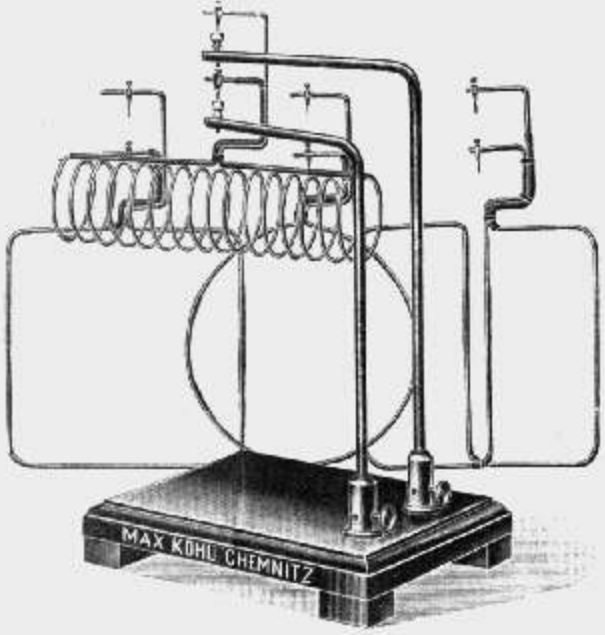
62 383. 1 : 6.



62 382. 1 : 8.



62 386. 1 : 10.



62 387. 1 : 5.

62,382. **Demonstration Apparatus for the Magnetic Field of a horse-shoe Electromagnet,** after Götze, Figure . . . . . £ 1. 10. 0

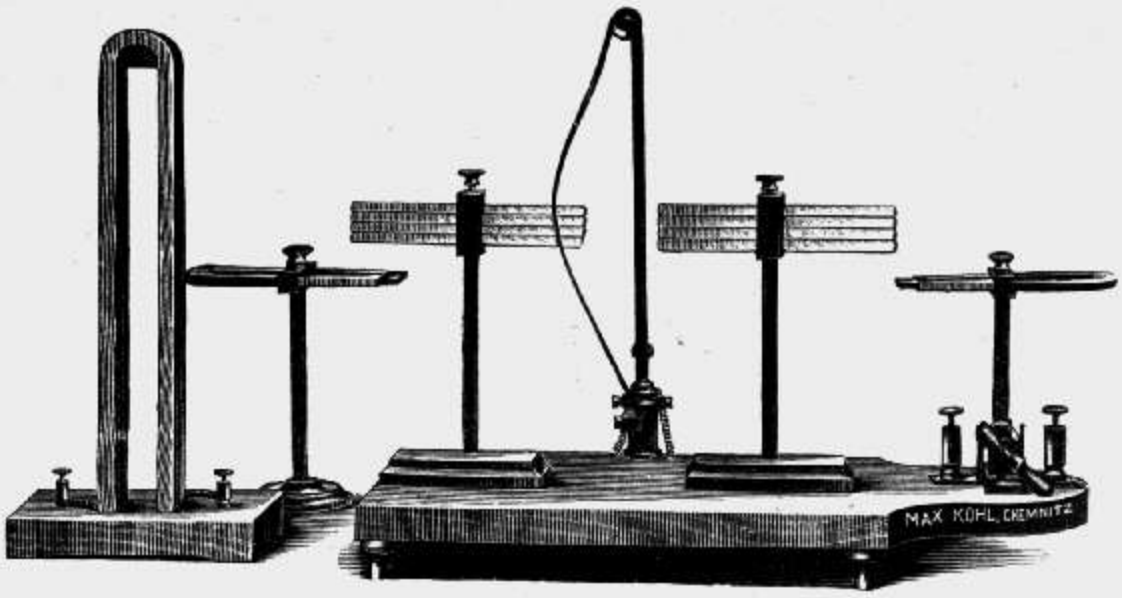
62,383. **Ampere's Stand,** Figure, reliable pattern, with separate stands; main stand on metal tripod with levelling screws, rotary and fixed in position by screw; wire figures of aluminium with silver points. The following appertain to above: 1 solenoid (W. D. Fig. 536 [509]), 1 simple rectangle (W. D. Fig. 532 [505]), 1 double (astatic) rectangle (W. D. Fig. 534 [507]), 1 wire stirrup with wire coil (W. D. Fig. 535 [508]), 1 boxwood bowl with 2 concentric rings, 1 boxwood bowl with partition wall. Also adapted for experiments as suggested in Gan.-Man. Figs. 739, 740, 746, 751; Gan.-Rein. Figs. 891, 893, 877 . . . . . £ 4. 4. 0

This pattern enables the experiments to succeed with ease. The primary condition is that absolutely pure and dry mercury should be employed. This we supply if desired at a charge of **£ 0. 8. 0** per kilo. A current density of 15—20 amps. is necessary. Precise instructions for use are given in.

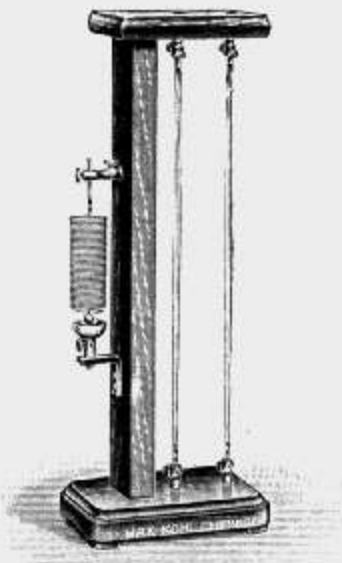
62,367. **Wire Coil for Ampere's Stand** (W. D. Fig. 537 [510]), Figure on p. 962 . . . £ 0. 8. 0

Cl. 2673, 3879, 2675, 267.

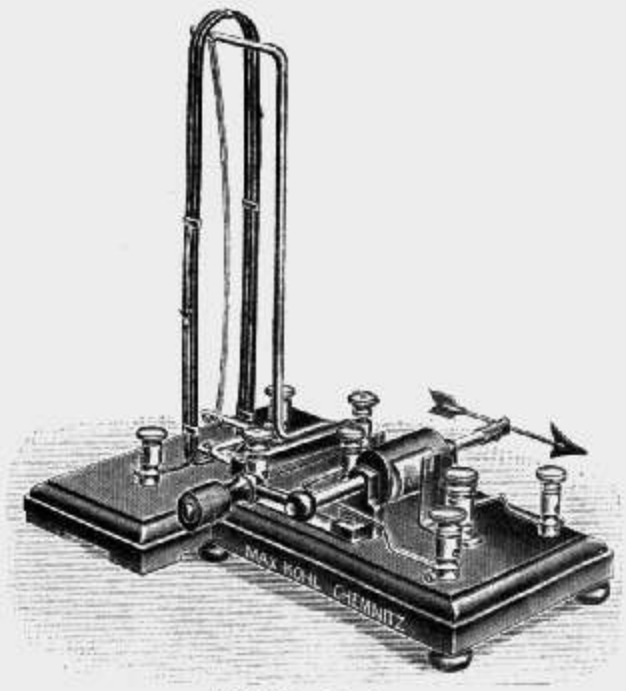
Max Kohl A. G. Chemnitz, Germany.



62 389. 1 : 5.



62 388. 1 : 12.



62 390. 1 : 4.

Max Kohl A. G. Chemnitz, Germany.

62,368. **Zinc Plate,** in two parts, for demonstrating lines of force, for use in conjunction with No. 62,367 (W. D. Fig. 547 [520]) . . . . . £ 0. 4. 0

62,386. **Ampere's Stand,** large pattern, Figure, with aluminium solenoid working on sapphire cap; height of stand 75 cm. The lateral flat wire coil moves in hinges, as does also the lower wire holder 7. 10. 0

The apparatus works very well with a few Bunsen Cells and permits of proving the laws of attraction and repulsion of currents flowing in the same and opposite directions.

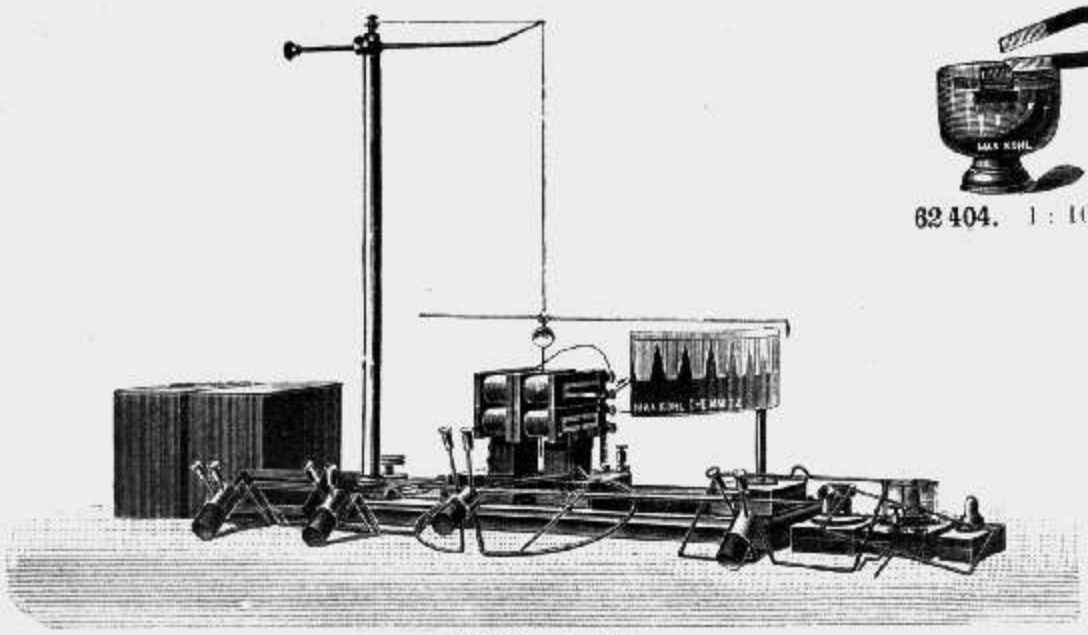
62,387. **Ampere's Stand,** simple, Figure, with a rectangular, a circular, an astatic and a solenoid-shaped conductor 1. 10. 0

62,388. **Apparatus** after Friedr. C. G. Müller, **for demonstrating the electro-dynamic action upon each other of currents flowing in the same and opposite directions,** Figure, comprising two bundles of Lametta strips stretched between terminals, and a Roget spiral (M. T. Fig. 214) 1. 16. 0

62,389. **Apparatus** after Mühlenbein, Figure **for demonstrating the alternating action of currents and magnets** (Ztschr. f. d. phys. u. chem. U., **1,** p. 203) 2. 14. 0

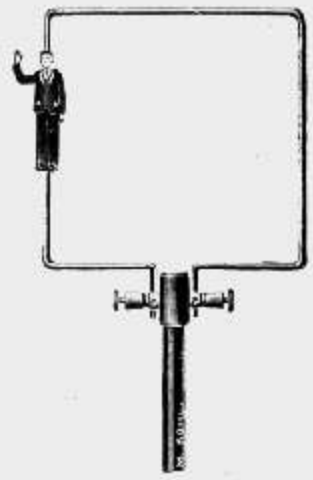
The apparatus admits of proving Ampere's Laws easily and visibly for teaching purposes.

62,390. **Apparatus** for Mühlenbein's experiment, Figure, after Kolbe (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 96), consisting of 1 wire frame on wood board (No. 62,392, £ **0. 15. 0**), 1 Ruhmkorff Commutator (No. 61,135, £ **1. 5. 0**) and 1 movable Conductor as suggested by Mühlenbein (No. 62,391, £ **0. 15. 0**) 2. 15. 0



62 400. 1 : 10.

62 404. 1 : 10.



62 403. 1 : 13.

	£ s. d.
62,391. **Movable Conductor after Mühlenbein,** cf. Figure 62,390, suitable for placing in the terminals of the commutator No. 61,135	0. 15. 0
62,392. **Wire Frame on Wood Board** (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 96) for Mühlenbein's experiment, cf. Figure 62,390	0. 15. 0
62,393. **Ampere's Stand,** after Kolbe (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 98)	1. 15. 0
For above:	
62,394. **Simple Solenoid** with pointer (Fig. 98 B)	0. 12. 0
62,395. **Tenfold Solenoid**	0. 14. 0
62,396. **Curled Solenoid** (Fig. 101)	0. 12. 0
All solenoids have platinum points.	
62,397. **Fixed Wire Frame** (Fig. 98 R_2) on slider, with two adjustable current-direction indicators	1. 0. 0
62,398. **Tenfold Wire Frame** for placing in the slider; can also be used for demonstrating the multiplier	1. 0. 0
62,399. **Magnetic Needle** (Fig. 110) with glass tube, on slider	0. 12. 0
62,400. **Universal Stand,** after Kolbe (Kolbe-Skellon, Introduction to Electricity, Part. II, Figs. 98—101, 110, 111, 137), Figure (Ztschr. f. d. phys. u. chem. U. **8,** 1894/95, p. 155)	8. 0. 0
The following pertain to the apparatus:	
(a) The Stand (Fig. 98 A or 110 A).	
(b) Parts to enable it to be used as an Ampere stand (Figs. 98—101); the movable conductors of aluminium with platinum points; all current conductors with adjustable current direction indicators.	
(c) Parts for the model of a multiplier and a tangent galvanometer (Figs. 110 and 111).	
(d) Parts for the sensitive galvanometer (Fig. 137), with astatic needle and copper damper, also an insertion mirror; for showing thermo-electric currents (Fig. 135) and magnetic induction (Figs. 138—140, 148).	
(e) 1 Zinc Protecting Box with two glass walls, for finer experiments with the mirror.	
(f) 1 Box for storing the solenoids, needles, etc.	
62,401. **1 Accurately Ground Mirror** for No. 62,400 . . . . . **Extra**	0. 12. 0
62,402. **1 Double Needle** with 2 unidirected magnets for No. 62,400 . . . . . **Extra**	0. 8. 0
62,403. **Square Conductor** for explaining Ampere's Rule, Figure, after Friedr. C. G. Müller (M. T. Fig. 180)	0. 6. 0
62,404. **De la Rive's Floating Current,** Figure (M. P. 9th Edn. III, Fig. 602; Gan.-Rein. Fig. 884), without glass vessel or magnet	0. 8. 0
62,405. **Rotary Solenoid with Iron Stopper,** Figure, after Götze, for demonstrating the action of a magnetic field on the position of the solenoid which is traversed by the current	4. 0. 0
62,406. **Apparatus for demonstrating the Alternating Effect of Crossed Currents,** after Friedr. C. G. Müller, at the same time a model of a dynamometer (M. T. Fig. 215)	3. 12. 0
62,407. **Apparatus** after Buff, Figure, **for the attraction of parallel unidirected and the repulsion of parallel opposed currents** (M. P. 9th Edn. III, Figs. 706 and 707) . . .	2. 10. 0

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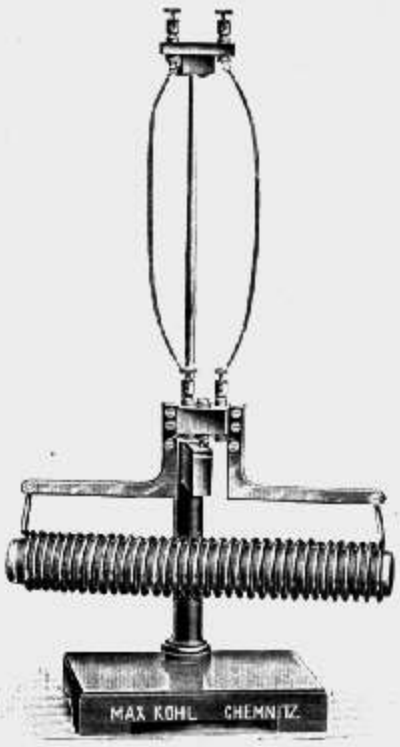
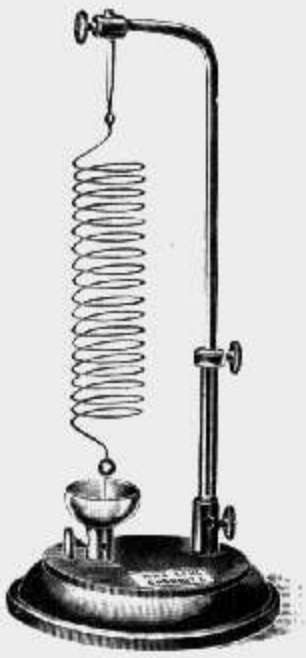
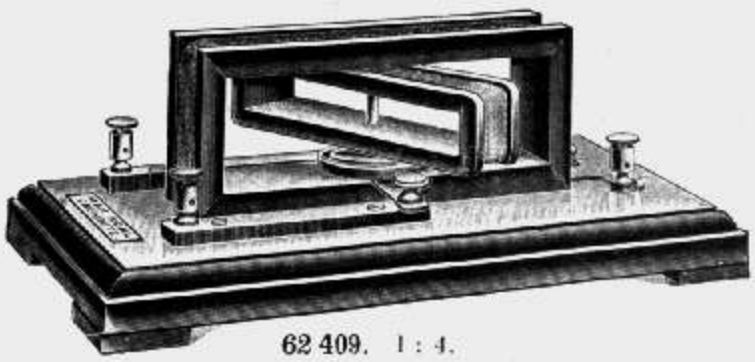


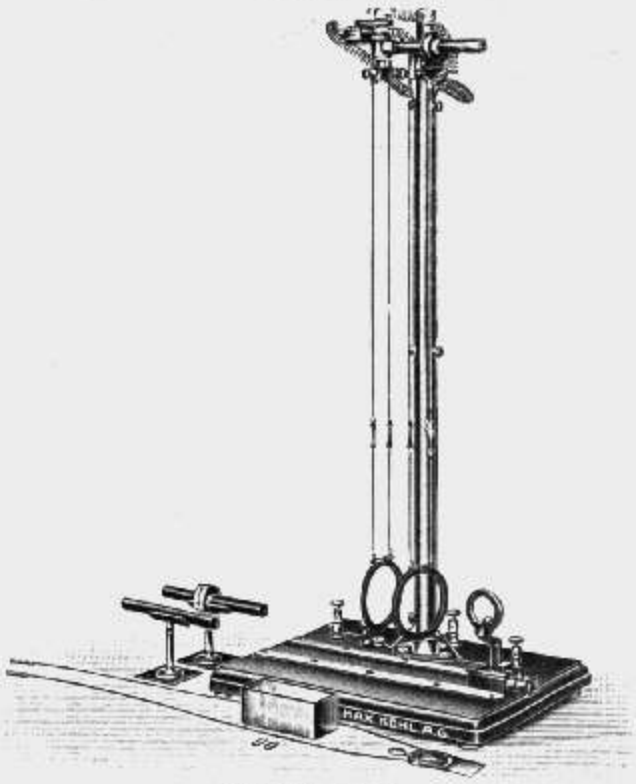
62 405. 1 : 7.



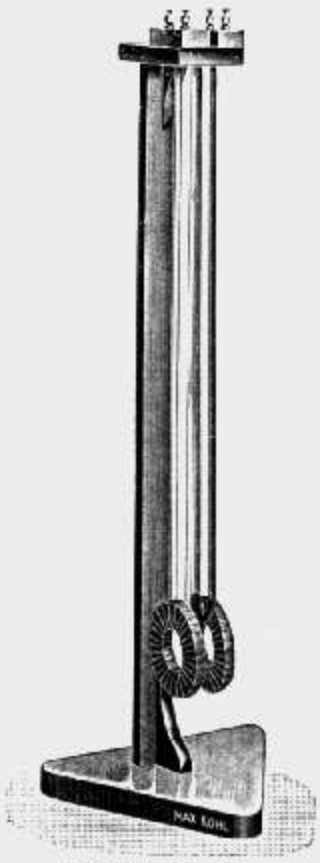
62 408. 1 : 5.



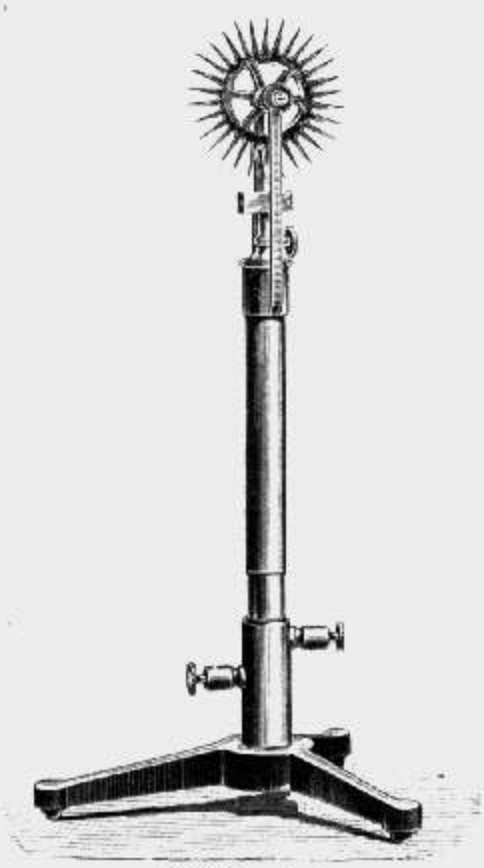
62 409. 1 : 4.



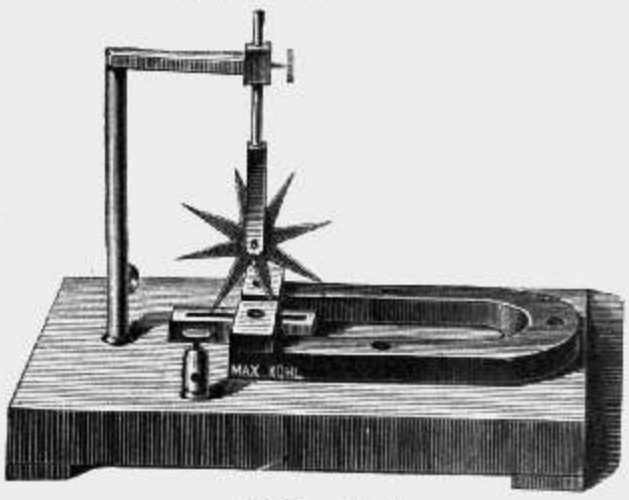
62 410. 1 : 8.



62 407. 1 : 12.



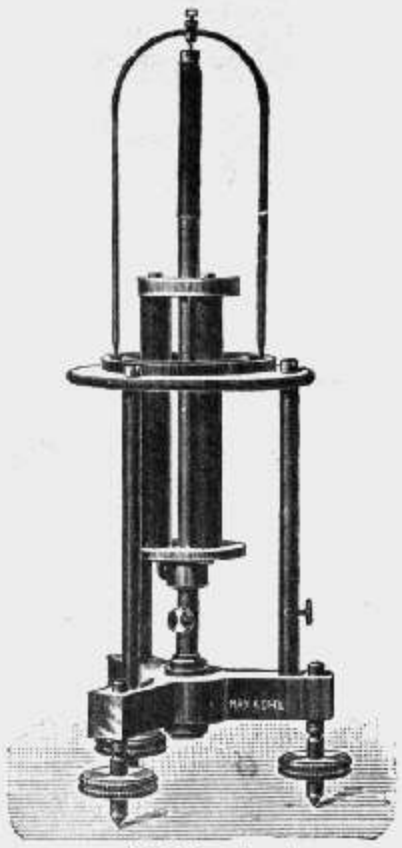
62 412. 1 : 4.



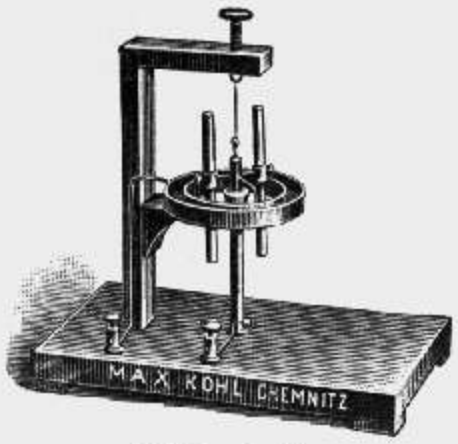
62 411. 1 : 4.

	£ s. d.
62,408. **Roget's Spiral for the Attraction of rectified parallel Currents,** Figure	0. 16. 0
62,409. **Apparatus** after Garthe, Figure, **for the action of crossed currents** (M. P. 9th Edn. III, Fig. 712)	1. 4. 0
62,410. **Electro-dynamic Double Pendulum,** after Kolbe, Figure, for showing the mutual attraction and repulsion of conductors and magnets (Ztschr. f. d. phys. u. chem. U. **23,** 1910, p. 201)	6. 0. 0
This newly-designed apparatus is very certain in its action and requires a current of only 2—3 amps. at 6—8 volts. A special advantage of the apparatus rests in the fact that one of the solenoids can be turned through 180° so that the current flows in an inverse direction in relation to the other solenoid or the magnet, without a commutator being necessary.	
62,411. **Barlow's Wheel,** Figure (M. P. 9th Edn. III. Fig. 577; Gan.-Rein. Fig. 886) .	1. 0. 0
62,412. — idem, different pattern, Figure (M. P. 9th Edn., Figs. 574—576), with a massive horse-shoe magnet which is set into motion	1. 10. 0

Cl. 4161, 2802, 2803, 6020, 2801, 2862, 2661.



62 413. 1 : 4.



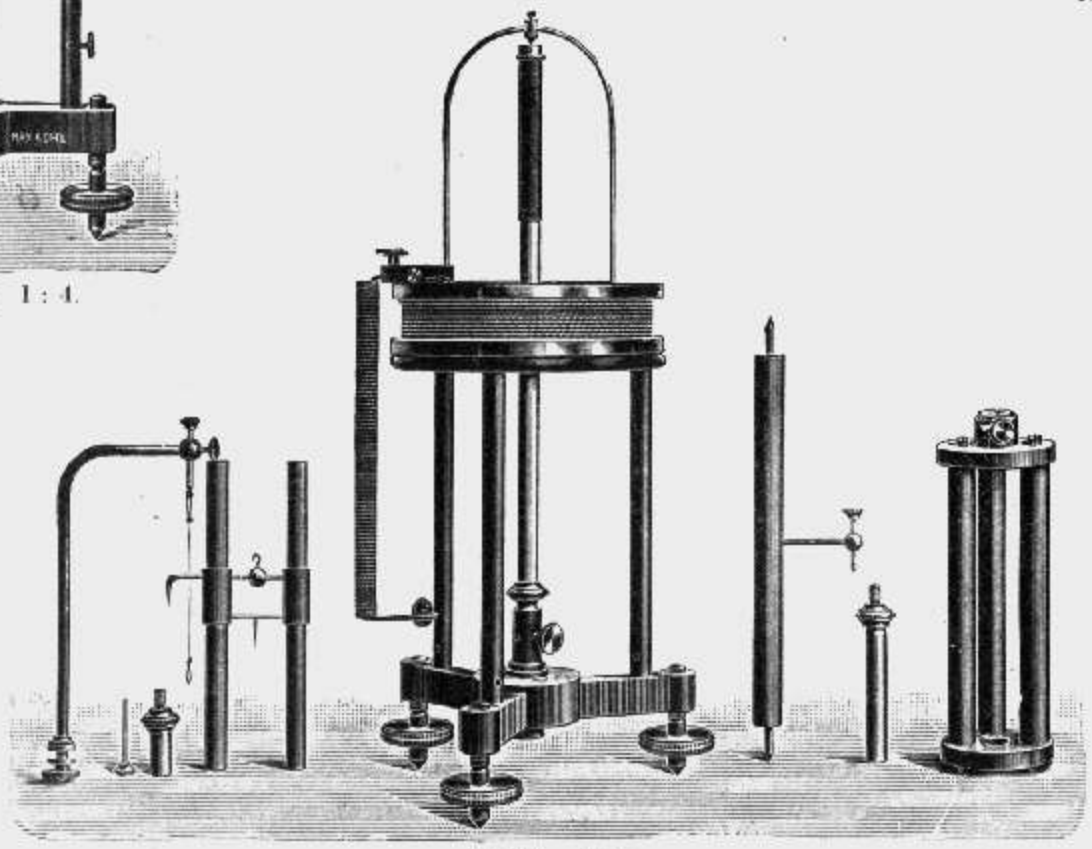
62 414. 1 : 9.



62 415. 1 : 6.



62 416. 1 : 6.



62 417. 1 : 4.

62,413. **Apparatus for the Rotation of a Movable Current about a Magnet,** Figure (M. P. 9th Edn. III, Fig. 579; Gan.-Man. Fig. 736; Gan.-Rein. Fig. 885) . . . . . £ 1. 4.0

62,414. **Apparatus for the Rotation of a Magnet about a Fixed Current,** Figure (M. P. 9th Edn. III, Fig. 583) . . . . . £ 1. 4.0

62,415. **Apparatus for the Rotation of a Magnet about its own Axis** under the Influence of a Current, Figure (M. P. 9th Edn. III, Fig. 587) . . . . . £ 1. 4.0

62,416. **Apparatus for the Rotation of a Current by the Action of another,** Figure (M. P. 9th Edn. III, Fig. 719; Gan.-Man. Fig. 748, Gan.-Rein. Fig. 878) . . . . . £ 1. 4.0

62,417. **Apparatus for the Rotation: (1) of a Movable Current about a Magnet; (2) of a Magnet about a fixed Current; (3) of a Magnet about its own Axis under the Influence of a Current; (4) of a Current by the Action of another,** Figure . . . . . £ 3. 12. 0

This apparatus is a combination of the four preceding apparatus.

62,418. **Apparatus** after Faraday, Figure, **for the Rotation of a Movable Conductor, traversed by a Current, about a Magnet** (M. P. 9th Edn. III, Fig. 580) . . . . . £ 2. 8. 0

One of the poles of a vertical horse-shoe magnet (to the right of the illustration) is fitted with a wood bush having a mercury gutter into which a copper wire stirrup plunges. The mercury is connected with the one connecting terminal and the copper stirrup with the other (both shown in illustration). The other pole of the magnet (to the left) carries a zinc vessel in which is fitted a copper ring suspended on a copper stirrup. As both stirrups are pivotted the first device is set into rotation when the current passes through and the second when the zinc vessel is filled with dilute sulphuric acid.

Max Kohl A. G. Chemnitz, Germany.

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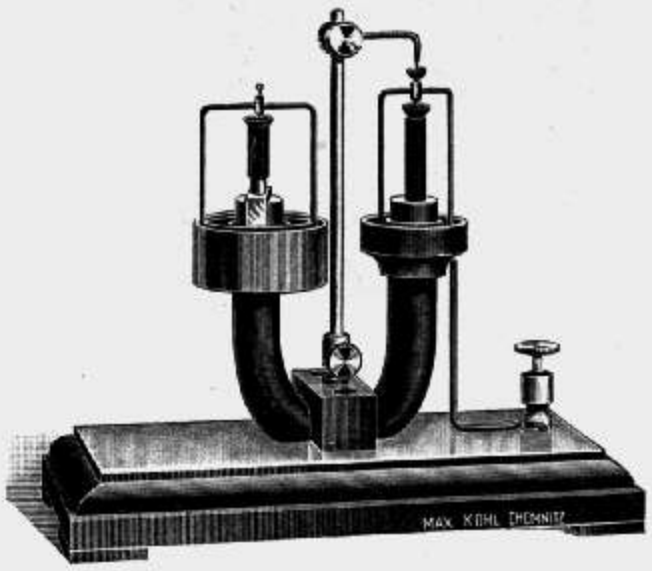
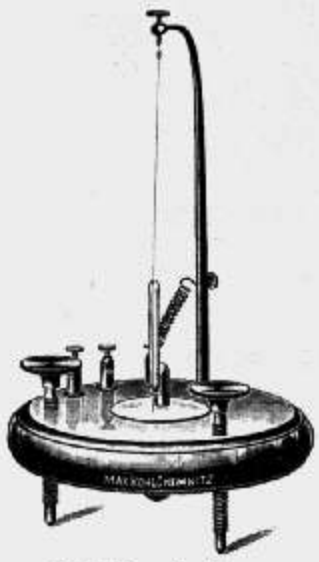
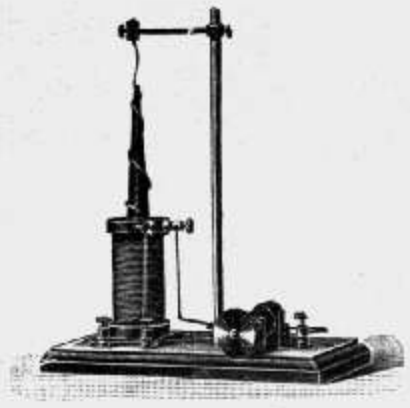


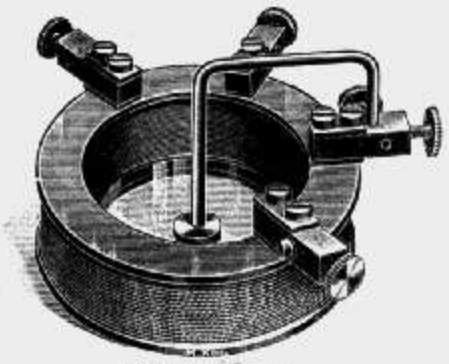
62 418. 1 : 3.



62 419. 1 : 3.



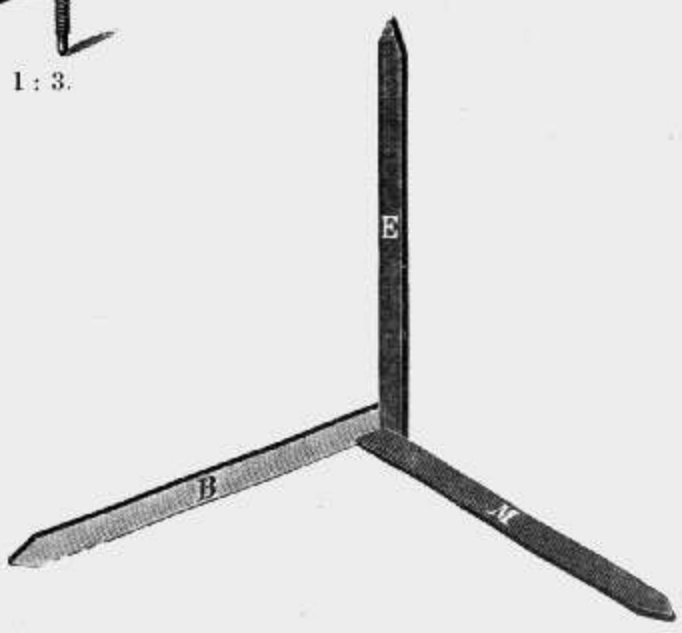
62 420. 1 : 9.



62 422. 1 : 2.



62 423. 1 : 4.



62 424. 1 : 3.

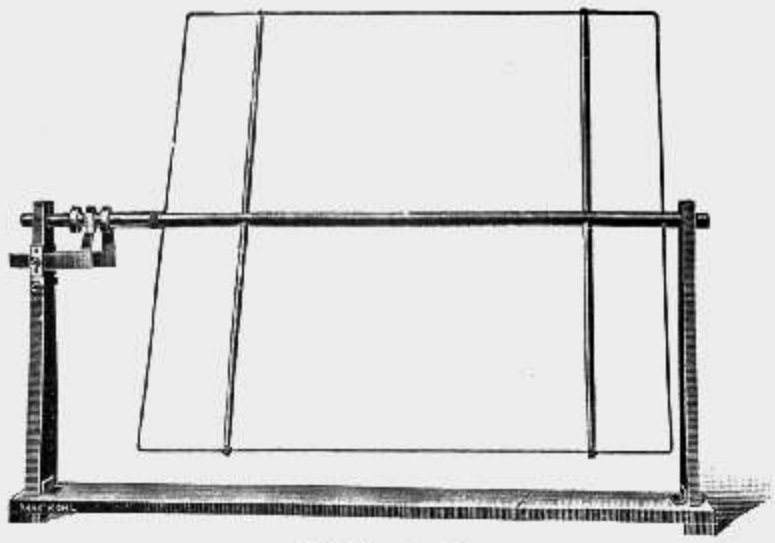
	£ s. d.
62,419. **Apparatus after Faraday, simpler,** Figure	1. 10. 0
A rigid wire, arranged to move in a hook, rotates about the pole of a magnet when traversed by the current, thus describing the outer surface of a cone. The current is conducted (1) by the hook-suspension, (2) by a mercury gutter into which is plunged the free movable end of the wire.	
62,420. **Apparatus for the Electromagnetic Action on Flexible Conductors,** Figure (M. P. 9th Edn. III, Fig. 582)	2. 0. 0
A very flexible copper rope, loosely guided upon the elongated conical core of an electromagnet, winds itself spiral-form on the latter when traversed by a powerful current. If the current is reversed by the commutator it unwinds itself and again winds itself up in the reserve direction.	
62,421. — idem, double preceding size	4. 10. 0
62,422. **Apparatus** after Weinhold, Figure (W. D. Fig. 539 [512]), **for the rotation of liquid conductors** as showing the action of crossed currents; for the Horizontal Projection Apparatus	0. 12. 0

Section 7: Induction Currents.

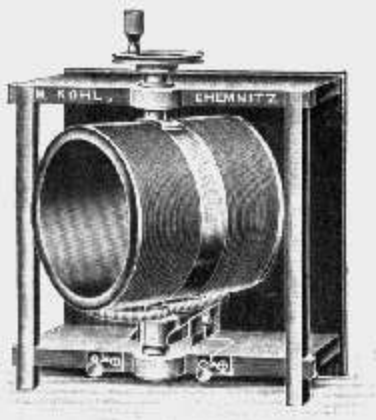
	£ s. d.
62,423. **Horse-shoe Magnet with Armature and Induction Coil,** after Friedr. C. G. Müller (M. T. Fig. 217), for proving the laws of induction	0. 12. 0
62,424. **Model for explaining the Laws of Magnetic Induction** for actuated conductors, Figure (W. D. Fig. 556 [529])	0. 3. 0
The apparatus consists of three sheet iron strips soldered together at one end at right angles to each other being tapered at the other end and painted in different colours; they are marked **B, E, M** (**B**ewegungsrichtung des Leiters [Direction of Motion of the Conductor], **E**lectromotive Force, **M**agnetic Field).	
62,425. **Automatic Induction Indicator** after Pfaundler (M. P. 9th Edn. III, Fig. 566) . . .	0. 5. 0



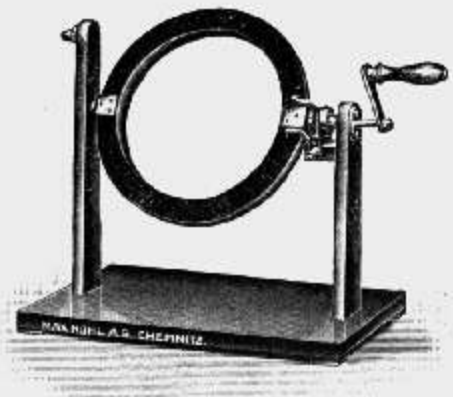
62 426. 1 : 7.



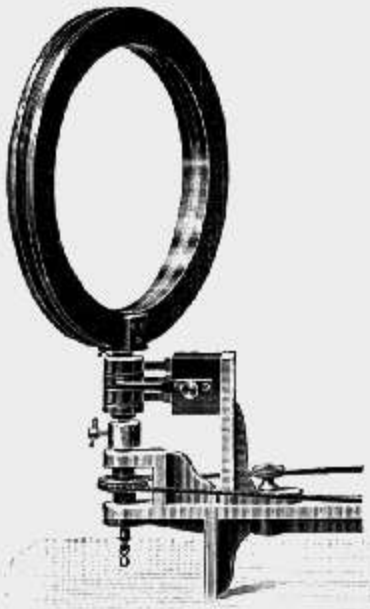
63 427. 1 : 10.



62 429. 1 : 8.



62 430. 1 : 10.



52 064. 1 : 7.

62,426. **Apparatus for Explaining the Existence of the Magnetic Induction Current** and the rule for its direction, Figure (M. P. 9th Edn. III, Fig. 565); **Electromagnet** with indication of lines of force and device for the presence of the induction current . . . £ 1. 12. 0

62,427. **Simple Earth Inductor for Direct and Alternating Current,** after Szymansky, Figure . . . . . £ 1. 10. 0
The most suitable galvanometer to use for above is Szymansky's, No. 61,342, p. 883.

62,428. **Coil for showing Induction by the Earth's Field** after Weinhold (W. D. p. 853 [791]) £ 0. 10. 0

62,429. **Earth Inductor** after Friedr. C. G. Müller, Figure (M. T. Fig. 220), with 200 turns and a winding surface of 200 sq. cm . . . . . £ 3. 10. 0

62,430. **Earth Inductor after Palmieri,** Figure (M. P. 9th Edn. III, Fig. 644), with round frame 300 mm diameter, with 100 turns of 1 mm thick wire, with commutator and slip rings for taking off D. C. and A. C. and with device for rotating the winding frame horizontally and vertically . . . . . £ 3. 0. 0

52,064. **Earth Inductor,** Figure, with commutator and slip rings for taking off D. C. and A. C., for the Whirling Table (Frick, phys. Techn. II, 1, Fig. 1118) . . . . . £ 1. 16. 0

52,063. — idem, for taking off D. C. only . . . . . £ 1. 13. 0

62,433. **Iron Bar,** 60 cm long, with copper wire winding (M. P. 9th Edn. III, Fig. 654), for showing that an induction current occurs when a bar magnet is passed along the winding £ 0. 7. 0

62,434. **Induction Coil** Figure, fixed horizontally on a stand, with a powerful bar magnet, for showing the presence of an induction current when the magnet is introduced into the coil . . . . . £ 0. 18. 0

Cl. 2655, 2680, 4122, 6007, 2685.

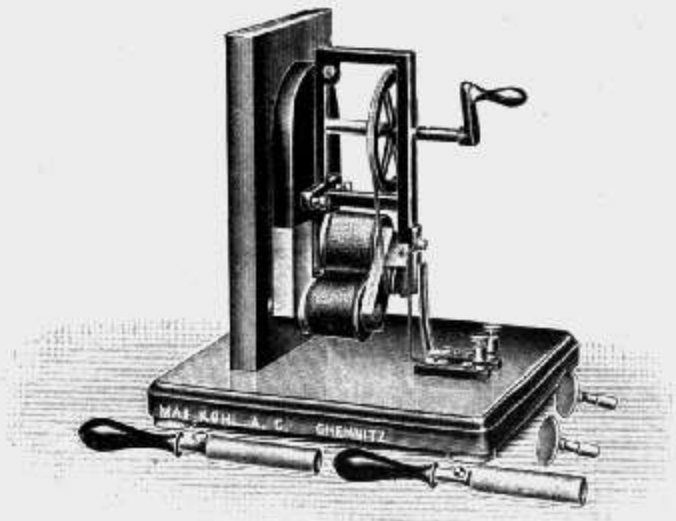
Max Kohl A. G. Chemnitz, Germany.



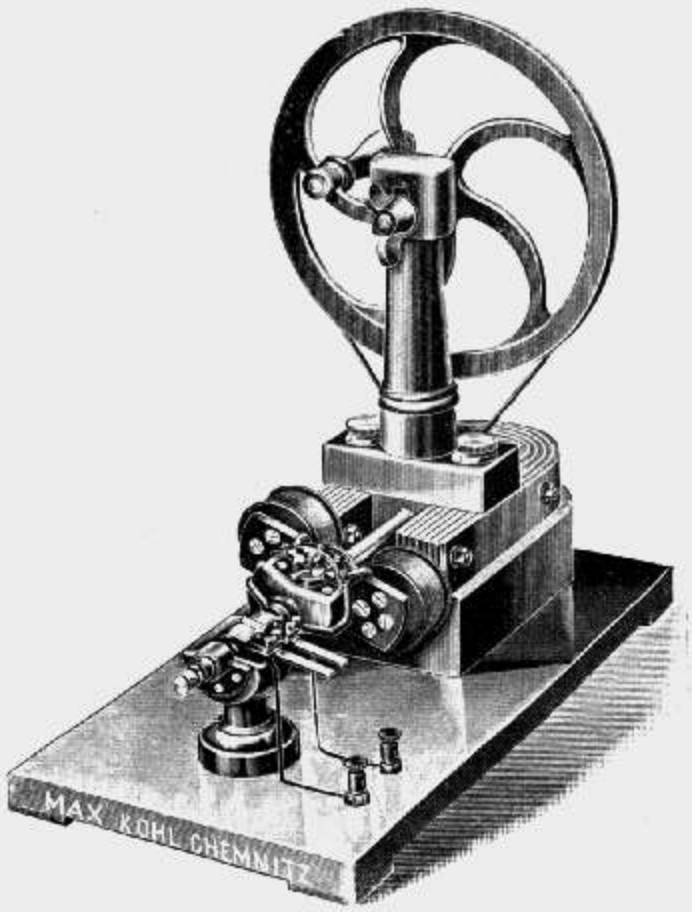
62 434. 1 : 6.



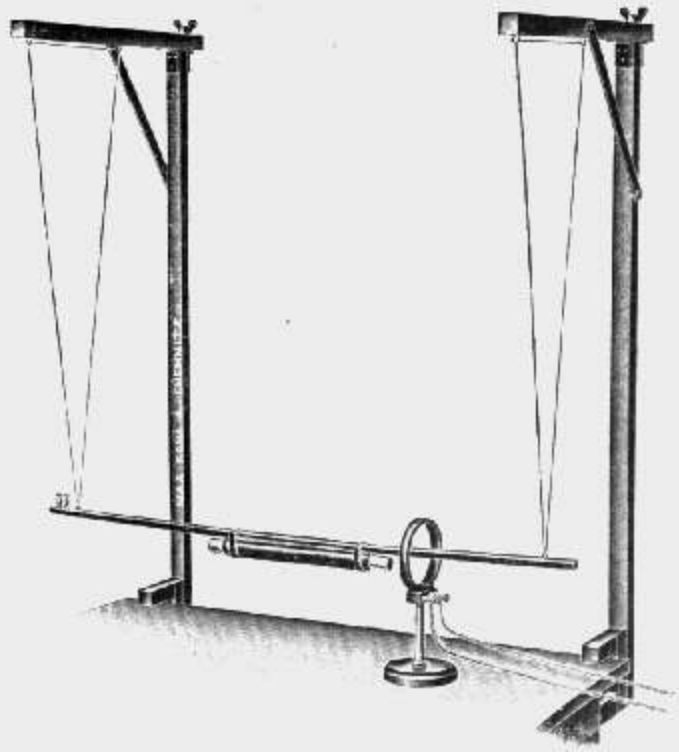
63 435. 1 : 10.



62 440. 1 : 4.



62 436. 1 : 6.



62 442. 1 : 16.

62,435. **Apparatus** after Faraday, **for showing the induction currents present when an electro-magnet is magnetized,** Figure (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 142), with two handles as electrodes . . . . . £ 1. 8. 0

62,436. **Magnetic Induction Machine** after Stöhrer, Figure (M. P. 9[b] Edn. III, Fig. 613), for demonstrating induction phenomena, water-decomposition, incandescent light, arc light and electro-magnetism, with commutator and device to enable the two armature coils to be put in parallel or series 10. 0. 0

Accessories for No. 62,436:

62,437. **2 Grips** with connecting leads 0. 3. 0

62,212. **U-shaped Glass Tube** with platinum electrodes for electrolysis of water 0. 8. 0

62,438. **Glow Lamp Stand** with Edison Socket and Glow Lamp 0. 6. 0

62,439. **Stand for clamping thin Carbon Rods,** for arc light 0. 8. 0

62,269. **Horse-shoe Electromagnet** with suspension ring and armature 0. 8. 0

For Magnetos: see Nos. 62,358—62,361, p. 961.

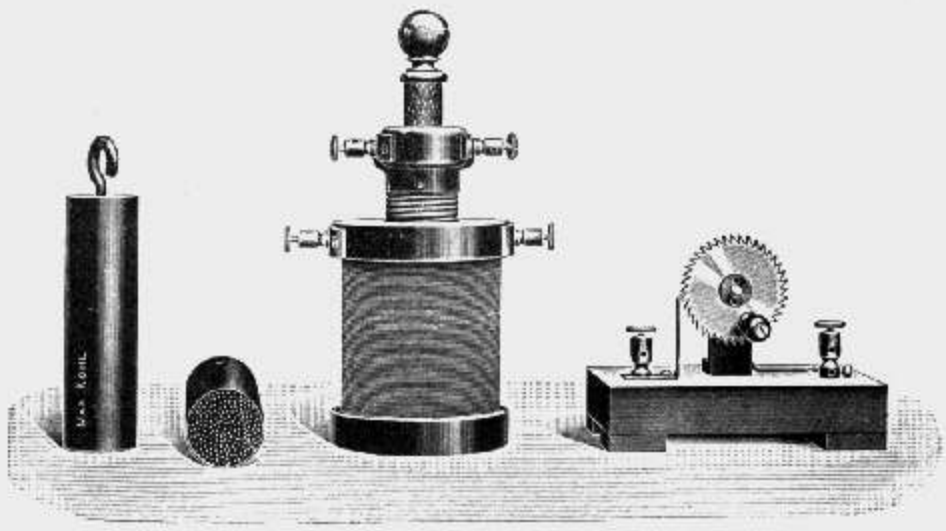
62,440. **Magneto-electric Induction Apparatus,** Figure 2. 0. 0

62,442. **Apparatus for Experiments on Induction,** after Kolbe, Figure (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 143) consisting of a 350 mm long electromagnet on wood rod, with 100 turns copper wire, and a second wire coil on base with 100 turns, also **two wooden gallows** for same for screwing on to the Lecture Table 2. 8. 0

Cl. 2679, 2680, 5539, 2681, 5762.



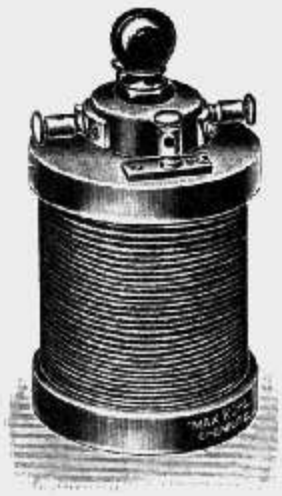
62 444. 1 : 5.



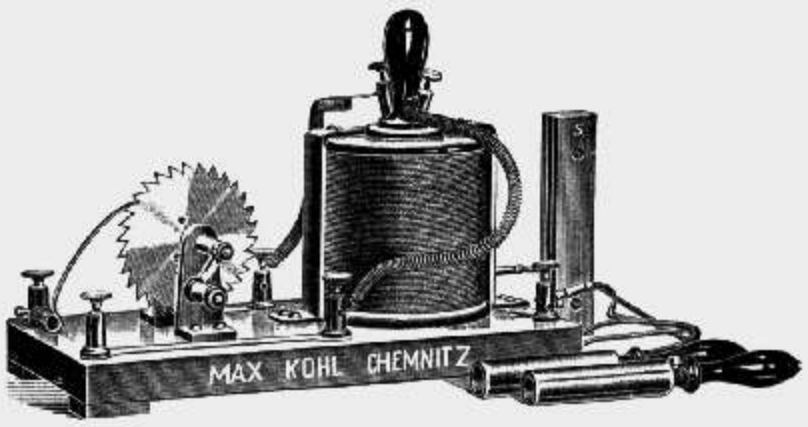
62 450. 1 : 5.



62 461. 1 : 4.



62 448. 1 : 5.



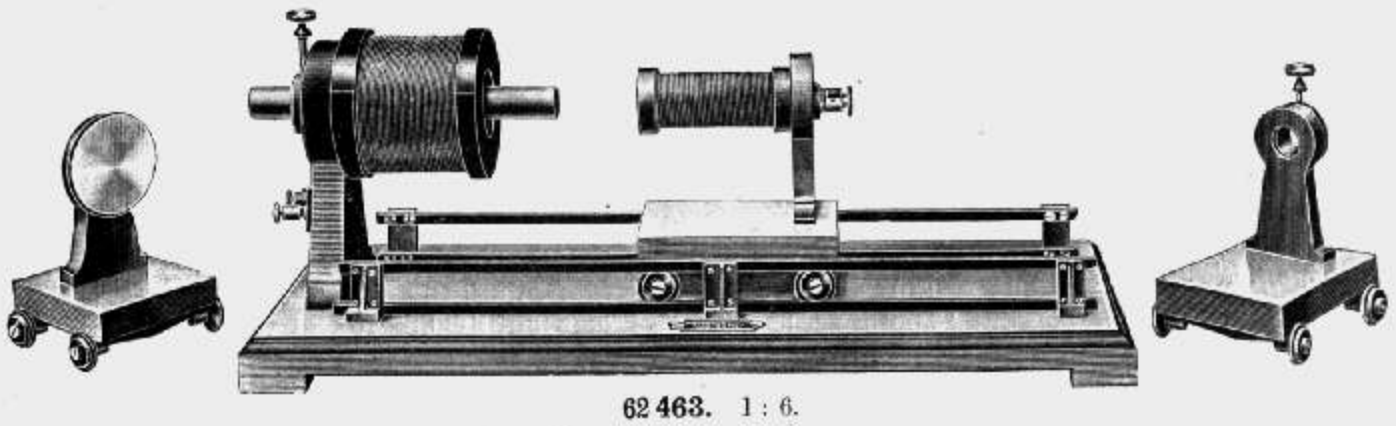
62 462. 1 : 4.

	£ s. d.
62,444. **2 Induction Coils** after Weinhold, Figure (W. D. Fig. 555 [528]), for the fundamental experiments on induction; can also be placed crosswise over each other; with bar magnet 120 mm long and 12 mm thick	0. 16. 0
62,445. — idem, larger pattern	1. 0. 0
60,007. **Cylindrical Bar Magnet for above,** 150 mm long, 10 mm thick	0. 2. 0
62,447. **Induction Coil** (M. P. 9th Edn. III, Fig. 732), with two different coloured wires wound in parallel	0. 10. 0
62,448. **2 Wire Coils** (M. P. 9th Edn. III, Fig. 729, Gan.-Man. Fig. 773; Gan.-Rein. Fig. 966), for inserting one in the other, with bundle of iron wires as core, Figure	0. 18. 0
62,449. **Cylindrical Bar Magnet for above**	0. 2. 0
62,450. **Induction Coil with Interrupting Wheel,** Figure	1. 16. 0
The apparatus consists of a large wood reel wound with thin copper wire. The following fit into this coil: 1 solid soft iron core with suspension hook which can be screwed out; 1 iron wire bundle for self-induction experiments; and 1 coil for mutual induction, wound with thick copper wire, into which a thinner iron wire bundle fits. In addition an interrupting wheel is supplied for physiological effects.	
62,451. **Cylindrical Bar Magnet for above**	0. 2. 0
62,437. **2 Handles** for above with flexible leads	0. 3. 0
62,452. **Interrupting Wheel alone,** cf. Figure 62,450, to the right	0. 12. 0
62,461. **2 Wire Coils** for inserting one in the other, Figure, the inner one wound with thick wire, with bundle of soft iron wire and with an interrupting wheel; the external coil wound with fine wire; on base	1. 10. 0
62,462. — idem, **larger,** Figure, mounted on wood board, with interrupting wheel, iron wire bundle, bar magnet, and two handles for physiological purposes	2. 0. 0
62,463. **2 Induction Coils,** Figure, with iron bar, bar magnet, and membrane	5. 5. 0
The primary wire coil, the magnet and the membrane are mounted on a carriage frame with rollers so that they may be conveniently introduced into the secondary coil. The apparatus can be used at the same time for explaining the telephone.	

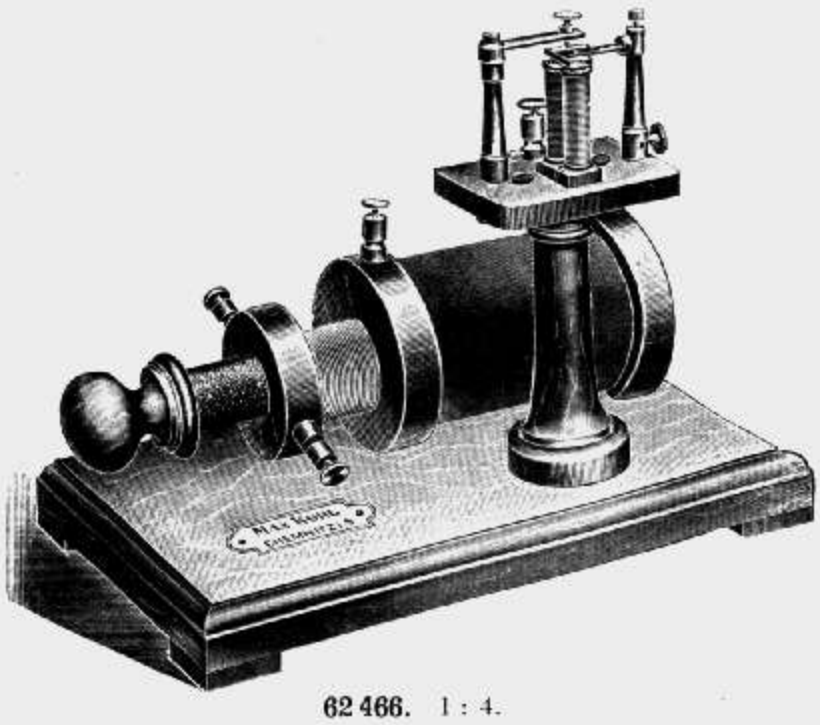
Cl. 6027, 2805, 2806, 2807.

Max Kohl A. G. Chemnitz, Germany.

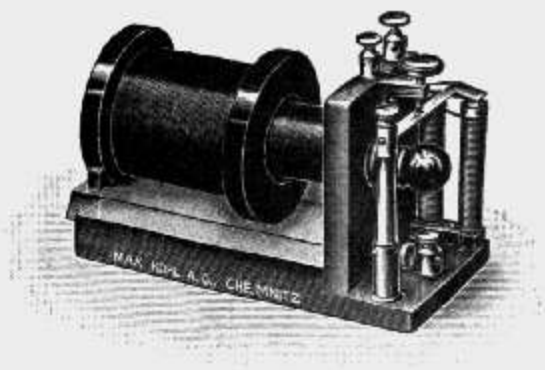
Max Kohl A. G. Chemnitz, Germany.



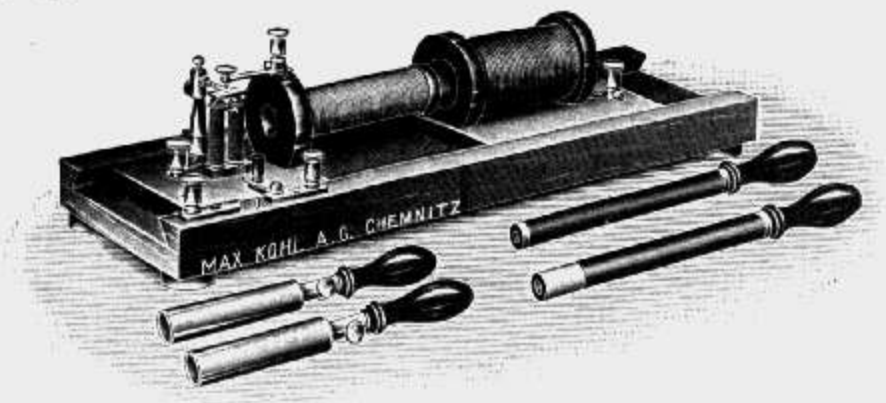
62 463. 1 : 6.



62 466. 1 : 4.



62 467. 1 : 3.



62 469. 1 : 6.

62,464. **Magnetic Hammer Break** (M. P. 9th Edn. III, Fig. 735), for automatically interrupting a current . . . . . £ s. d. 0. 16. 0

62,465. **Circuit-breaking Device** after Buff (M. P. 9th Edn. III, Figs. 750—752) 2. 0. 0

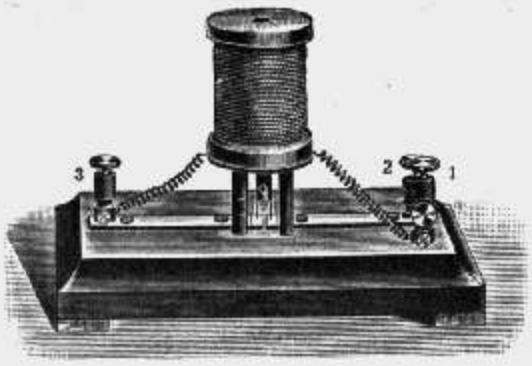
62,466. **Induction Coils** with **Magnetic Hammer Break,** Figure, for demonstrating the fundamental phenomena of induction and of the extra current 2. 8. 0

62,467. **Slide Induction Apparatus** with **Magnetic Hammer Break,** Figure, for physiological purposes 1. 10. 0

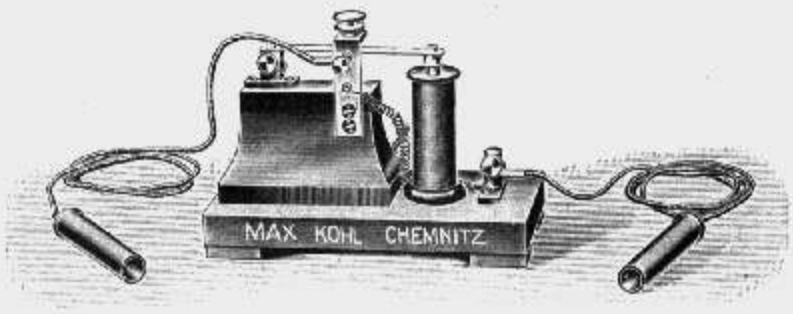
62,468. **Apparatus,** after Branly, **for Induction Currents of the higher order** 17. 10. 0

If the primary current of a spark coil connected with the apparatus is opened, a current is induced in the secondary winding and traverses a spark gap and one of two spirals wound on the same ebonite cylinder. An induced current is consequently produced in the second winding on opening and closing, and ignites a gas jet and flows through a spark gap and a second inductor, as a primary current. Use is made of four spark gaps, five gas burners and three ebonite cylinders having two windings each.

62,469. **Slide Induction Apparatus,** after Dubois-Reymond, for all fundamental experiments on induction, Figure, with one iron core, one bar magnet and two handles . . 3. 10. 0



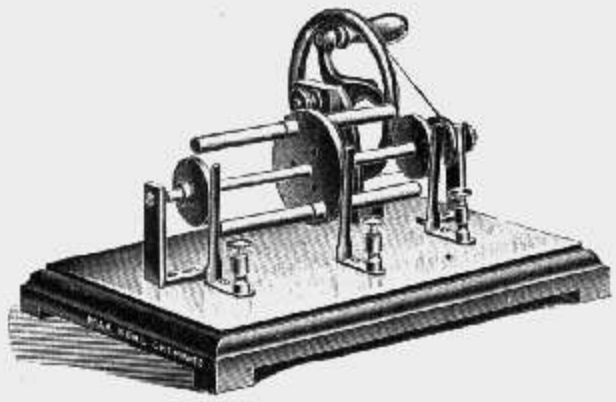
62 470. 1 : 3.



62 471. 1 : 5.



62 478. 1 : 6.



62 480. 1 : 8.

62,470. **Apparatus for showing the Extra Current, after Dr. Geschöser,** Figure (Ztschr. f. d. phys. u. chem. U. **11,** 1898, p. 83) . . . . . £ 1. 4. 0

62,471. **Apparatus for demonstrating the Extra Current,** Figure (M. P. 9th Edn. III, Fig. 742) 1. 12. 0

62,472. **Experimental Arrangement for proving Self-induction,** after Kann, with a glow lamp connected in parallel to a coil of high self-induction (Ztschr. f. d. phys. u. chem. U. **16.** 1903, p. 284) 1. 10. 0

Standards of Self-Induction after Wien, Figure, constructed in accordance with the data of the Physikalisch-Technische Reichsanstalt (E. T. Z. 1903, p. 504).

Henries	0,0001	0,001	0,01	0,1	0,5	1
Value cm	10^5	10^6	10^7	10^8	$5 \cdot 10^8$	10^9
List No.	**62,473**	**62,474**	**62,475**	**62.476**	**62,477**	**62,478**
£	**1. 5. 0**	**1. 5. 0**	**1. 12. 0**	**2. 5. 0**	**3. 10. 0**	**4. 10. 0**

These standards are wound on iron-free reels of serpentine stone and fixed so as to allow of no play. By obviating all metal parts with the exception of the small terminals and by sub-dividing the winding the occurrence of eddy currents is prevented.

The standards are calibrated to within 0.002 of their value and can be provided with certificates from the Physikalisch-Technische Reichsanstalt on payment of the necessary fees.

62,479. **Induction Coil for calibrating Ballistic Galvanometers,** consisting of a long coil the field density of which can be calculated from the dimensions, and a short coil slipped over the former 1. 5. 0

62,480. **Apparatus** after Plücker and Fessel, Figure, **for causing an induction current by rotating two magnets** (M. P. 9th Edn. III, Fig. 584) 1. 10. 0

52,062. — idem, for the Whirling Table, Figure on p. 288 . . . . . 1. 8. 0

62,481. **Apparatus for Unipolar Induction,** after Weber (M. P. 9th Edn. III, Figs. 590 and 591) 5. 0. 0

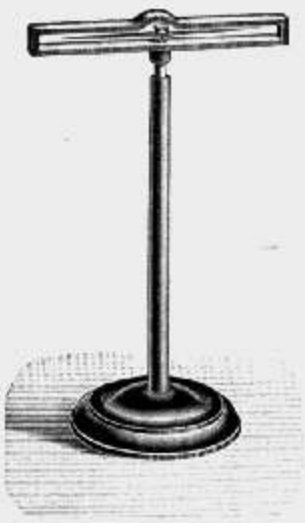
62,482. **Apparatus for showing Damping by Induction,** Figure (W. D. Fig. 557 [530]), copper stirrup with magnetic needle swinging therein 0. 18. 0

62,483. **Apparatus for showing Damping by Induction,** after Weinhold, Figure (W. D. Fig. 558 [531]), for the horizontal Projection Apparatus 0. 18. 0

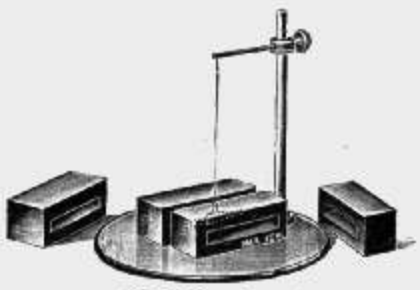
62,484. **v. Waltenhofen's Pendulum for showing the Damping Effect of Induction,** Figure (W. D. Fig. 559 [532]) 2. 10. 0

Cl. 2818, 3708, 2819, 2672.

Max Kohl A. G. Chemnitz, Germany.



62 482. 1 : 4.



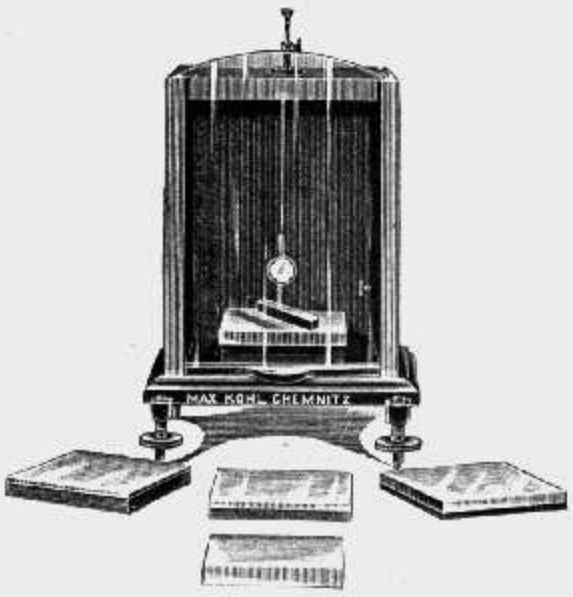
62 483. 1 : 4.



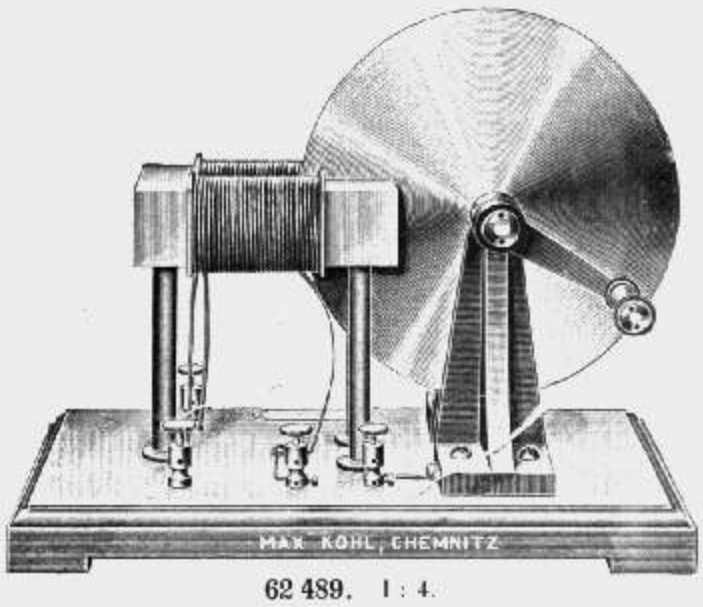
62 484. 1 : 9.



62 485. 1 : 4.



62 486. 1 : 8.



62 489. 1 : 4.

62,485. **Accessories for Dia- and Paramagnetic Experiments,** Figure, consisting of: 2 pole pieces with conical ends, 1 stand for suspending the dia- and paramagnetic bodies, a glass tube for holding off air currents, and 3 small bars of antimony, bismuth and glass . £ 1. 0. 0

62,486. **Apparatus for showing the Damping Action of Induction,** Figure . . . . . £ 5. 0. 0

A bar magnet is suspended in a glass box having levelling screws. On the bottom of the box four copper plates of different thickness and a brass plate of the same size can be laid in such manner that the distance from the magnet is always equal. The variation of damping is very striking.

52,059. **Apparatus for Arago's Magnetism of Rotation,** Figure on p. 287 (W. D. Fig. 560 [533]), for the Whirling Table . . . . . £ 1. 4. 0

An adjustable glass plate with magnetic needle is arranged above a large rotating copper disc. On rotating the disc the needle is deflected in the direction of rotation, it being itself finally set in rotation.

52,060. **Rotating Magnet with rotary Copper Disc placed above it,** Figure, on p. 287, for the Whirling Table . . . . . £ 1. 0. 0

When the magnet is rotated the copper disc rotates in the same direction and almost as quickly as the magnet (as the armature in an asynchronous three-phase motor).

62,489. **Apparatus for Generating Eddy Currents** in a Copper Disc rotating between the Poles of an Electromagnet, Figure (cf. M. P. 9th Edn. III, Fig. 691), with stand . . . £ 3. 0. 0

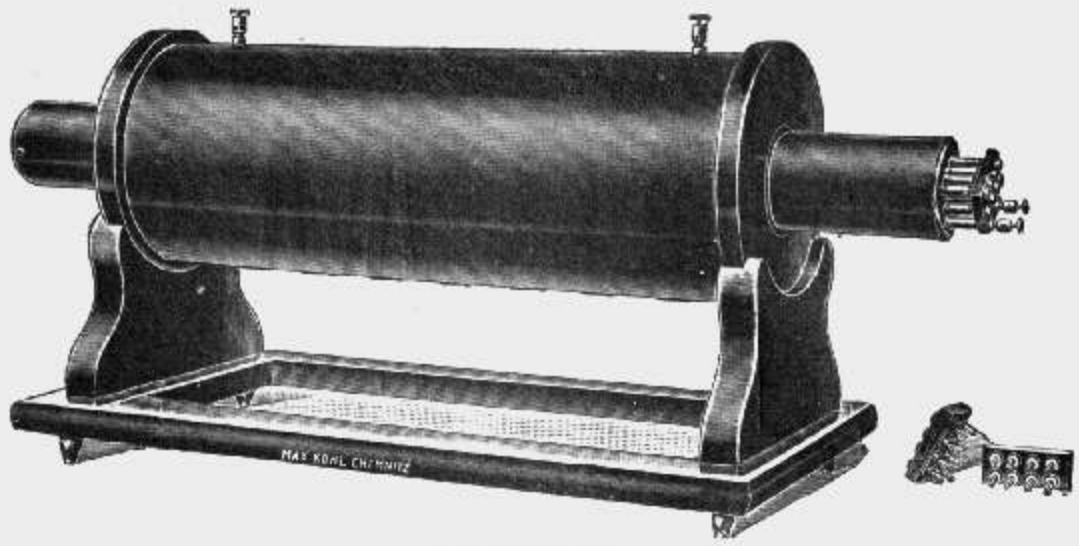
52,061. — idem, for the Whirling Table, Figure on p. 288 . . . . . £ 1. 8. 0

The copper disc is rotated at a moderate speed without allowing the current at first to pass into the electromagnet. As soon as the current is closed it is noticed that a considerably larger expenditure of force is necessary to rotate the disc rapidly.

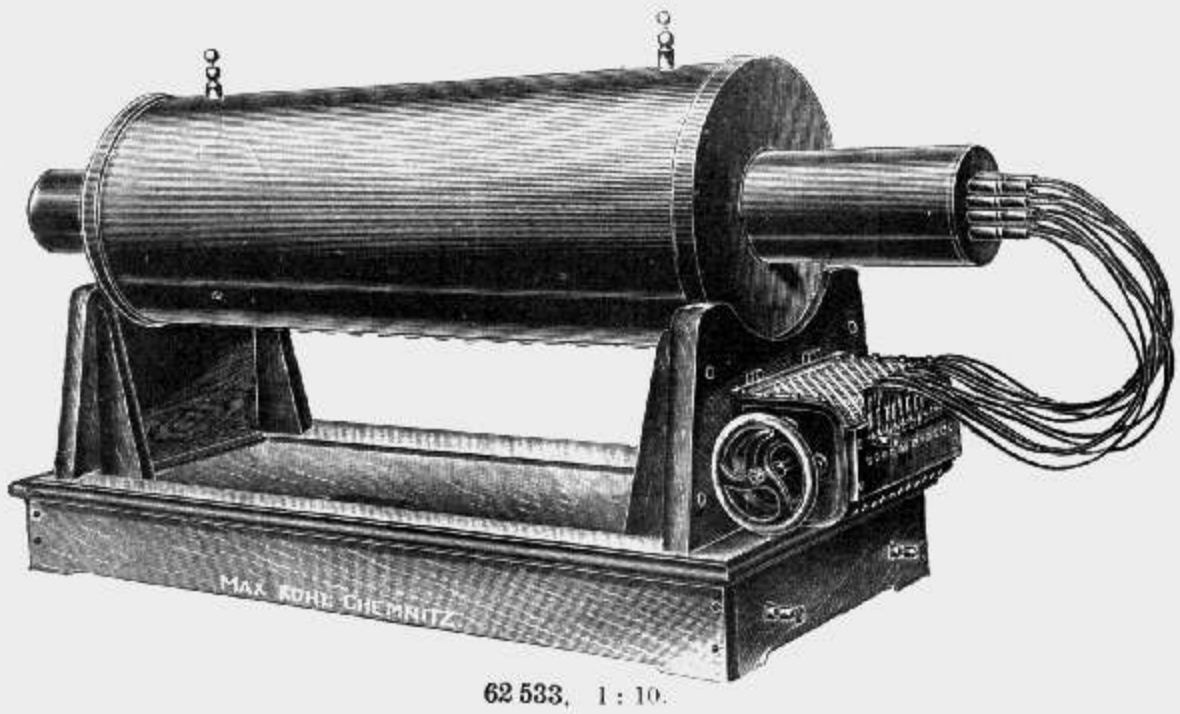
Regarding above, cf. also Accessories to Electromagnets Nos. 62,281—62,313.

Cl. 2688, 2691, 6026, 2690, 2692, 2695. 62

Max Kohl A. G. Chemnitz, Germany.



62 513. 1 : 7.



62 533. 1 : 10.

Induction Coils and Accessories.

Our output of Induction Coils up to the present amounts to over 3500.

Our Induction Coils, which are constructed from an experience extending over many years, and which are unsurpassed in efficiency by any other make, are built of the best materials, which are submitted to the most stringent tests before being worked up. The reels are made of stout tubes with end discs and ebonite jacket and, with the exception of the very small apparatus, can be detached from the stands. The method of constructing the secondary coils ensures that each individual winding is thoroughly well insulated.

In the case of sizes 7—15 a, types A, B, C, D and E, the Primary Coils are enclosed in a separate ebonite tube from which they can be taken out.

We supply the Induction Coils either with a **base** to enable them to be placed on a table, or, if desired, with **Wall Bracket, the prices of both patterns being the same.**

For working with Wehnelt Interrupters the coils are fitted with controllable self-induction (thus varying also the ratio of transformation and the secondary voltage attained). This regulation can either be carried out by **Plugs** or with a **Pachytrope** (Multiple Commutator).

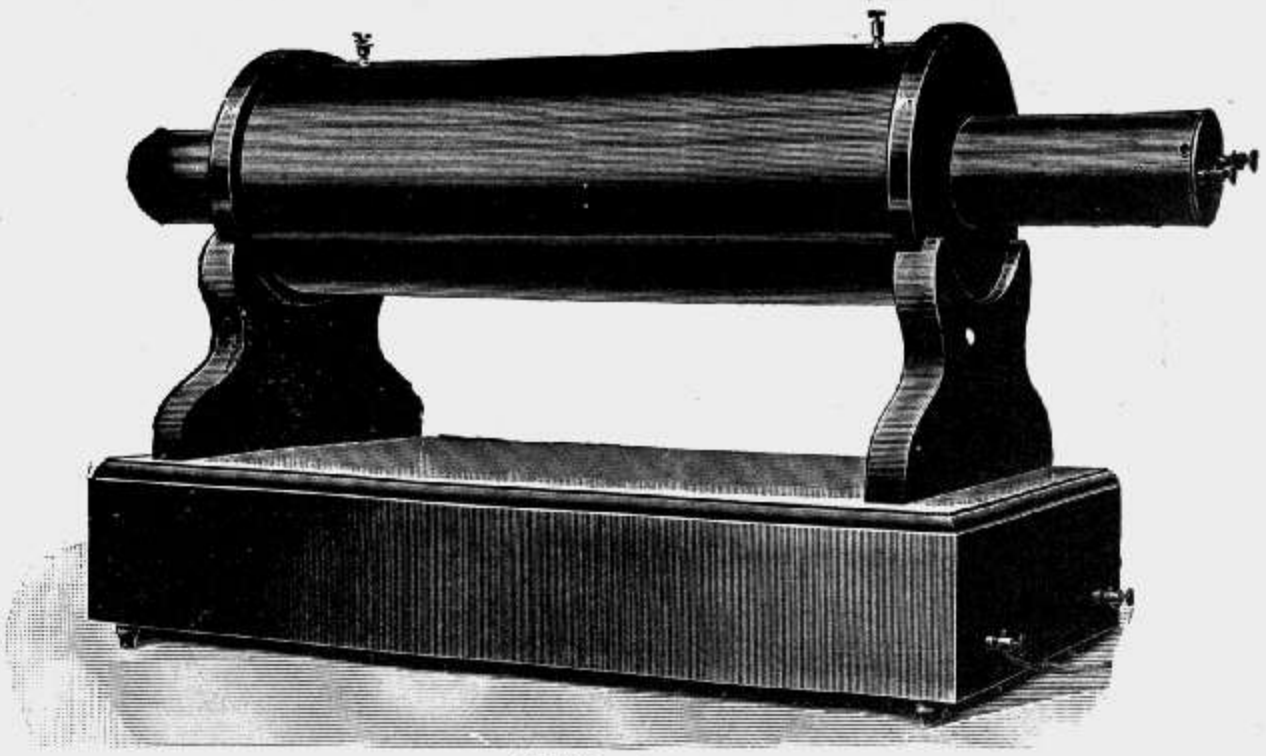
We supply our Induction Coils in the following patterns:

I. Induction Coils with Normal Winding.

(1) **For Wehnelt Interrupters, with Condenser,** viz:
- (a) Type A, with Multiple Commutator for varying the self induction of the primary coil, cf. Fig. 62,533.
- (b) Type B, with Plug Commutation for varying the self-induction of the primary coil, cf. Fig. 62,513.

(2) **For Wehnelt and Motor Interrupter, with Condenser:**
- (a) Type C, with Multiple Commutator for varying the self-induction ot the primary coil, cf. Fig. 62,533.
- (b) Type D, with Plug Commutation for varying the self-induction of the primary coil, cf. Fig. 62,513.

Max Kohl A. G. Chemnitz, Germany.



62 571. 1 : 10.

(3) **For Motor Interrupters, with Condenser, without commutation or Primary Coil. Type E,** cf. Fig. 62,571.
(4) **With Mercury Interrupter, with Condenser and Ruhmkorff Commutator. Type F,** cf. Fig. 62,613.
(5) **With Platinum Interrupter, with Condenser and Ruhmkorff Commutator. Type G,** cf. Fig. 62,624.
(6) **With Mercury and Platinum Interrupters, with Condenser and Ruhmkorff Commutator. Type H,** cf. Fig. 62,636.
(7) **With Platinum Interrupter of special construction having very thick platinum contacts, with Condenser, Ruhmkorff Commutator and Spark Gap for Wireless Telegraphy and Röntgen Ray purposes. Coil not detachable.** In carrying case. **Type J,** cf. Fig. 62,641.
(8) **With Platinum Interrupter, as before, and with Mercury Interrupter; with Condenser, Ruhmkorff Commutator and Spark Gap for Wireless Telegraphy and Röntgen Ray purposes. Coil not detachable.** In carrying case. **Type K.**
(9) **With Platinum Interrupter; for Glow Lamp Factories; with Condenser, Ruhmkorff Commutator and Glow Lamp Holder. Type L,** cf. Figs. 62,624 and 62,624a.

Max Kohl A. G. Chemnitz, Germany.

II. Röntgen Ray Induction Coils, with low-resistance Secondary Winding, specially for Rapid Radiographic Work, and for Charging Condensers.

(10) **For Wehnelt Interrupters, without Condenser,** viz:
(a) **Type R J A,** with Multiple Commutator for varying the self-induction of the primary coil.
(b) **Type R J B,** with Plug Commutation for varying the self-induction of the primary coil.
(11) **For Wehnelt and Motor Interrupters, with Condenser:**
(a) **Type R J C,** with Multiple Commutator for varying the self-induction of the primary coil.
(b) **Type R J D,** with Plug Commutation for varying the self-induction of the primary coil.
(12) **For Motor Interrupters, with Condenser, without Commutation of Primary Coil Type R J E.**

The induction coils with Wehnelt and Motor Interrupters are worked as a rule with Direct Current from heavy current mains. The most useful voltage for both types of interrupter and for coils having a spark length of over 300 mm, is 110. Induction coils of below 300 mm spark-length work better with a pressure of 65 volts when Wehnelt Interrupters are used. The Motor Interrupter yields good results with the considerably lower voltage, and can also be worked with cells or accumulators. The minimum voltages necessary for the same are the following; which also hold good for mercury and platinum interrupters:

Up	to	200	mm	spark-length	12	volts
,,	,,	350	,,	,,	16	,,
,,	,,	400	,,	,,	24	,,
,,	,,	450	,,	,,	32	,,
,,	,,	500	,,	,,	48	,,
,,	,,	600	,,	,,	64	,,

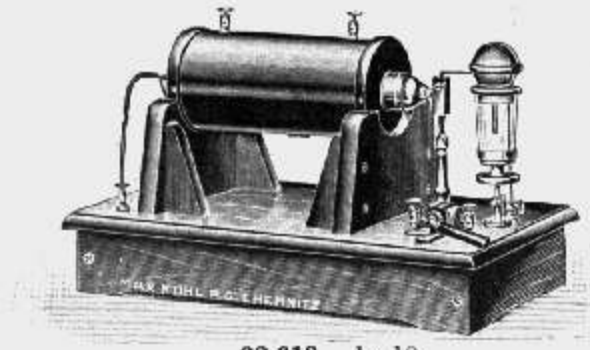
The current consumption for the maximum spark-length is, for Motor Interrupters, about 3—5 amps.; for Wehnelt Interrupters with spark-lengths to 300 mm, approx. 30 amps.; above 300, approx. 20—25 amps.

With pressures above 130 volts shunt resistances are absolutely necessary, and when possible they should be used when employing Motor Interrupters.

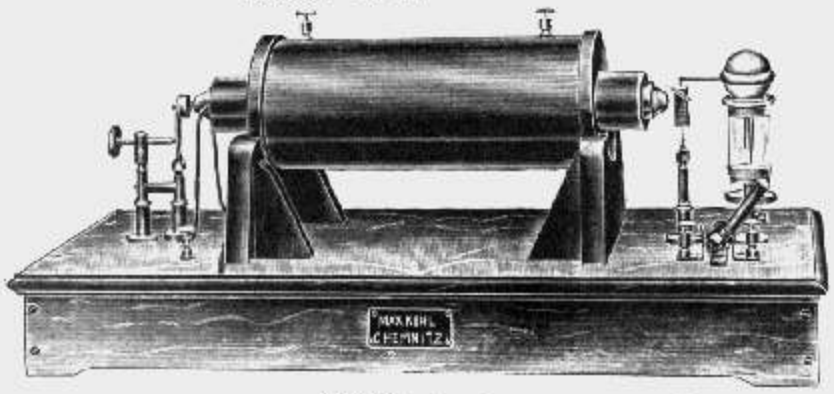
When ordering, kindly give particulars as to kind of current and voltage.

A test certificate and directions for using are appended to each Induction Coil.

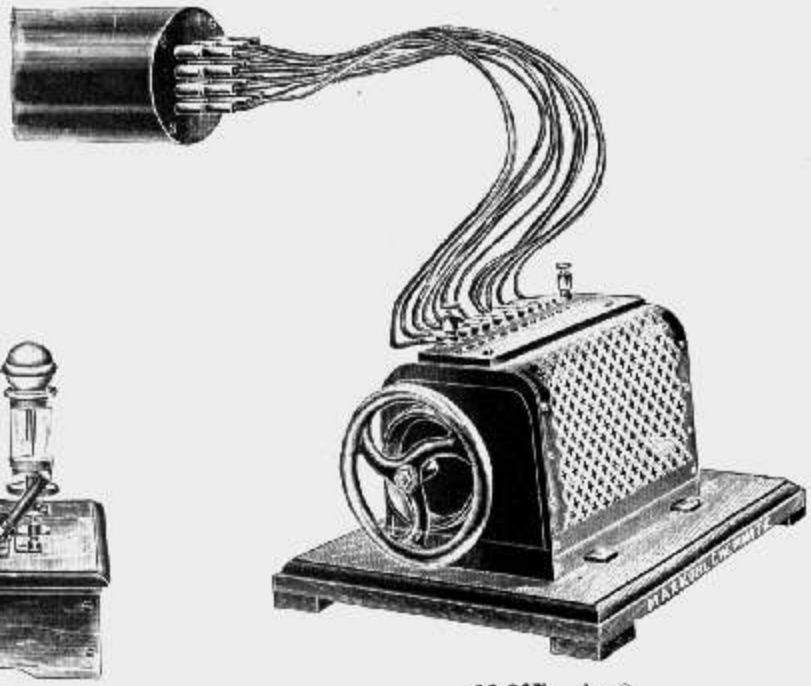
If desired, and at an extra cost of 5 per cent, we fit all our Induction Coils with suitable mica insulation for hot countries; this prevents deformation taking place in the insulating material.



62 613. 1 : 10.



62 636. 1 : 5.



62 607. 1 : 8.

Induction Coils without Interrupter, Type A, B, C, D and E, on Table Stand.

Spark-length with Wehnelt-Interrupter	Size	For Wehnelt Interrupter				For Wehnelt and Motor Interrupters				For Motor Interrupters		Spark-length with the Motor Interrupter
		Type A Without Condenser, Primary Coil with Pachytrope, cf. Fig. 62 533		Type B Without Condenser, Primary Coil with Plug Commutation, cf. Fig. 62 513		Type C With Condenser, Primary Coil with Pachytrope, cf. Fig. 62 533		Type D With Condenser, Primary Coil with Plug Commutation, cf. Fig. 62 513		Type E With Condenser, Primary Coil without Commutation, cf. Fig. 62 571		
mm		List No.	£ s. d.	List No.	£ s. d.	List No.	£ s. d.	List No.	£ s. d.	List No.	£ s. d.	mm
I. Standard Secondary Winding.												
—	2	—	—	—	—	—	—	—	—	62 559	8. 0.0	90
—	3	—	—	—	—	—	—	—	—	62 560	10. 0.0	120
—	4	—	—	—	—	—	—	—	—	62 561	12. 0.0	150
250	5	62 491	16.10.0	62 508	15.10.0	62 525	18.10.0	62 542	17.10.0	62 562	15. 0.0	200
300	6	62 492	20. 0.0	62 509	19. 0.0	62 526	22. 0.0	62 543	21. 0.0	62 563	18.10.0	250
350	7a	62 493	26. 0.0	62 510	25. 0.0	62 527	28.10.0	62 544	27.10.0	62 564	25. 0.0	300
350	7b	62 494	30. 0.0	62 511	26. 0.0	62 528	32.10.0	62 545	28.10.0	—	—	300
400	8	62 495	37. 0.0	62 512	33. 0.0	62 529	39.10.0	62 546	35.10.0	62 566	32.10.0	350
450	9	62 496	44. 0.0	62 513	40. 0.0	62 530	47. 0.0	62 547	43. 0.0	62 567	40. 0.0	400
500	10	62 497	54. 0.0	62 514	50. 0.0	62 531	57. 0.0	62 548	53. 0.0	62 568	50. 0.0	450
550	11	62 498	65. 0.0	62 515	60. 0.0	62 532	68.10.0	62 549	63.10.0	62 569	60. 0.0	500
600	11a	62 499	75. 0.0	62 516	70. 0.0	62 533	78.10.0	62 550	73.10.0	62 570	70. 0.0	550
650	12	62 500	85. 0.0	62 517	80. 0.0	62 534	88.10.0	62 551	83.10.0	62 571	80. 0.0	600
700	12a	62 501	95. 0.0	62 518	90. 0.0	62 535	99. 0.0	62 552	94. 0.0	62 572	90. 0.0	650
750	13	62 502	105. 0.0	62 519	100. 0.0	62 536	109. 0.0	62 553	104. 0.0	62 573	100. 0.0	700
800	13a	62 503	115. 0.0	62 520	110. 0.0	62 537	119. 0.0	62 554	114. 0.0	62 574	110. 0.0	750
850	14	62 504	125. 0.0	62 521	120. 0.0	62 538	129. 0.0	62 555	124. 0.0	62 575	120. 0.0	800
900	14a	62 505	135. 0.0	62 522	130. 0.0	62 539	140. 0.0	62 556	135. 0.0	62 576	130. 0.0	900
950	15	62 506	150. 0.0	62 523	145. 0.0	62 540	155. 0.0	62 557	150. 0.0	62 577	145. 0.0	950
1000	15a	62 507	165. 0.0	62 524	160. 0.0	62 541	170. 0.0	62 558	165. 0.0	62 578	160. 0.0	1000
II. Low Resistance Secondary Winding.												
350	RJI	62 579	34. 0.0	62 581	30. 0.0	62 583	36.10.0	62 585	32.10.0	62 587	29.10.0	350
400	RJII	62 580	41.10.0	62 582	37.10.0	62 584	44. 0.0	62 586	40. 0.0	62 588	37. 0.0	400

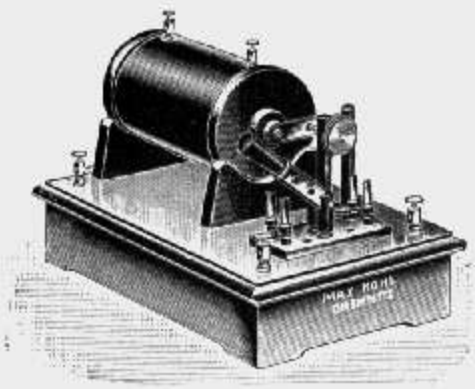
Sizes 5—7a for Wehnelt Interrupters have double, 7b—10, quadruple, and 11—15a, sextuple commutation of the Primary Coil.

		£ s. d.
62,589.	**Sparking Pillars** on Stand or firmly fitted on the wall bracket, for sizes 2—5	1. 0. 0
62,590.	— i d e m, for sizes 6—9	1. 16. 0
62,591.	— i d e m, „ „ 10—12	2. 10. 0
62,592.	— i d e m, „ „ 12a—15a	4. 0. 0

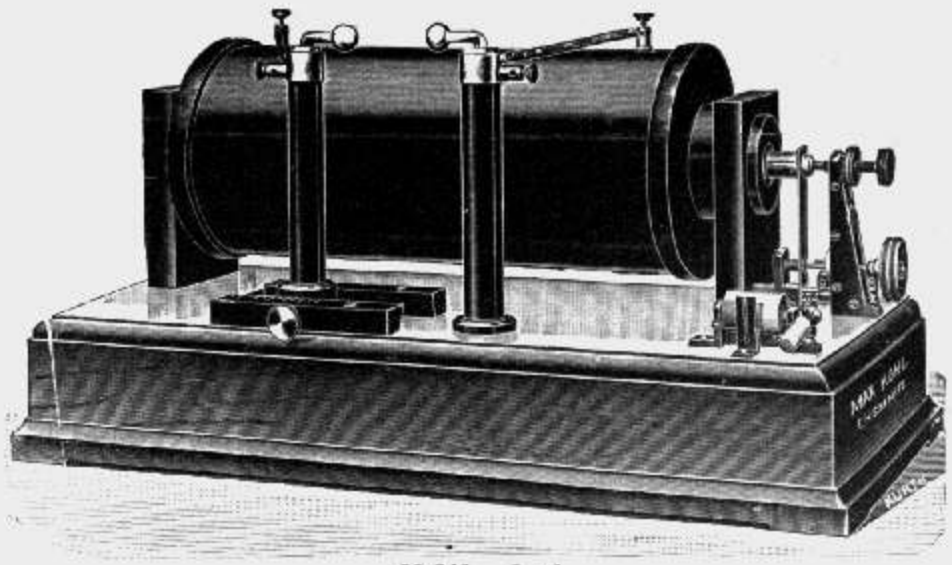
Cl. 6024, 2843, 2839.

Max Kohl A. G. Chemnitz. Germany.

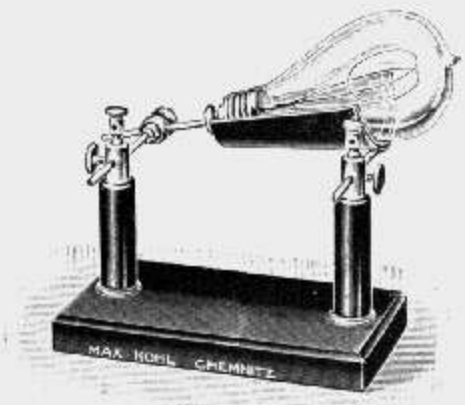
Max Kohl A. G. Chemnitz, Germany.



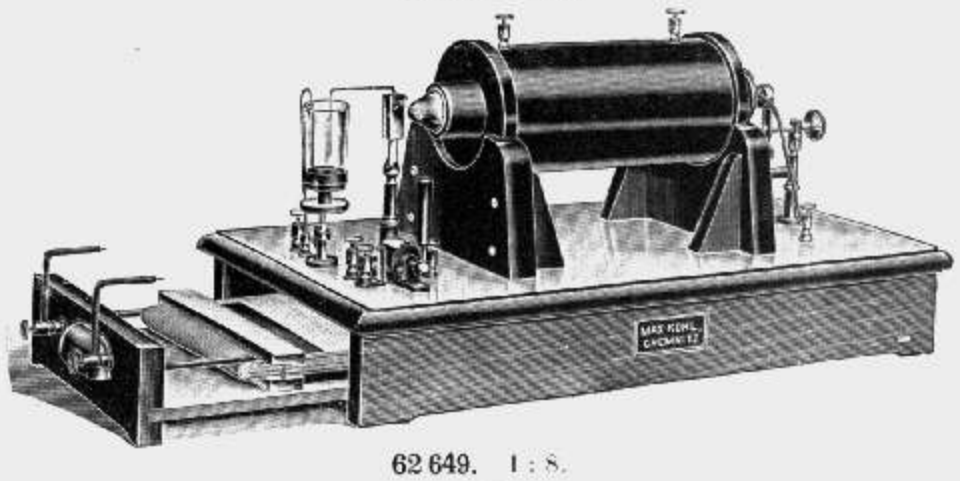
62 624. 1 : 8.



62 641. 1 : 6.



62 624 a. 1 : 6.



62 649. 1 : 8.

62,607. **Pachytrope** (Multiple Commutator) with quintuple connections, for sizes 11—15 a. Figure, with plugs and leads . . . . . £ 7. 0. 0

62,608. — idem, with fourfold connections, for sizes 8—10 . . . . . 6. 0. 0

The Pachytrope with quadruple connections is intended for subsequently fitting to Induction Coils sizes 8—10, and the Pachytrope with sextuple connections for Induction Coils sizes 11—15 a.

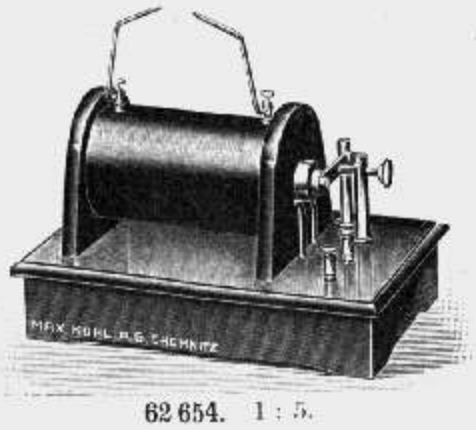
Induction Coils with Mercury and Platinum Interrupters, with normal winding, type F, G, H, I, K and L.

Spark-length with Platinum Interrupter	Spark-length with Mercury Interrupter	Size	Type F With Mercury Interrupter, cf. Fig. 62 613		Type G With Platinum Interrupter, cf. Fig. 62 624		Type H With Mercury and Platinum Interrupter, cf. Fig. 63 636		Type I With Platinum Interrupter of Special Construction cf. Fig. 62 641		Type K With Platinum Interrupter as before and with Mercury Interrupter		Type L With Platinum Interrupter and GlowLampHolder, cf. Fig. 62 624 and 62 624 a	
mm	mm		List No.	£ s.	List No.	£ s.	List No.	£ s.	List No.	£ s.	List No.	£ s.	List No.	£ s.
15	—	0000	—	—	62 619	3. 10	—	—	—	—	—	—	—	—
20	—	000	—	—	62 620	4. 0	—	—	—	—	—	—	—	—
30	40	00	62 609	5. 0	62 621	5. 0	62 631	6. 10	—	—	—	—	62 645	5. 10
40	50	0	62 610	6. 0	62 622	6. 0	62 632	7. 10	—	—	—	—	62 646	6. 10
50	60	1	62 611	7. 0	62 623	7. 0	62 633	8. 10	—	—	—	—	62 647	7. 10
60	90	2	62 612	8. 10	62 624	8. 10	62 634	10. 0	—	—	—	—	—	—
90	120	3	62 613	10. 10	62 625	10. 10	62 635	12. 0	—	—	—	—	—	—
120	150	4	62 614	12. 10	62 626	12. 10	62 636	14. 0	—	—	—	—	—	—
150	200	5	62 615	16. 0	62 627	16. 0	62 637	17. 10	—	—	—	—	—	—
200	250	6	62 616	20. 0	62 628	20. 0	62 638	21. 10	—	—	—	—	—	—
250	300	7	62 617	24. 0	62 629	24. 0	62 639	25. 10	62 641	27. 10	62 643	30. 0	—	—
300	350	8	62 618	31. 10	62 630	31. 10	62 640	33. 0	62 642	35. 0	62 644	37. 10	—	—

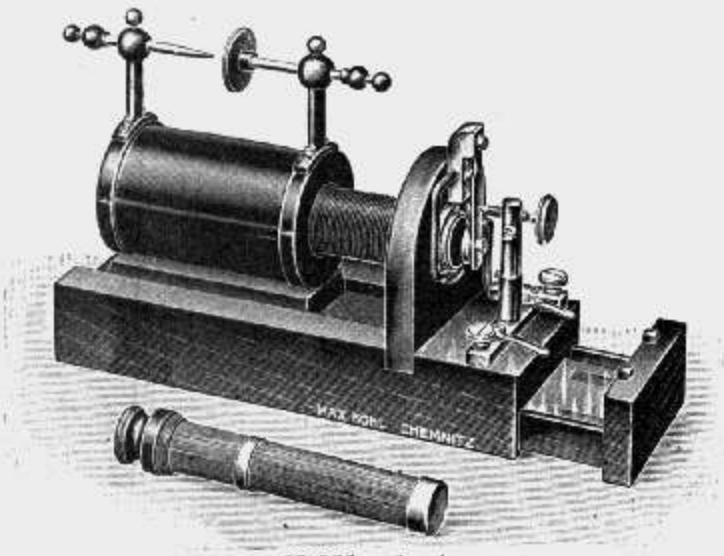
If Induction Coils Nos. 62,619—62,640 are fitted with a Deprez Interrupter instead of the Platinum Hammer Interrupters shown in Figs. 62,624 and 62,636, the price of each Induction Coil is increased by £ **1. 10. 0.**

62,648. **Extra Price** for fitting **Types F, G and I** with an Induction Commutator, to enable them to be used also with the Wehnelt Interrupter (advisable only for sizes 5—8) . . . . . £ 2. 0. 0

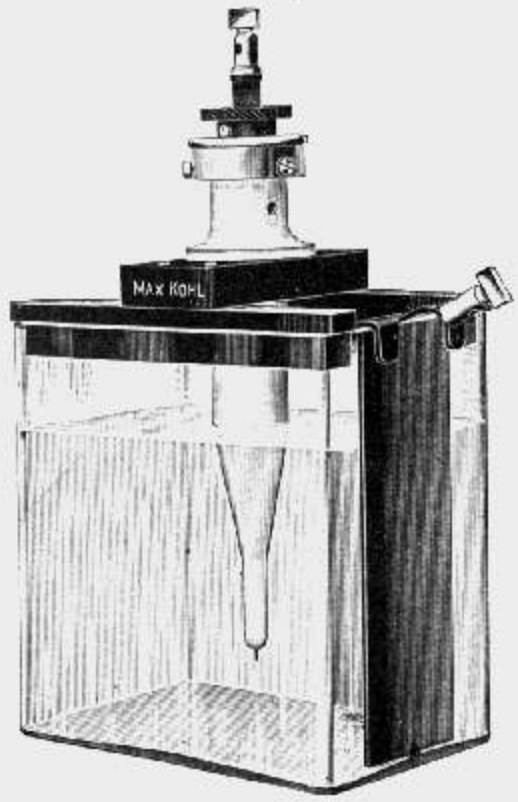
62,649. **Extra Price** for Constructing the Induction Coils with Condenser which can be withdrawn, Figure, so as to be able to demonstrate it 1. 10. 0



62 654. 1 : 5.



62 661. 1 : 4.



62 666. 1 : 5.

Small Induction Coils, simple pattern, Figure, **with Platinum Interrupter,** without Commutator, on polished mahogany box, coil of wood, not detachable

List No.	62,652	62,653	62,654	62,655	62,656
Spark-length mm	6	10	15	20	30
£	**0. 10. 0**	**0. 15. 0**	**1. 13. 0**	**2. 0. 0**	**2. 10. 0**

— idem, with simple Commutator.

List No.	62,657	62,658	62,659	62,660
Spark-length mm	12	15	20	30
£	**1. 0. 0**	**1. 18. 0**	**2. 5. 0**	**2. 15. 0**

62,661. **Induction Coil,** for demonstration purposes, can be taken to pieces, Figure, with adjustable secondary coil and Condenser which can be drawn out; spark-length 10 mm — 6. 0. 0

Carrying Cases for Induction Coils.

List No.	62,662	62,663	62,664	62,665
For Size	0000—0	1—5	6—8	9—11
£	**1. 5. 0**	**1. 10. 0**	**1. 15. 0**	**2. 10. 0**

Interrupters.

(a) Electrolytic Interrupters for Direct and Alternating Current.

The Electrolytic Interrupters are charged with dilute sulphuric acid of 1.06 to 1.12 sp. gr.

The prices of Wehnelt Interrupters are liable to alteration without notice on account of the fluctuations in the price of platinum.

62,666. **Wehnelt Interrupter for Direct Current** with 1 platinum pin 1 mm thick, with large glass vessel, Figure, with conical porcelain tube 3. 10. 0

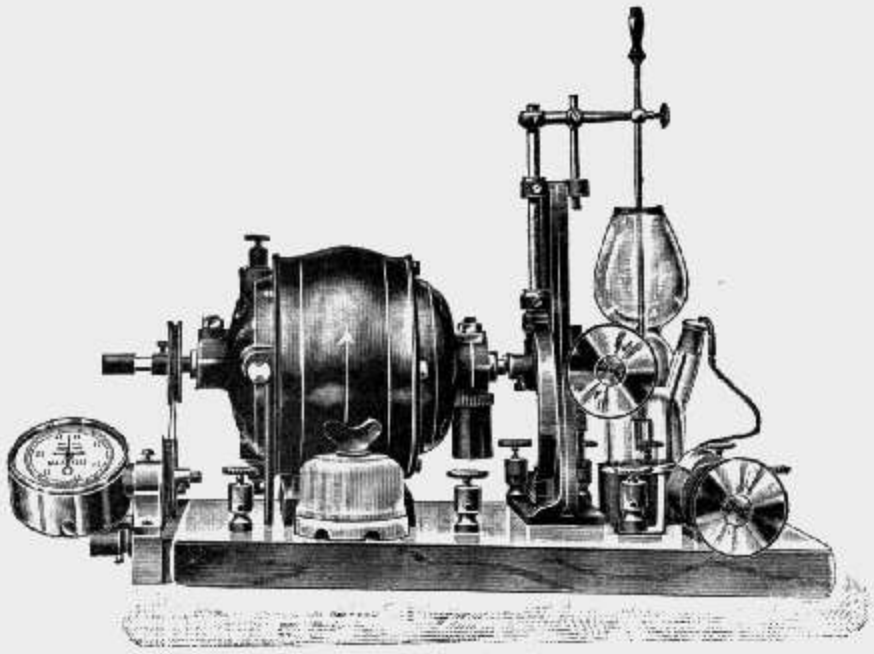
62,667. **Wehnelt Interrupter for Direct Current,** with 3 platinum pins 1 mm thick, with large glass vessel 6. 15. 0

62,668. **Wehnelt Interrupter** with 1 platinum pin 3 mm thick, for working with Alternating Current, cf. Figure 62,666 . . . . . 5. 10. 0

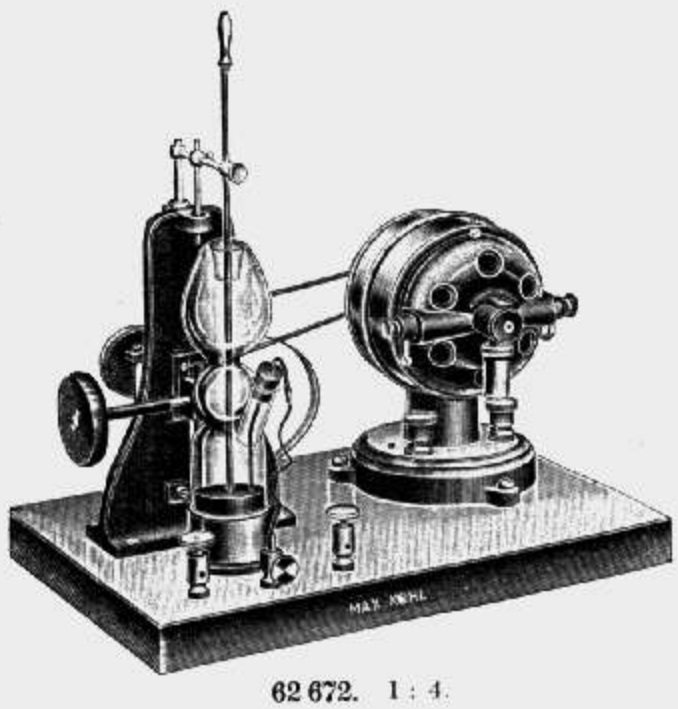
It is possible to work with Alternating Current but this cannot be recommended as the platinum pin is rapidly consumed and regulation difficult. The primary coil also must be specially "tuned".

Cl. 6014, 5345, 2850.

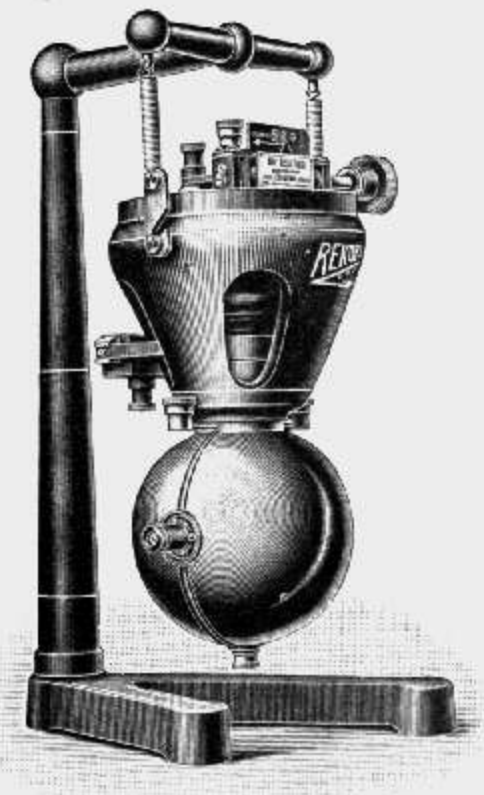
Max Kohl A. G. Chemnitz, Germany.



62670. 1 : 4.



62672. 1 : 4.



62673. 1 : 5.

(b) Motor Mercury Interrupters for Direct Current.

£ s. d.

We supply the following Motor Interrupters for pressures of 16, 24, 32, 65, 110, 150 and 220 Volts and would ask that the voltage desired be stated when ordering. If this is not given we supply the Interrupters for **110 volts.**

The price of all Interrupters is exclusive of the mercury necessary for charging.

62,669. **Motor Mercury Interrupter** (Kohl's pattern) with immersion contact, without tachometer — 7. 15. 0

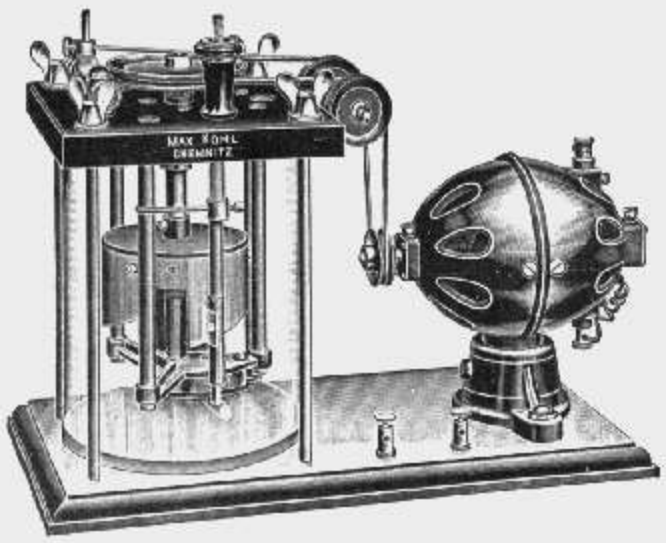
62,670. — idem, with tachometer, Figure 11. 15. 0

62,671. — idem, without switch or commutator 7. 0. 0

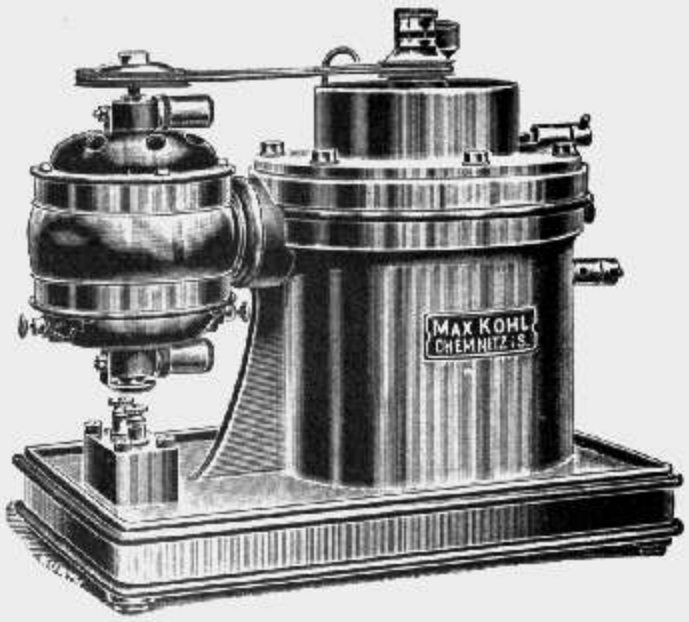
62,672. **Motor Mercury Interrupter** with Immersion Contact (Kohl's design), light pattern, Figure 5. 0. 0

62,673. **Centrifugal Mercury Interrupter,** Figure, including mercury charge, for Direct Current pressures of 32, 110, or 220 volts 9. 0. 0

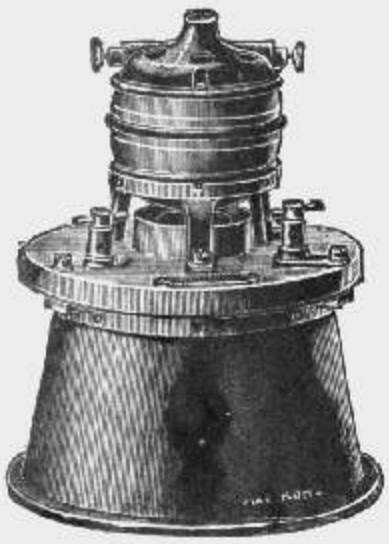
In this Interrupter the mercury is successively centrifugated during rotation, thus preventing emulsionising. In this manner a regular, certain contact is assured as well as great certainty in action, and constant cleaning and recharging, necessary with other mercury interrupters, is but seldom required. The number of interruptions can be regulated within wide limits.



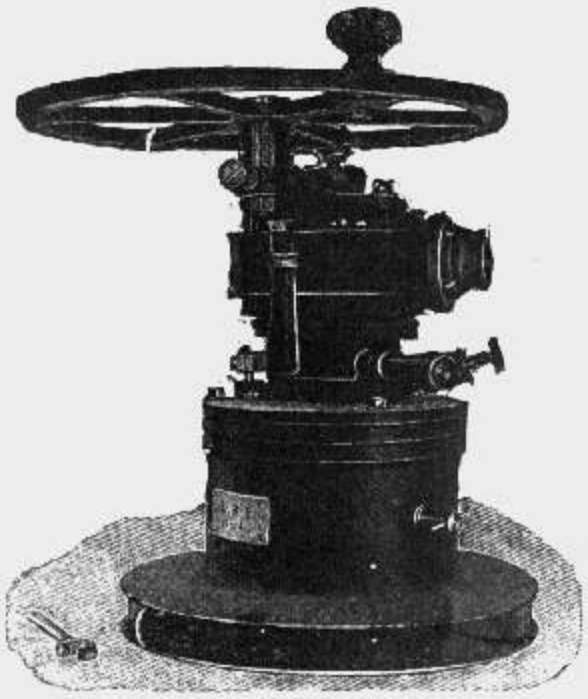
62 674. 1 : 6.



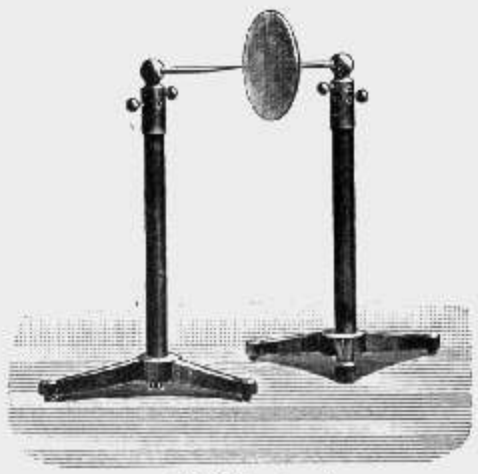
62 676. 1 : 4.



62 679. 1 : 5.



62 681. 1 : 5.



62 682. 1 : 6.

		£	s.	d.
62,674.	**Mercury Jet Interrupter,** without tachometer, Figure (cf. Gan.-Rein. Fig. 1030) Charge: 8000 g mercury and 1500 g petroleum.	9.	0.	0
62,675.	— idem, with tachometer	14.	0.	0
62,676.	**Turbine Interrupter,** without tachometer, Figure The Interrupter is filled with 2000 g (150 ccm) mercury and 1250 g (1400 ccm) alcohol of at least 85%.	10.	0.	0
62,677.	— idem, with tachometer	15.	0.	0
62,678.	**Contact Ring for the Turbine Interrupter** with different number of hollows	0.	15.	0
62,679.	**Turbine Interrupter,** simpler, Figure Charge 1250 g mercury and 1000 g (1120 ccm) alcohol.	6.	0.	0
62,680.	**Regulating Resistance** for the Motors of the Direct Current Interrupters	1.	0.	0

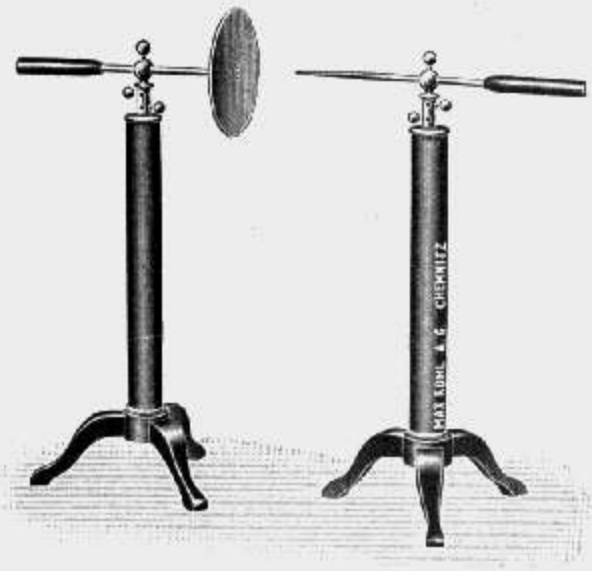
(c) Motor Mercury Interrupters for Alternating Current.

62,681.	**Turbine Interrupter for Alternating Current,** Figure, with synchronism indicator; also suitable for charging accumulators The exact frequency and voltage should be given when ordering.	16.	10.	0

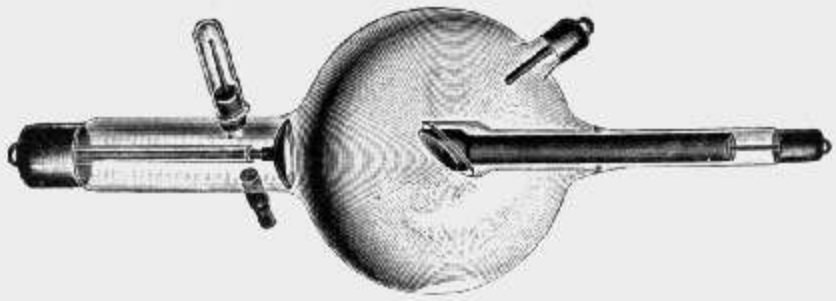
We have a special price list dealing with Switchboards and Resistances for working Induction Coils, especially those used for X-Ray purposes; we shall be pleased to send this on application.

Cl. 2857, 2858, 2859, 2863, 2873.

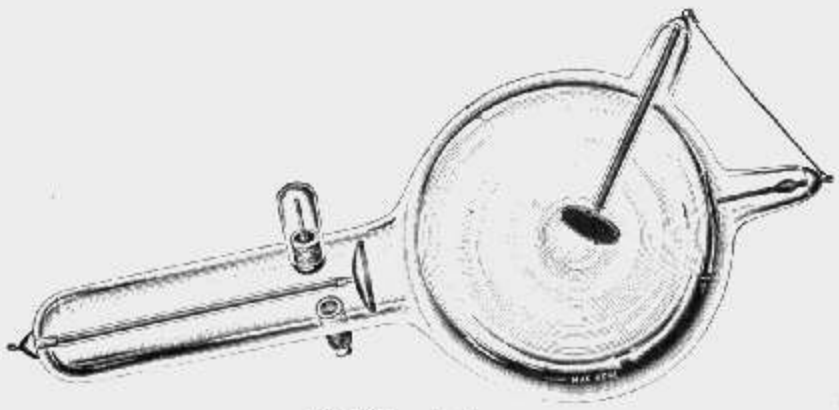
Max Kohl A. G. Chemnitz, Germany.



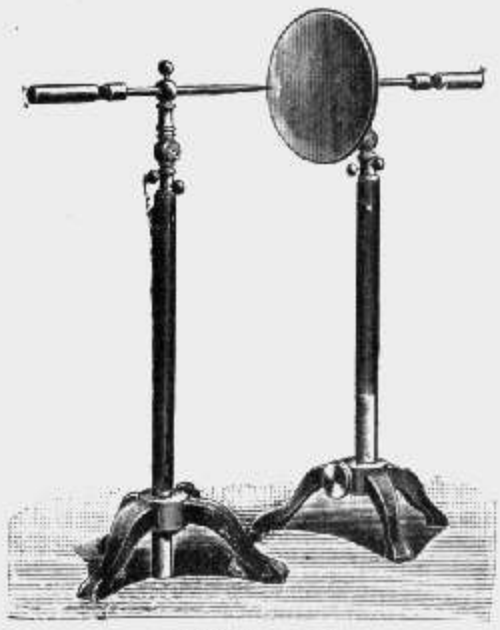
62 683. 1 : 8.



62 699. 1 : 5.



62 691. 1 : 4.



62 685. 1 : 5.

Sparking Pillars and X-Ray Tubes.

	£ s. d.
62,682. **Sparking Pillars** for spark-lengths to 200 mm, Figure	1. 0.0
62,683. — idem, for spark-lengths to 450 mm, Figure	1.16.0
62,684. — idem, for spark-lengths to 1000 mm	2.10.0
62,685. **Sparking Pillars,** Figure, with joints so as to be able to set the spark gap horizontally and vertically, for metallic spectra, for spark-lengths to 450 mm	2.14.0

X-Ray Tubes, for small load, for working in connection with Induction Coils having platinum, mercury and motor interrupters, also with influence machines, Figure, with osmose regeneration.

List No.	**62,687**	**62,688**	**62,689**	**62,690**	**62,691**	**62,692**	**62,693**	**62,694**	**62,695**
Spark-length to mm	100	120	200	300	400	500	600	700	800
£	**0. 14. 0**	**0. 17. 0**	**0. 18. 6**	**1. 0. 0**	**1. 2. 3**	**1. 4. 6**	**1. 6. 6**	**1. 8. 6**	**1.10.6**

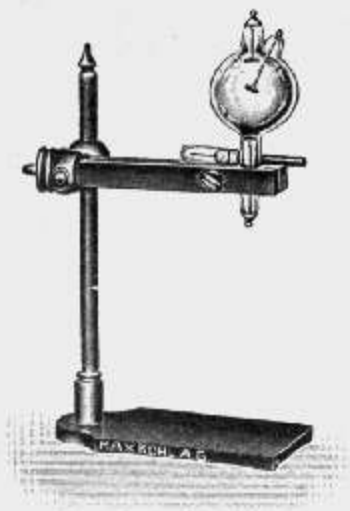
X-Ray Tubes, with massive anticathode, for heavy loads and for working with Wehnelt or Motor Interrupters, with regeneration by osmose, Figure

List No.	**62,697**	**62,698**	**62,699**	**62,700**	**62,701**	**62,702**	
Spark-length to	200	300	400	500	600	700	mm
£	**1. 10. 0**	**1. 14. 6**	**1. 19. 0**	**2. 3. 6**	**2. 8. 0**	**2. 13. 6**	

As the vacuum of the X-Ray Tubes intensifies by use they must be fitted with a so-called regenerating device if the life has to be prolonged to any extent.

The tubes have osmose regeneration; this is based on the property possessed by palladium to be permeable to hydrogen when in the incandescent state. The device consists of a small palladium tube fused in. When the vacuum in the tube has become too high, i. e. when the tube has become hard, the end of the small palladium tube is made red-hot for a few seconds by means of a spirit lamp, without the flame being allowed to come into contact with the fused part of the glass. Hydrogen is diffused into the tube from the core of the flame through the incandescent palladium tube and the vacuum is lowered, i. e. the tube is rendered softer. The tube should be allowed to cool thoroughly before being used again.

X-Ray Tubes for Medical Purposes supplied in all patterns — see special list.



51 110. 1 : 8.



62 705. 1 : 6.



62 721. 1 : 8.

	£ s. d.
51,110. **Simple Wood Stand for holding X-Ray Tubes,** Figure. Price without Tube illustrated	0. 5. 0
62,704. **Milliammeter** for High Tension Currents; base-diameter approximately 120 mm; for measuring the current flowing into the **X**-Ray Tube; Weston type instrument with range to 5 milliamperes, on serpentine base	3. 16. 0
62,705. — idem, with two ranges (to 5 and 50 milliamperes), Figure	4. 3. 0

Fluorescent Screens coated with Barium platinocyanide, excellent in action, in wood frame. The Barium platinocyanide Screens are covered with a slab of stout lead-baryta glass which protects the observer from the action of the Röntgen Rays but allows the image to appear without any change.

List No.	62,706	62,707	62,708	62,709	62,710	62,711
Size cm	9×12	13×18	18×24	24×30	30×40	40×50
£	0. 17. 0	1. 10. 0	2. 7. 0	3. 13. 0	6. 0. 0	9. 13. 0

If provided with handles and protecting sheets, the price of each screen is increased by £ 0. 8. 0.
The prices of all Fluorescent Screens are liable to change without notice owing to the fluctuations in the price of platinum.

Fluorescent Screens coated with Barium platinocyanide, very efficient, in wood frame, without protective lead glass.

List No.	62,712	62,713	62,714	62,715	62,716	62,717
Size cm	9×12	13×18	18×24	24×30	30×40	40×50
£	0. 14. 0	1. 6. 0	2. 2. 0	3. 6. 0	5. 11. 0	9. 0. 0

Cryptoscopes, Figure, with **Fluorescent Screen** which can be withdrawn.

List No.	62,718	62,719	62,720	62,721	62,722	62,723
Size of Fluorescent Screen cm . . .	9×12	13×18	18×24	24×30	30×40	40×50
(a) **Without Lead Shielding Glass** . £	1. 4. 0	1. 17. 0	2. 15. 0	4. 1. 0	6. 16. 0	10. 5. 0
(b) **With Lead Shielding Glass** . . . £	1. 7. 0	2. 1. 0	3. 0. 0	4. 8. 0	7. 5. 0	10. 18. 0

— idem, **without Fluorescent Screen**

List No.	62,724	62,725	62,726	62,727	62,728	62,729
For Fluorescent Screen cm	9×12	13×18	18×24	24×30	30×40	40×50
£	0. 10. 0	0. 11. 0	0. 13. 0	0. 16. 0	1. 5. 0	1. 10. 0

By using the Cryptoscopes radioscopy can be carried on without darkening the room.

62,730. **Cardboard with Strips of different Metals, for checking the penetrative power of X-Rays**	0. 10. 0
62,731. **Apparatus for Demonstrating that the Air is Ionised by X-Rays.** Price without X-Ray tube or electrometer, but with bellows	2. 0. 0

The apparatus consists of a wood box (lined with sheet lead) which encloses one of the X-Ray tubes Nos. 62,687—62,691 or 62,697—62,699. The X-Rays issue out of an aperture placed opposite the anti-cathode and discharge an electroscope opposite. If the electrometer is set up somewhat laterally it can also be discharged if the ionised air is deflected on to it by the bellows.

A suitable electrometer to use is Braun's, No. 60,211—60,215, p. 803, or Kolbe's No. 60,196, p. 802. It is advisable, however, to place a plate of large surface on the electrometer.

62,732. **Plate** for placing on the Electrometer (Braun's or Kolbe's)	0. 2. 0

See complete special list for further Accessories for Röntgen Ray Investigations. This is sent on receipt of a card.

Max Kohl A. G. Chemnitz, Germany.

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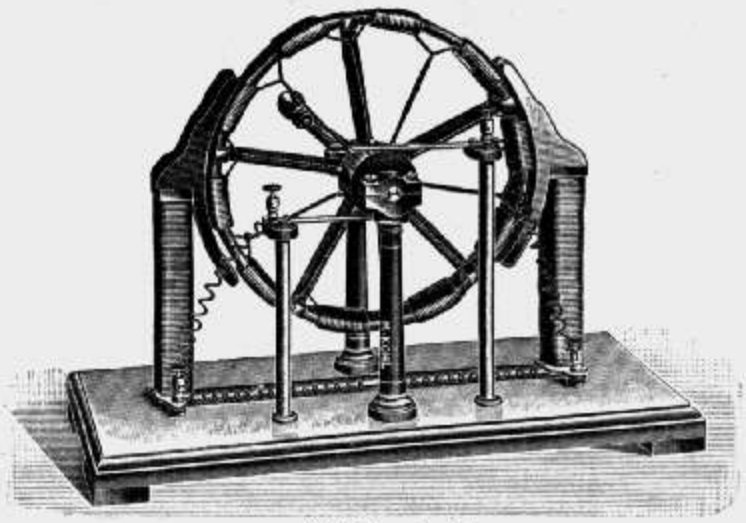
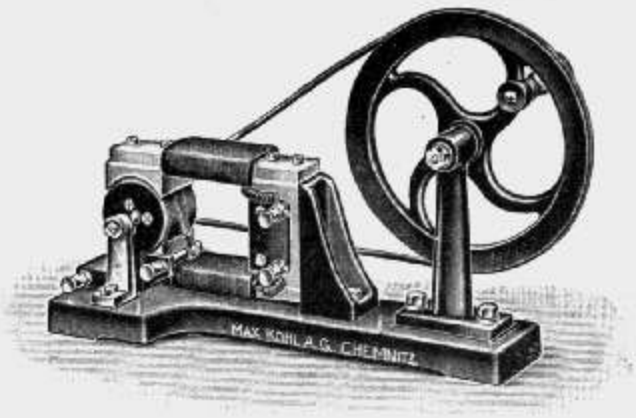
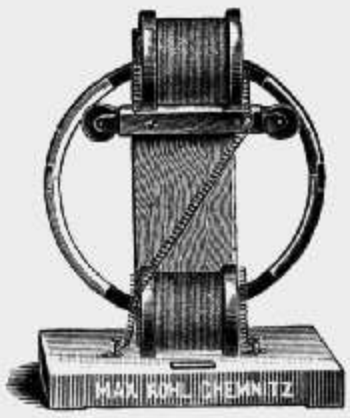


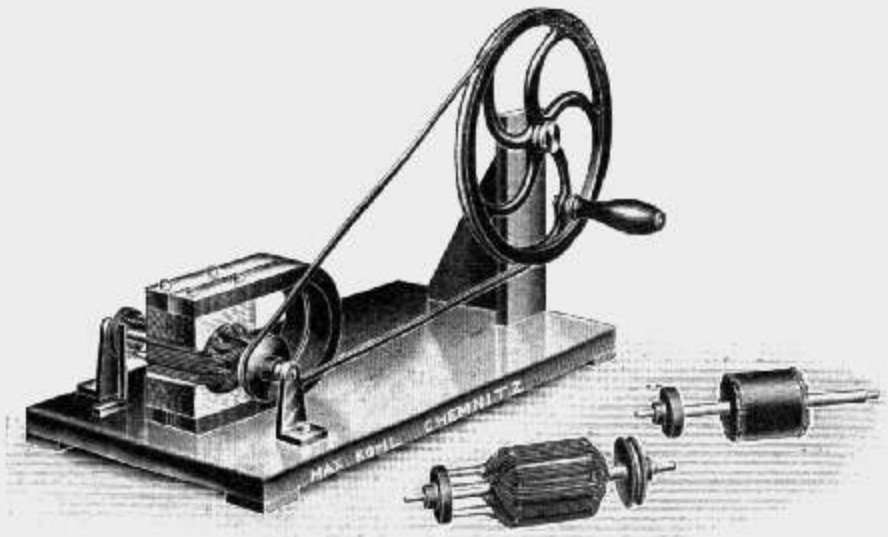
62 734. 1 : 7.



62 735. 1 : 6.



62 733. 1 : 8.



62 737. 1 : 12.

Dynamos.

Explanatory Models.

62,733. **Apparatus for Explaining the Magnetic Induction of Magneto Electric Machines and for explaining the Pacinotti and Gramme Rings,** Figure. Stand with two fixed wire coils and two rotary semi-circular magnets (M. P. 9th Edn. III, Fig. 649) . . . . . £ 2. 8. 0

62,734. **Model of a Pacinotti-Gramme Machine,** after Pfaundler, Figure . . . . . £ 5. 0. 0

The Model can be worked, can be used as a series or shunt motor, and, used as a dynamo, gives a current which can be shown by a vertical galvanometer. If the magnets are excited by a separate source of electricity the current generated is strong enough to work a bell.

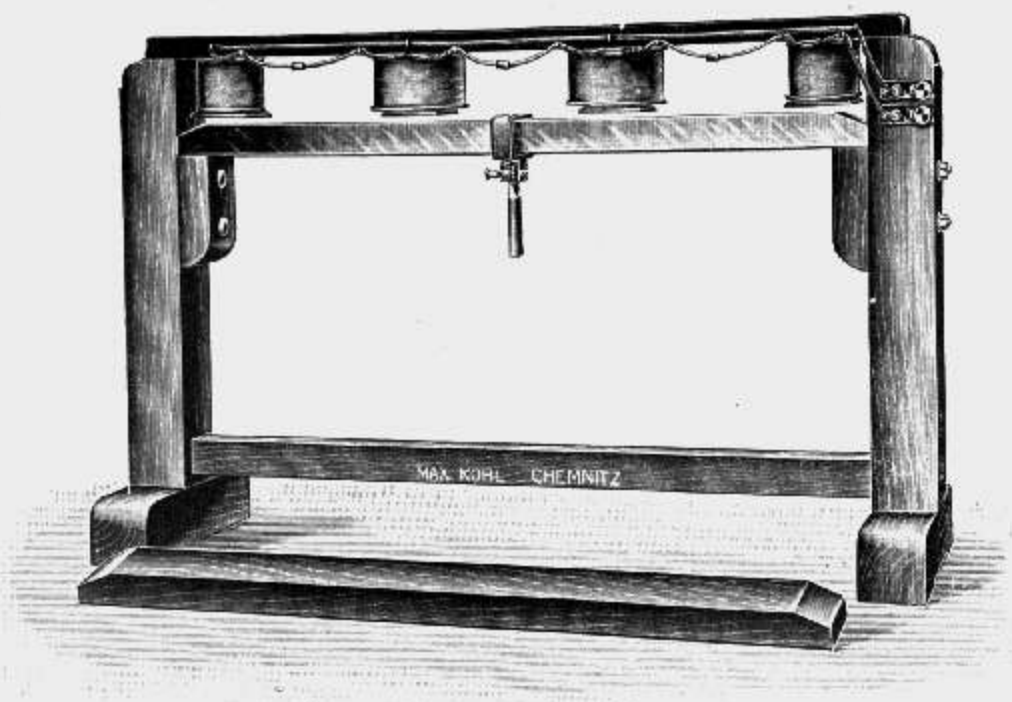
62,735. **Model of a Pacinotti-Gramme Machine,** Figure (W. D. Fig. 565 [538]), with ring armature arranged very comprehensively. The machine can be used to generate a current, also to rotate under the influence of a current . . . . . £ 2. 15. 0

52,067. **Model of a Pacinotti-Gramme Machine,** after Pfaundler, Figure, on p. 288 (M. P. 9th Edn. III, Figs. 659 and 660), for the Whirling Table, with device for demonstrating the lines of force . . . . . £ 6. 10. 0

The following pertain to the apparatus: an iron armature, wound; an iron armature, unwound; a wood armature with winding and a frame stretched with paper for demonstrating the lines of force.

62,737. **Model of a Magneto Electric Machine,** Figure, after Friedr. C. G. Müller (M. T. Figs. 227—230), with one each wound Siemens H Armature, ring armature, drum armature and an unwound drum armature . . . . . £ 4. 4. 0

Cl. 2699, 5416, 2697, 4511.



62738. 1 : 10.

	£ s. d.
62,738. **Magnet Stand and Movable Armature Coil,** Figure, for explaining the dynamo-electric induction in dynamos, after Götze, with a wood rail, and an iron rail to serve as track or core of the movable coil	9. 0. 0
62,066. **Apparatus for explaining the Magneto-electric and Dynamo-electric Principle, for the Whirling Table,** Figures A and B on p. 288 . . . . . The apparatus consists of: 1 Pacinotti Ring, 1 Magnet, 1 Electromagnet, 1 Brush Conductor.	3. 0. 0
62,739. — idem, without magnet, as effective model of a dynamo, for placing on the Whirling Table	2. 5. 0
62,741. **Model of a Direct Current Dynamo; can also be used as a Direct Current Motor,** Figure, for explaining the machine and the most usual methods of connection and adaptations; with a ring armature and a drum armature which can be easily interchanged	9. 0. 0
The Machine can be used either as a series or shunt **dynamo**; when connected in shunt it can also be worked with separate excitation. In addition it works as a series or shunt motor and it is possible to demonstrate with it the action of the shunt regulator. Given in are one ring armature and one drum armature, which can be easily interchanged. All windings are composed of as few turns as possible so as to increase the comprehensiveness; the individual armature coils are wound alternately with two different coloured wires to facilitate the explanation of the machine. The current obtained when driven by hand can be shown by a galvanometer and a small glow lamp. Used as a **motor** the machine actuates the fly-wheel together with the handle. If the machine is worked more rapidly by means of a driving frame its output is correspondingly larger.	
62,742. **Sliding Resistance,** for use as Shunt Regulator	1. 0. 0
Apparatus after Grimsehl for explaining the Dynamo (Ztschr. f. d. phys. u. chem. U. **6**, 1893, p. 240), comprising:	
62,743. **Electromagnet** with horizontal cores and iron frame (Fig. 1)	7. 0. 0
62,744. **Current Conductor** for above, showing the presence of the electric current when the lines of force intersect, for rectilinear motion (Fig. 2)	0. 10. 0
62,745. — idem, for rotary motion (Fig. 3)	0. 8. 0
62,746. — idem, rectangular form, without commutator (Fig. 4)	0. 11. 0
62,747. — idem, rectangular form, with commutator (Fig. 6)	0. 15. 0
62,748. — idem, with a number of wire turns (Fig. 7)	0. 19. 0
62,749. **Siemens H-Armature** (Fig. 8)	0. 19. 0

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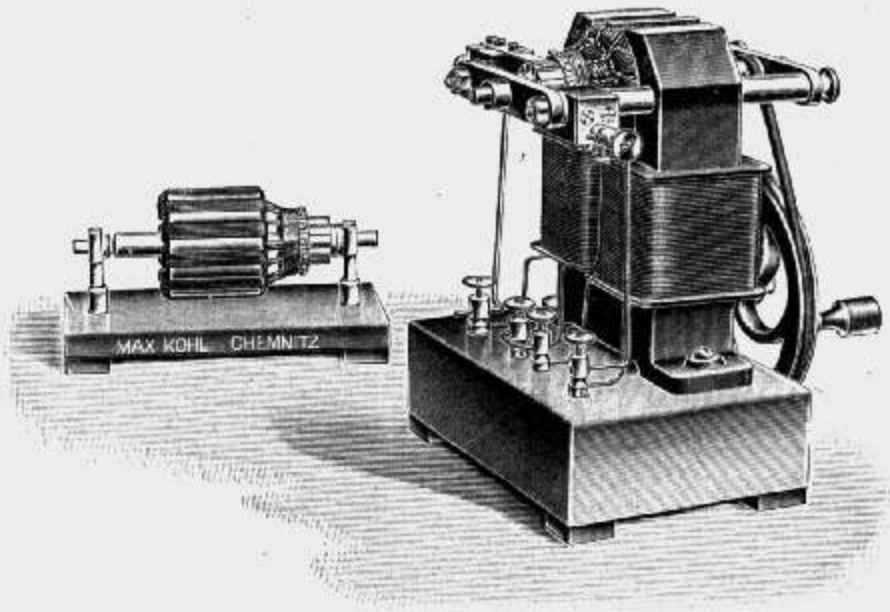
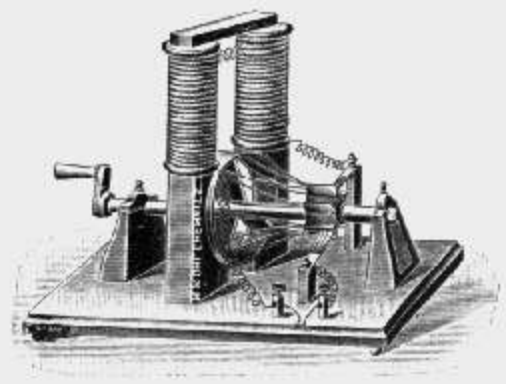
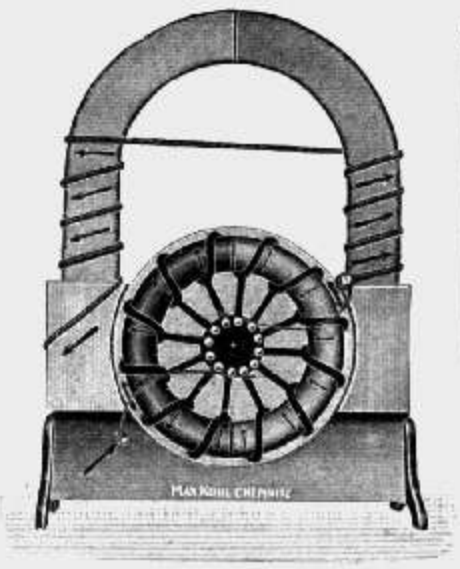


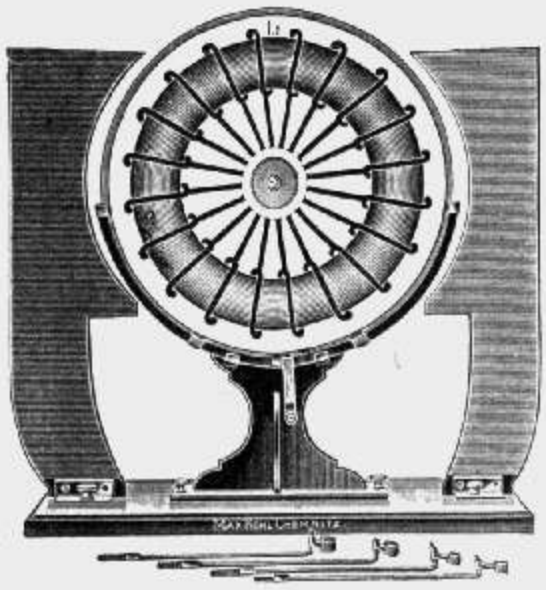
62 741. 1 : 5.



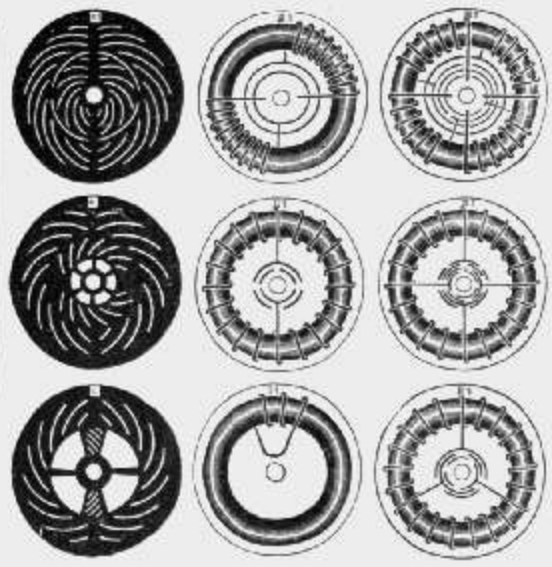
62 753. 1 : 4.



62 754. 1 : 12.



62 755 A. 1 : 10.



62 755 B. 1 : 20.

62,750. **Iron Ring** with a group of wire turns and commutator for explaining the Gramme Ring . . . . . £ 1.12.0

62,751. **Gramme Ring** with 12 groups of turns and commutator in 12 parts 2. 2.0

62,752. **3 Drawings** for explaining Nos. 62,750 and 62,751, on cardboard 0. 3.0

62,753. **Model of a Dynamo** with Gramme Ring, Figure, constructed of wood and metal; cannot be worked; for explaining construction only 1.10.0

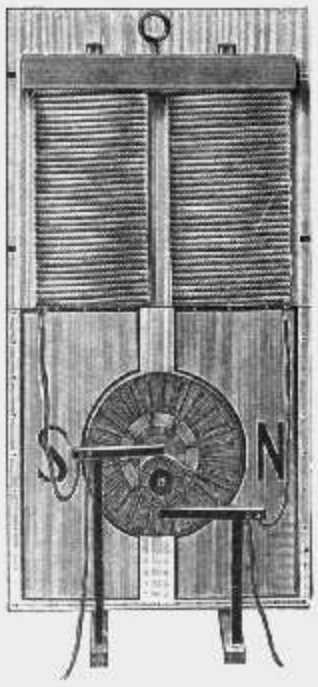
62,754. **Apparatus for explaining the Direct Current Machine having Ring Armature**, after Pfaundler, Figure, very large model of wood and pasteboard; cannot be worked 2. 0.0

62,755. **Apparatus for Demonstrating the Passage of the Current in the Gramme Ring** when **Direct, Alternating or Three-phase Current** is taken off; after Hammerl. Figures A and B (Ztschr. f. d. phys. u. chem. U. **9**, p. 33), with 10 discs; cannot be worked . 4. 0.0

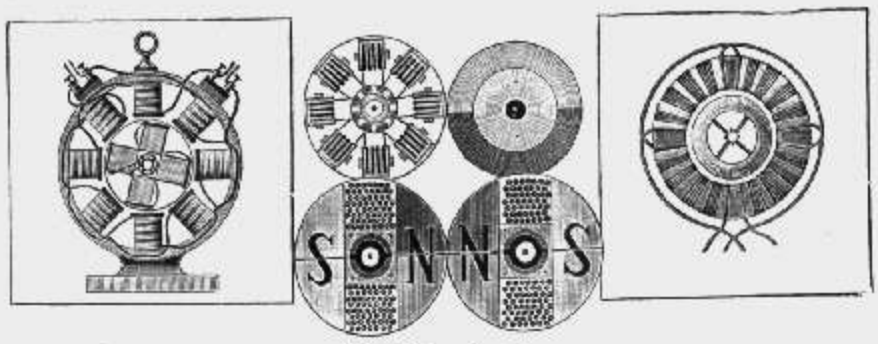
The apparatus consists of a firmly fixed round glass disc having an axis in the centre for a movable glass disc of the same size. Pasteboard discs with a drawing of the Gramme Ring can be placed on the latter disc corresponding to the various cases. The windings and commutator segments are cut out and transparent coloured silk paper is pasted on behind, so that by using a black pasteboard disc cut out in lines, and covering the fixed glass disc, luminous points occur (by illuminating by means of a powerful source of light set up behind the apparatus) which are displaced when the movable disc is rotated and in this manner render visible the course of the currents.

Fig. A shows the apparatus set up with a pasteboard disc, while the remaining 9 pasteboard discs are illustrated in Fig. B.

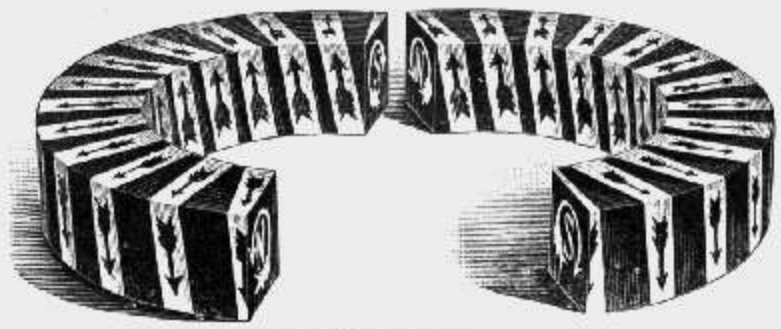
Cl. 3817, 2704, 2795, 2706, 2707



62 756 A. 1 : 11.



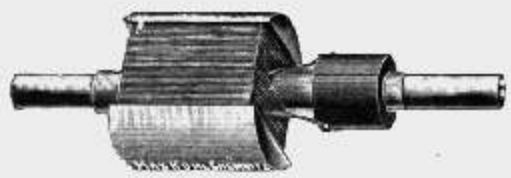
62 756 B. 1 : 11.



62 757. 1 : 10.



62 758. 1 : 8.



62 759. 1 : 4.

62,756. **4 Mechanically Movable Plates for illustrating Dynamos and Motors,** after C. Freyer, Figures A and B . . . . . £ s. d. 1. 10. 0

The following demonstrations can be carried out with these plates: (1) Magneto-electric Machine with double T armature (Alternating Current); (2) idem (Direct Current); (3) Dynamo with double T armature; (4) Dynamo with Gramme Ring; (5) Electric Motor (Direct Current) with double T armature; (6) Electric Motor with Gramme Ring; (7) Alternating Current Machine; (8) Alternating Current Motor (three-phase motor).

To Plate I (double plate), which is suitable for demonstrations Nos. 1—6, the following accessories are supplied: 1 folding disc for dynamo, 1 ditto for motor, 2 discs for Gramme Ring, 1 coloured disc for the magnetic field, 1 commutator in two parts, and 1 ditto in 8 parts, 2 brushes, 4 connecting leads. Plate II is used for Demonstration No. 7, Plate III for Demonstration No. 8

62,757. **Model of a Gramme Ring,** Figure (W. D. p. 883 [818]), of pasteboard, 50 cm diameter, divided, the path of current and the poles are given 0. 16. 0

In the illustration one half of the ring is turned round; the poles of similar name go together.

62,758. **Model of a Schuckert Flat Ring,** with winding, Figure, with ring, commutator, and axis of wood 1. 0. 0

62,759. **Model of a Siemens Armature,** with winding, of wood, Figure 1. 0. 0

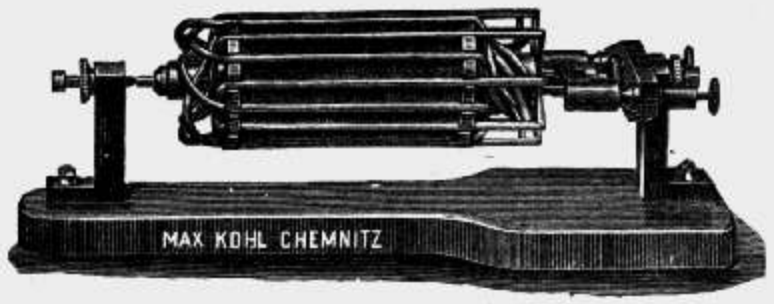
62,760. **Model of a Gramme Ring Armature,** same construction 1. 0. 0

Cl. 2708, 2708 a, 2709, 2711, 3818.

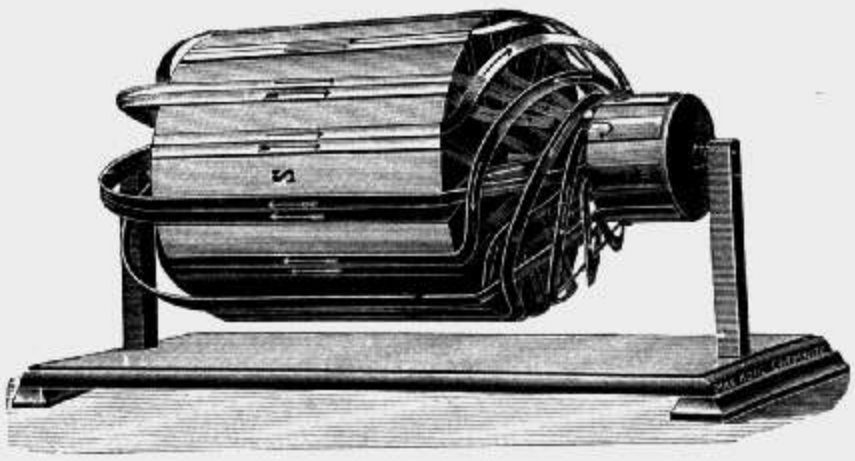
Max Kohl A. G. Chemnitz, Germany.



62 761. 1 : 4.



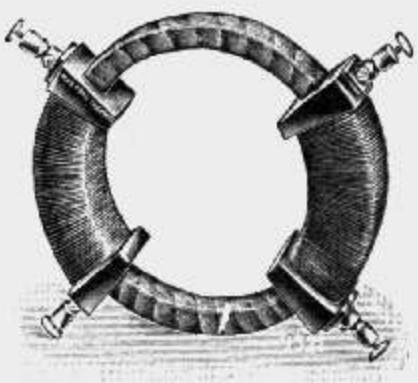
62 762. 1 : 3.



62 762 a. 1 : 9.



62 763. 1 : 8.



62 766 a. 1 : 4.

£ s. d.

62,761. **Model of a Drum Armature,** same construction as preceding, Figure 1. 0. 0

62,762. **Model of a Drum Armature,** after Weinhold, Figure (W. D. Fig. 572 [545]), very comprehensive, for demonstrating the mode of winding and current action, rotating, and generating current, with magnet 3. 10. 0

62,762 a. **Model of a Drum Armature,** after Weinhold, of pasteboard, Figure (W. D. p. 889 [827]) 1. 5. 0

62,763. **Iron Ring** for making a Ring Armature Winding, Figure, after Friedr. C. G. Müller (M. T. Fig. 226) 0. 1. 8

62,764. — idem, with winding 0. 4. 0

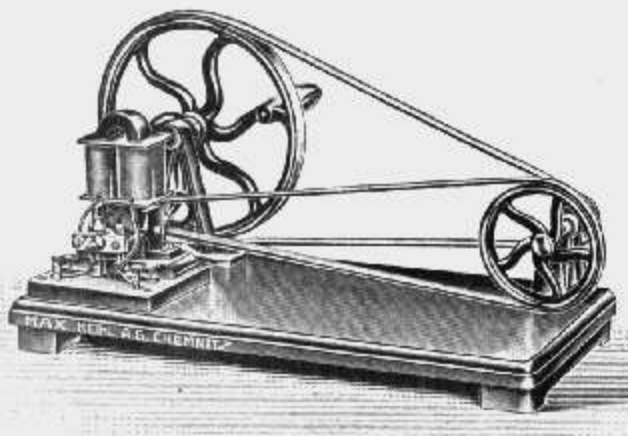
62,765. **Winding Formers,** after Friedr. C. G. Müller, for making a drum armature winding (M. T. Fig. 229), of cardboard. Price per 10 . . . . . 0. 3. 0

62,766. — idem, for ring armature winding (M. T. Fig. 225). Price per 10 . . . . . 0. 3. 0

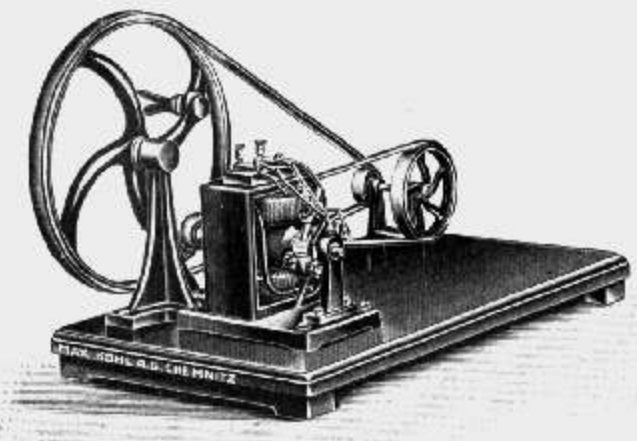
62,766 a. **Closed Iron Ring** with 2 sliding coils, after Friedr. C. G. Müller (M. T. Fig. 216), for induction experiments and as transformer model 1. 4. 0

Max Kohl A. G. Chemnitz. Germany.

Dynamos
for Generating Direct, Alternating and Three-phase Current; also Accessories.



62 767. 1 : 8.



62 777. 1 : 12.

62,767. **Direct Current Dynamo,** Figure, with crossed armature and commutator in four sections, driving frame on polished wood board, with compound gearing, for turning by hand . . . . . £ 3. 15. 0

62,768. **Machine alone,** can also be used as Motor 2. 10. 0

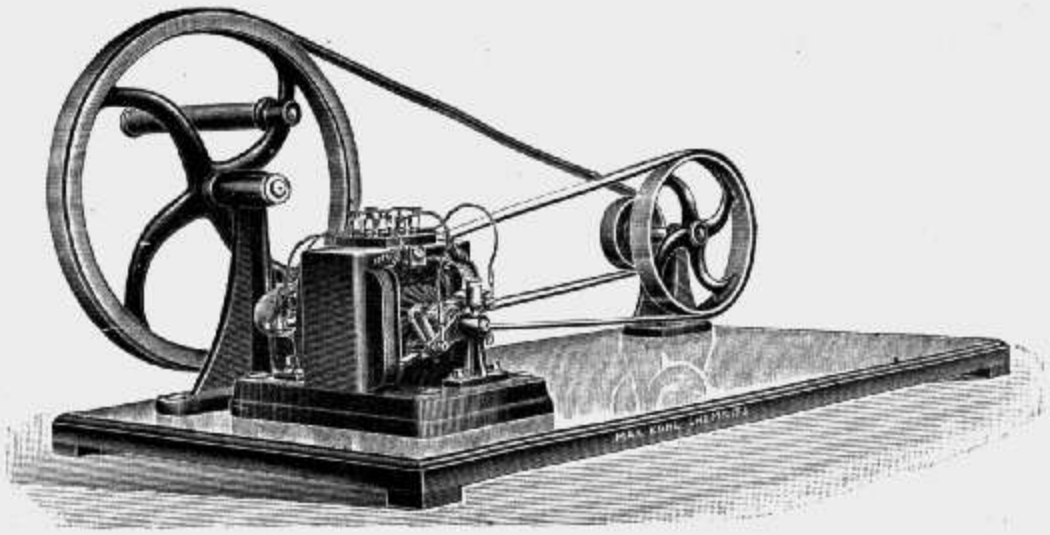
The Machine is constructed as a shunt dynamo; it gives 15 volts und 2 amps., feeds 2—3 small glow lamps or self-regulating arc lamp No. 62,815. It is possible to fuse a steel wire 0,15 mm thick and 8 cm long.

Shunt Dynamos for Direct Current, cf. Fig. 62,774; also constructed as Universal Dynamos, with 4 slip rings, for Direct, Alternating and Three-phase Current, with Drum Armature (cf. Gan.-Man. Fig. 806).

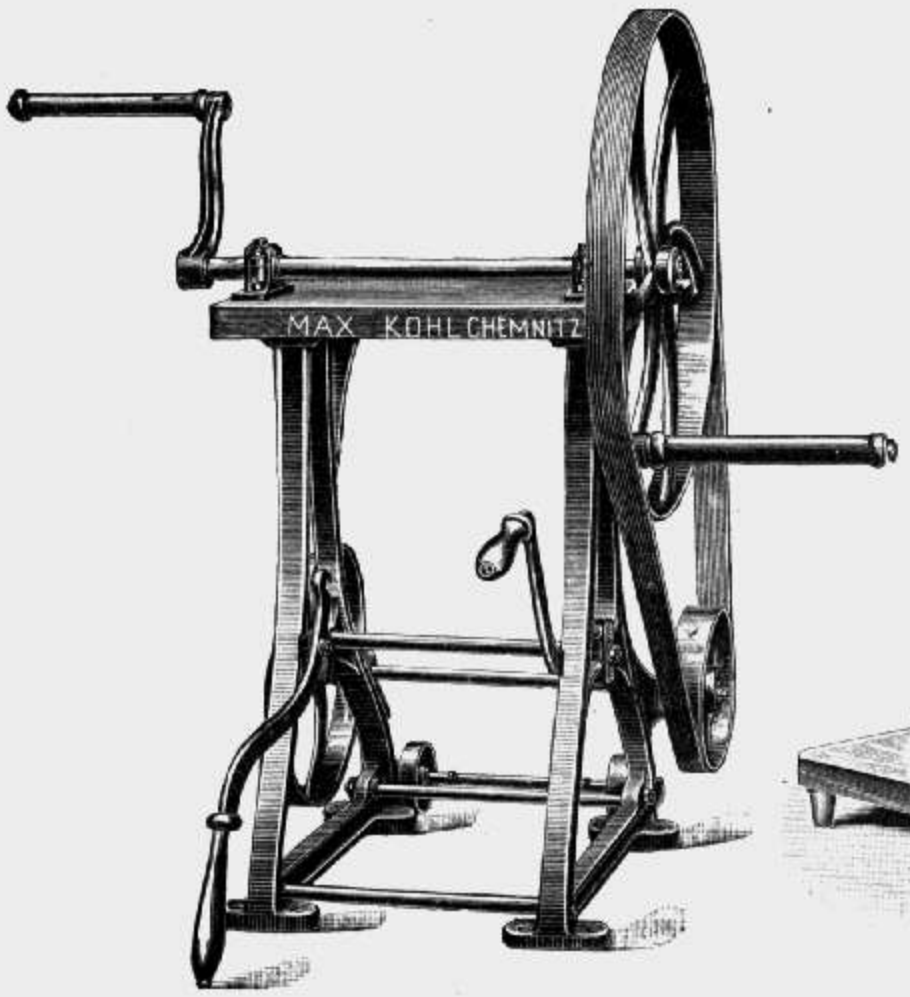
Approx. D. C. output		Approx. r. p. m.	Single-phase A. C. voltage	Three-phase pressure approx. volts	Approx. power required	Melts a Steel Wire		Feeds Glow Lamps		Feeds Arc Lamp No.	Without Driving Stand, cf. Fig. 62774			With Driving Stand, cf. Figs. 62777 and 62782		
Volts	Amps.		approx. volts		HP	Length mm	Diam. mm	No.	Hefner C. P.		List No.	£	s. d.	List No.	£	s. d.
(a) For Direct Current only.																
20	3	3000	—	—	0,25	120	0,15	4	3	62 815	**62 770**	**4.**	**10. 0**	**62 777**	**6.**	**0. 0**
35	4	2800	—	—	0,33	250	0,2	5	8	62 816	**62 771**	**8.**	**0. 0**	**62 778**	**10.**	**0. 0**
50	4	2200	—	—	0,5	300	0,2	5	12	62 816	**62 772**	**10.**	**0. 0**	**62 779**	**12.**	**10. 0**
65	5	2200	—	—	0,8	400	0,3	7	16	62 816	**62 773**	**12.**	**10. 0**	**62 780***	**22.**	**10. 0**
(b) For Direct Current, Monophase A. C., Three-phase Current and Dissymmetrical Two-phase A. C.																
20	3	3000	14	12	0,25	120	0,15	4	3	62 815	**62 774**	**5.**	**15. 0**	**62 781**	**7.**	**5. 0**
35	4	2800	24	20	0,33	250	0,2	5	8	62 816	**62 775**	**9.**	**5. 0**	**62 782**	**11.**	**5. 0**
50	4	2200	34	30	0,5	300	0,2	5	12	62 816	**62 776**	**11.**	**10. 0**	**62 783**	**14.**	**0. 0**
65	5	2200	44	38	0,8	400	0,3	7	16	62 816	**62 776 a**	**14.**	**0. 0**	**62 783 a***	**24.**	**0. 0**

The Machines are of the two-fold type, provided with Drum Armature and are also suitable for continuous

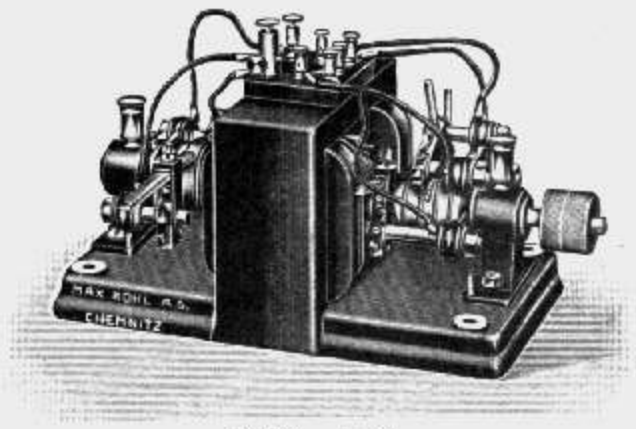
* The Driving Stand for Nos. 62,780 and 62,783 a is constructed in accordance with Fig. 62,783 b.



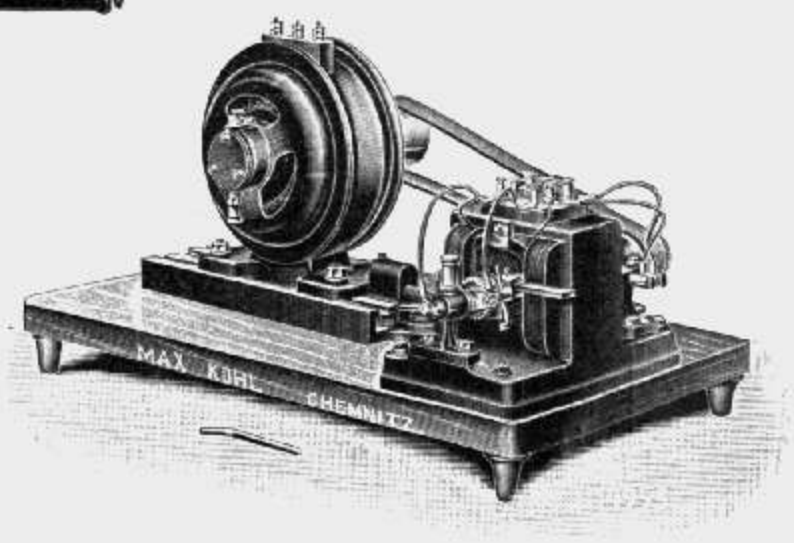
62 782. 1 : 8.



62 783 b. 1 : 12.



62 774. 1 : 6.



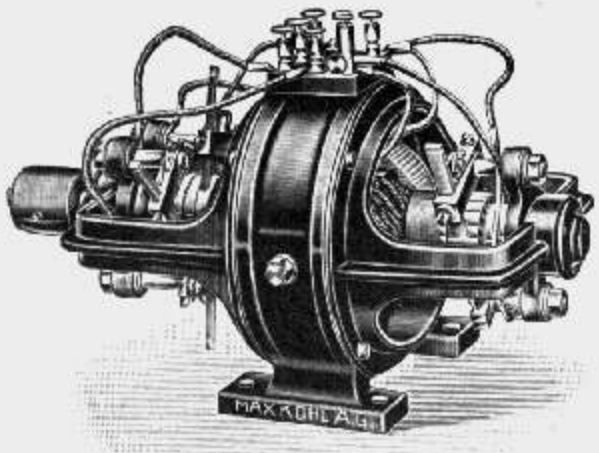
62 774 a. 1 : 12.

working. They can also be used as D. C. Motors. Nos. 62 744 — 62 776 a and 62,781 to 62,783 a each have four slip rings to which the corresponding points of the armature winding are connected and can also be used for converting Direct Current into Alternating or Three-phase Current by allowing them to run as electric motors and taking off Alternating or Three-phase Current at the corresponding terminals. With Machines Nos. 62,770/3 it is possible to drive, at the corresponding voltages, the D. C. Motors Nos. 62,768 and 62,834 (which should in this case be ordered for the proper D. C. voltage); and with Nos. 62,774/6 a the 2-phase A. C. Motors Nos. 62,909/14 and the 3-phase Motors Nos. 62,906, 62,907 and 62,912 (cf. the precise details in the list of Motors referred to). With the A. C. transformer No. 62,967 or 62,968 and the 3-phase transformer No. 62,974 or 62,975 respectively the voltage can be increased and this transformation shown by glow lamps. For this purpose use is made of the lamp stands Nos. 62,797, 62,802 and 62,803 respectively. With each Machine are supplied four metal blocks and four screws by the aid of which the dynamos are screwed on to the lecture table. The blocks are let into the wood by a joiner.

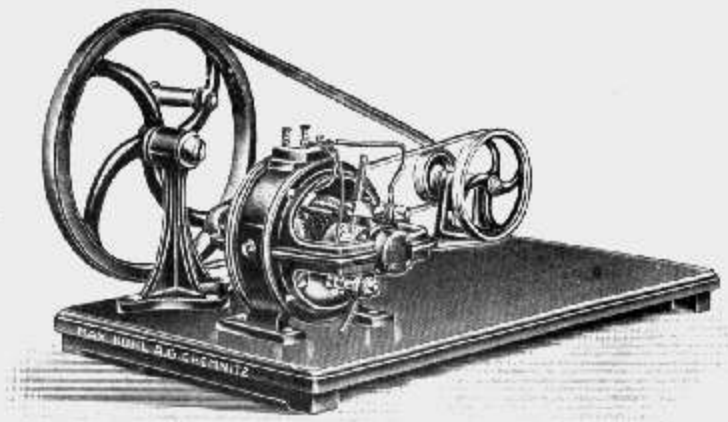
A pamphlet describing experiments is supplied with the Machine.

It is well to mention here that hand drive with the driving stand is a somewhat tiring operation being only adapted for short experiments. The driving stand for Nos. 62,780 and 62,783 a is driven by two persons (cf. Fig. 62,783 b).

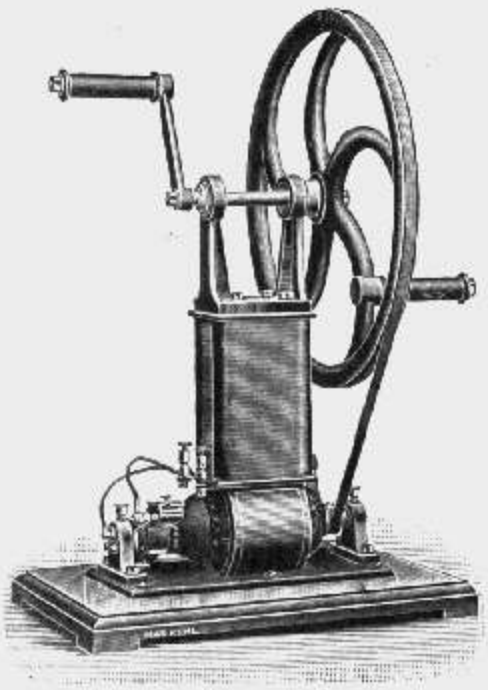
Larger Dynamos for Power: see Vol. I of this Price List, p. 147.



62787. 1 : 4.



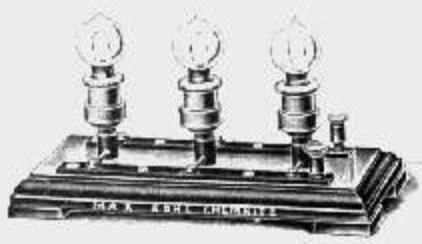
62790. 1 : 12.



62796. 1 : 12.



62797. 1 : 5.



62799. 1 : 5.

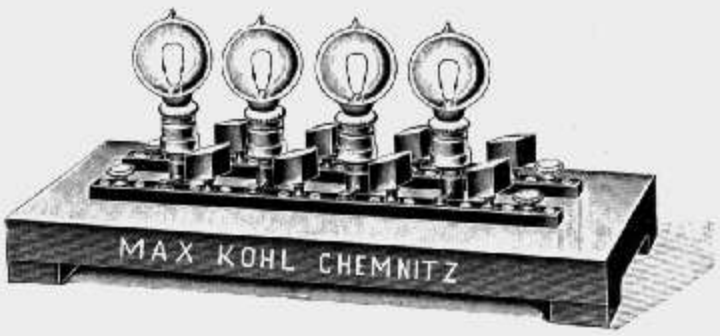
Direct Current Shunt Dynamos; also constructed as Universal Dynamos, with four slip rings, for Direct, Alternating and Three-phase Current, round pattern, with ball bearings, cf. Fig. 62,787.

Approx. D. C. effeciency		Approx. revs per min.	A. C. pressure approx.	3-phase Pressure approx.	Power required	Melts a steel wire		Feeds Glow Lamps		Feeds Arc Lamp	Without Driving Stand, cf. Fig. 62787		With Driving Stand, cf. Fig. 62790	
Volts	Amps.		Volts	Volts	HP.	Length mm	Diam. mm	No.	C. P.	No.	List No.	£. s. d.	List No.	£. s. d.
a) For Direct Current only.														
10	10	2500	—	—	0.3	150	0.4	4	8	62815	**62784**	**7.10.0**	**62790**	**9.10.0**
15	10	2200	—	—	0.4	250	0.4	6	8	62815	**62785**	**9. 0.0**	**62791**	**11.10.0**
20	11	2200	—	—	0.5	400	0.4	7	10	62816	**62786**	**10.10.0**	**62792**	**13. 0.0**
b) For Direct, Mono-phase Alternating, 3-Phase and unsymmetrical 2-phase Alternating Current.														
10	10	2500	7	6	0.3	150	0.4	4	8	62815	**62787**	**9.10.0**	**62793**	**11.10.0**
15	10	2200	10	9	0.4	250	0.4	6	8	62815	**62788**	**11. 0.0**	**62794**	**13.10.0**
20	11	2200	14	12	0.5	400	0.4	7	10	62816	**62789**	**12.10.0**	**62795**	**15. 0.0**

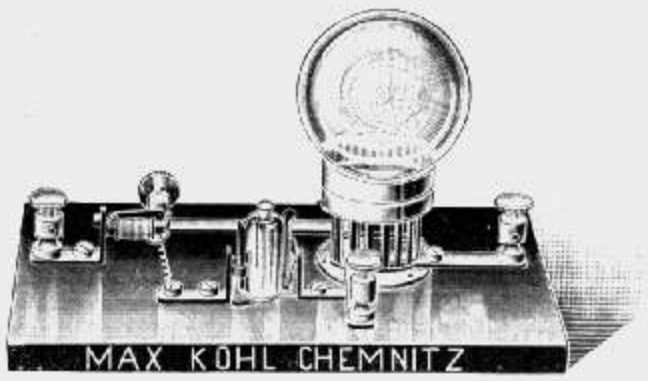
The remarks under Nos. 62,770—62,783a apply here also in a general sense.

62,796. **Dynamo for Direct Current,** with Drum Armature, Figure, with chain drive, for rotation by one or two persons; output 20 volts, 4 amps.; crankshaft running in ball bearings . . . . . £ s. d. 15. 0. 0

Driving Motors for Dynamos with Board (cf. Fig. 62,774 a, p. 993), quoted for on application; kindly send precise data as to current conditions.



62 802. 1 : 5.



62 807. 1 : 4.



62 806. 1 : 6.

Max Kohl A. G. Chemnitz, Germany.

Electric Lighting and Power Transmission.

Glow Lamps and Arc Lamps.

62,797. **Glow Lamp Stand with small Edison Socket and Glow Lamp,** from 2—65 volts, Figure, on serpentine stone base with ebonite pillar . . . . . £ 0. 6. 0

Unless otherwise stated we supply a 20-volt lamp.

62,798. **Glow Lamp** with small Edison Screw, 2—65 volts 0. 1. 0

Glow Lamp Stands, Figure:

List No.	62,799	62,800	62,801	
With	3	4	6	Glow Lamps
£	0. 16. 0	1. 0. 0	1. 8. 0	

We supply the Lamps in voltages suiting those of the machines just listed (10, 15, 20, 35, 50 and 65 volts): kindly quote pressure when ordering. Unless this is stated we supply 20-volt lamps.

Glow Lamp Stands with Plugging Device to enable the Lamps to be put in parallel and series, Figure:

List No.	62,802	62,803
With	4	6 Glow Lamps
£	1. 12. 0	2. 4. 0

As regards the Lamps, vide remarks under No. 62799.

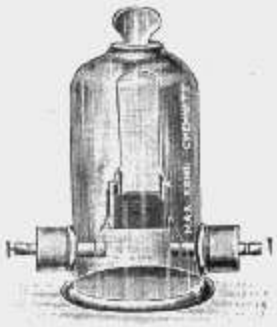
62,804. **Osram Metal-filament Glow-Lamps** with small Edison screw, for pressures from 2—8 volts 0. 1. 6

62,805. — idem, for 10—20 volts 0. 2. 0

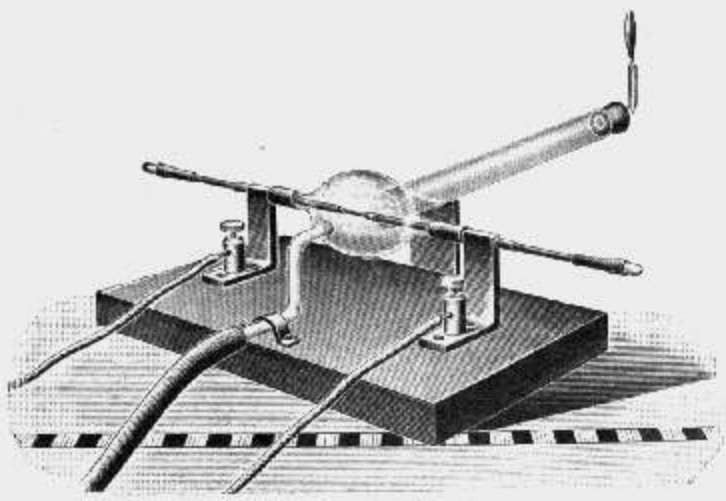
62,806. **Electric Glow Lamp** in the various stages of manufacture, Figure, in case . . 1. 10. 0

62,807. **Demonstration Nernst Lamp** after Grimsehl (Ztschr. f. d. phys. u. chem. U. **16,** 1903, p. 263), Figure, for connecting to 110—220 volts Direct Current 1. 10. 0

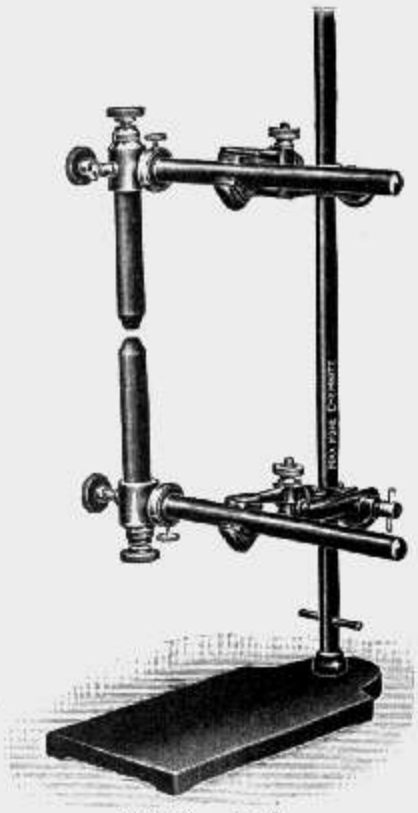
The individual parts of a Nernst Lamp are arranged on one serpentine (ophite) slab in such manner as to enable the action of the same and the path of the current to be followed quite well. The voltage desired should be quoted when ordering; otherwise a 110 volt lamp is supplied.



62808. 1 : 8.



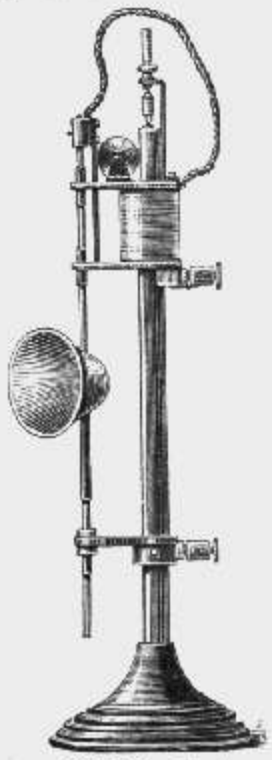
62809. 1 : 5.



62822. 1 : 9.



62810. 1 : 4.



62816. 1 : 4.



62820, 62821. 1 : 5.

	£. s. d.
62,808. **Glow Lamp Filament in Receiver,** after Hartl, Figure, for showing that the carbon filament does not burn up *in vacuo* but that it does in air (Ztschr. f. d. phys. u. chem. U. **10**, 1897, p. 235)	1. 6. 0
62,809. **Carbon Filament Lamp** after Grimsehl, Figure (Abhandlungen z. Didaktik u. Philosophie d. Naturwissenschaft, Nr. 1, Fig. 3; published by J. Springer, Berlin, 1904) .	0. 18. 0
62,810. **Glow Lamp Model** after Grimsehl, Figure (Ibid., Fig. 4)	0. 8. 0

Steel Wire for Glowing Experiments:

List No.	**62,811**	**62,812**	**62,813**	**62,814**
Diameter mm	0.15	0.2	0.3	0.4
1 Small Coil £	**0. 0. 7**	**0. 0. 7**	**0. 0. 7**	**0. 0. 7**

62,815. **Small Arc Lamp,** cf. Fig. 62,816, self-regulating, with reflector; can be worked by Dynamo No. 62,767	2. 0. 0
62,816. **Arc Lamp,** larger, Figure, with reflector, suitable for Machines Nos. 62,771 to 62,783a, also 62,786 and 62,789	2. 10. 0
62,817. **Carbon Rods** for above . . . . . Per metre	0. 0. 6
62,818. **Contac Lamp** after Reynier, with fine carbon rod for sliding on carbon roller . .	1. 10. 0
62,819. **Carbon Rods** for above . . . . . Per metre	0. 0. 6
62,820. **Jablochkoff's Candle** (Gan.-Man., Fig. 836), Figure	0. 1. 0
62,821. **Holder with Terminals** for above, Figure	0. 8. 0
62,822. **Carbon Terminals** after Brüsch, Figure, without the Bunsen Stand figured, but inclusive of 2 carbon rods for 10—20 amps., cf. Fig. No. 62,131	1. 12. 0
Carbon Rods for above for 10—20 amps. . . . . per pair	0. 0. 5

Cf. 4147, 5925, 5291, 5926, 2766, 6016.

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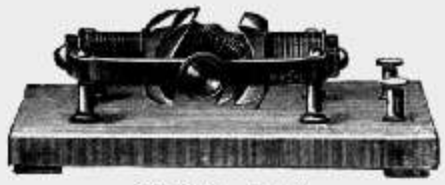
62 830. 1 : 5.



62 823. 1 : 3.



62 838 B. 1 : 5.



62 840. 1 : 4.



62 838. 1 : 5.



62 838 A. 1 : 5.



62 854. 1 : 6.

Electric Motors.

Cf. also Nos. 62,317—62,322 and 62,768.

£ s. d.

62,823. **Small D. C. Electric Motor,** Figure, with double T-armature 0. 12. 0

62,830. **Direct Current Motor,** Figure, $^1/_{12}$th H. P., for 12 volts, series wound and with ring armature; speed 1200 r. p. m. (approx.) at full load 4. 0. 0
This motor is very well adapted for demonstrations owing to its compact construction.

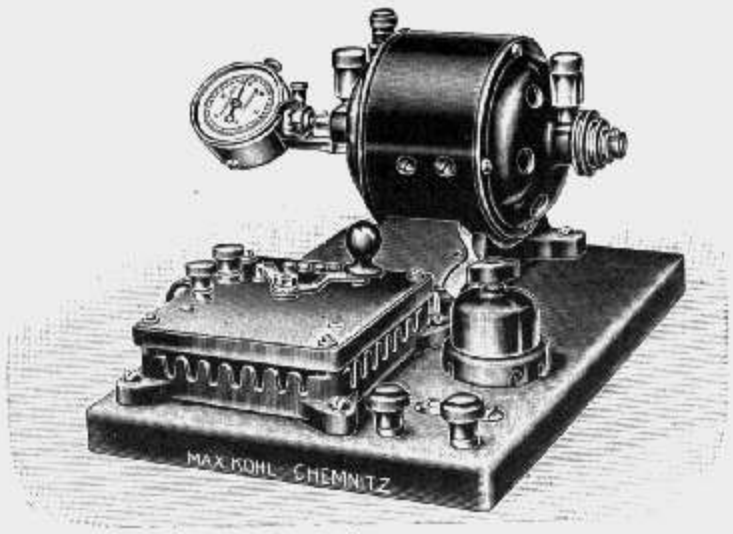
62,831. — idem, for 110 volts 4. 10. 0

62,832. — idem, for 220 volts 5. 0. 0

Direct Current Motors, Figures, with Drum Armatures.

Output: Approx. H. P.	R. P. M. (approx.)	Series Wound for 110 Volts		Series Wound for 220 Volts		Shunt Wound for 110 Volts		Shunt Wound for 220 Volts		Starting and Regulating Resistance		Extra Price constructed with vertical Axis- see Fig 62838 B	Extra Price constructed with tall Base, with Starter built in cf. Fig. 62838 A
		List No.	£. s. d.	List No.	£. s. d.	List No.	£. s. d.	List No	£. s. d.	List No.	£. s. d.		
$^1/_{80}$	1400	62 833	1. 10. 0	62 839	1. 15. 0	—	—	—	—	—	—	—	—
$^1/_{40}$	1500	62 834	2. 0. 0	62 840	2. 5. 0	—	—	—	—	62 869	18. 0	—	—
$^1/_{30}$	2500	—	—	—	—	62 843	2. 0. 0	—	—	62 870	12. 0	—	—
$^1/_{16}$	2000	62 835	2. 5. 0	62 841	2. 10. 0	62 844	2. 10. 0	—	—	62 871	1. 0. 0	12. 0	5. 0
$^1/_{16}$	1200	62 836	3. 15. 0	—	—	62 845	4. 0. 0	—	—	62 872	1. 0. 0	15. 0	5. 0
$^1/_{12}$	1200	62 837	4. 5. 0	—	—	62 846	4. 10. 0	—	—	62 873	1. 0. 0	15. 0	5. 0
$^1/_{8}$	1850	62 838	3. 10. 0	62 842	3. 15. 0	62 847	3. 15. 0	62 858	4. 0. 0	62 874	1. 0. 0	15. 0	5. 0
$^1/_{6}$	2000	—	—	—	—	62 848	4. 5. 0	62 859	4. 10. 0	62 875	1. 0. 0	15. 0	5. 0
$^1/_{6}$	1350	—	—	—	—	62 849	6. 10. 0	62 860	7. 0. 0	62 876	1. 10. 0	—	—
$^1/_{4}$	2000	—	—	—	—	62 850	6. 10. 0	62 861	7. 0. 0	62 877	1. 10. 0	—	—
$^1/_{4}$	1000	—	—	—	—	62 851	8. 0. 0	62 862	8. 0. 0	62 878	1. 10. 0	—	—
$^1/_{3}$	2000	—	—	—	—	62 852	7. 0. 0	62 863	7. 0. 0	62 879	2. 0. 0	—	—
$^1/_{3}$	700	—	—	—	—	62 853	10. 0. 0	62 864	10. 0. 0	62 880	2. 0. 0	—	—
$^1/_{2}$	2000	—	—	—	—	62 854	8. 0. 0	62 865	8. . 0 0	62 881	2. 0. 0	—	—
$^1/_{2}$	1000	—	—	—	—	62 855	10. 0. 0	62 866	10. 0. 0	62 882	2. 0. 0	—	—
$^1/_{2}$	500	—	—	—	—	62 856	13.10.0	62 867	13.10.0	62 883	2. 0. 0	—	—

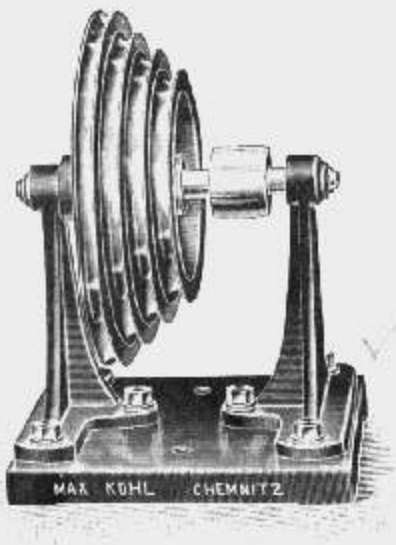
The prices include a normal cord or belt pulley. Motors quoted for on application for pressures other than 110 or 220 volts.



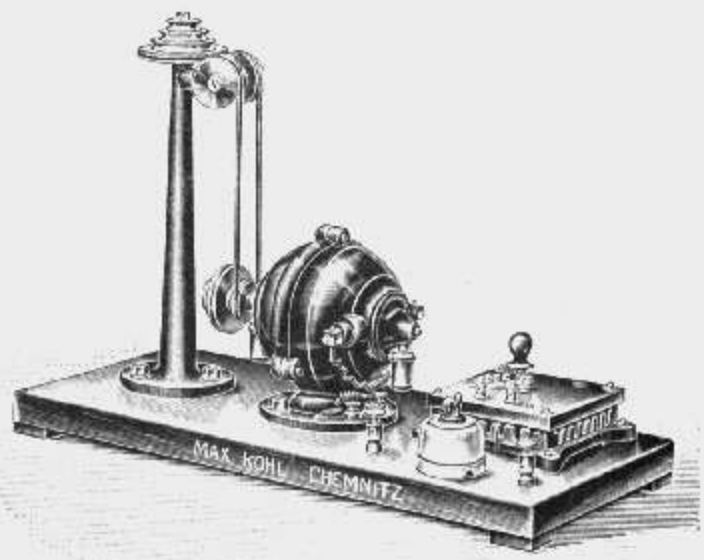
62 884. 1 : 5.



51 972. 1 : 8.



62 888. 1 : 6.



62 889. 1 : 7.

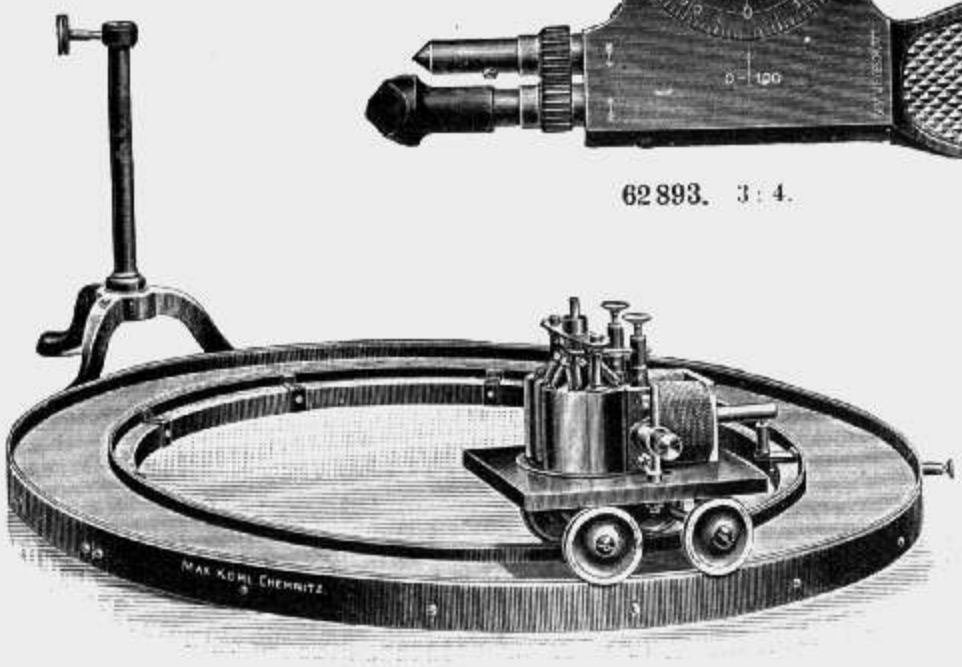
	£. s. d.
62,884. **Direct Current Motor,** series wound, on low base, Figure; output $^1/_{10}$th H. P., for 110 volt D. C., with switch, regulating resistance, tachometer and terminals	8. 0. 0
62,885. — idem, for 220 volts Direct Current	8. 10. 0
51,972. **Direct Current Motor** (shunt wound), Figure, rotary on base having vertical bearing; can also be used as Whirling Table; with cord pulley for driving Stirrers, electrolytic stands, etc., and with attachment for inserting colour discs, etc; for **110 volts Direct Current**. $^1/_8$th H. P.	7. 0. 0
51,973. — idem, for **220 volts Direct Current**	7. 5. 0
For other kinds of current and other voltages — prices on application.	
62,887. **Sliding Resistance** for regulating the speed of Nos. 51,972 and 51,973	1. 5. 0
62,888. **Stepped Gearing for Laboratories,** Figure	2. 0. 0
62,889. **Direct Current Motor** (shunt wound), Figure, with 4-stepped cord pulley for vertical drive, and with gearing for horizontal drive, 110 volts, $^1/_{16}$th H. P., with regulating resistance and switch on one board	6. 0. 0
62,890. **Electric Railway,** Figure, with Track and special stand	4. 16. 0
The motor can be removed from the chassis by loosening a few screws, and fixed on the stand, when it is used as a high-speed motor for rotating colour discs, etc.	
62,891. **Electric Railway,** Figure, with complete overhead system, on board, for working with 4—6 volts	3. 0. 0
62,892. **Model of a Controller** as used on electric trams, with small motor (Ztschr. f. d. phys. u. chem. U. **17**, 1904, p. 95)	9. 10. 0

Cf. 4670, 4687, 4955, 4196.

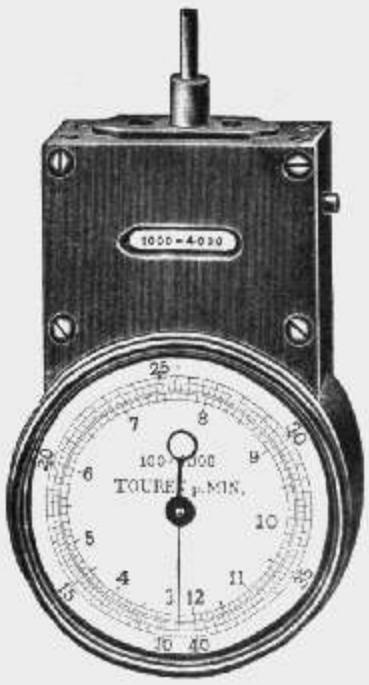
Max Kohl A. G. Chemnitz, Germany.



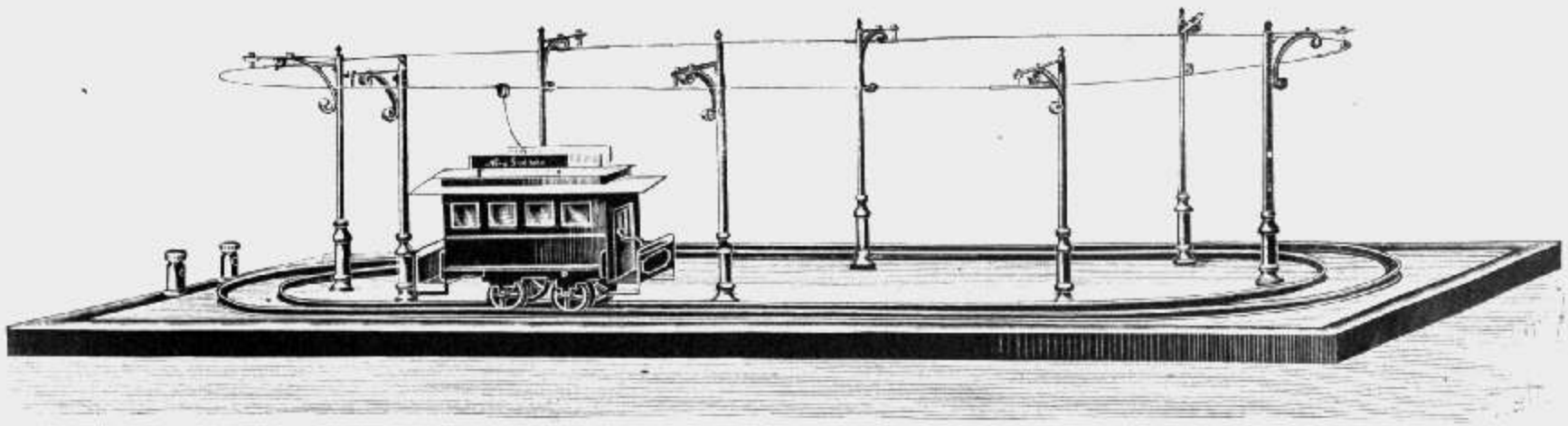
62 893. 3 : 4.



62 890. 1 : 6.



62 894. 2 : 3.



62 891. 1 : 8.

62,893. **Speed Counter** with 2 spindles for working in both directions, Figure, counting from 0—5000, nickelled, with three different attachments for the spindles, **in case** . £ 0. 10. 0

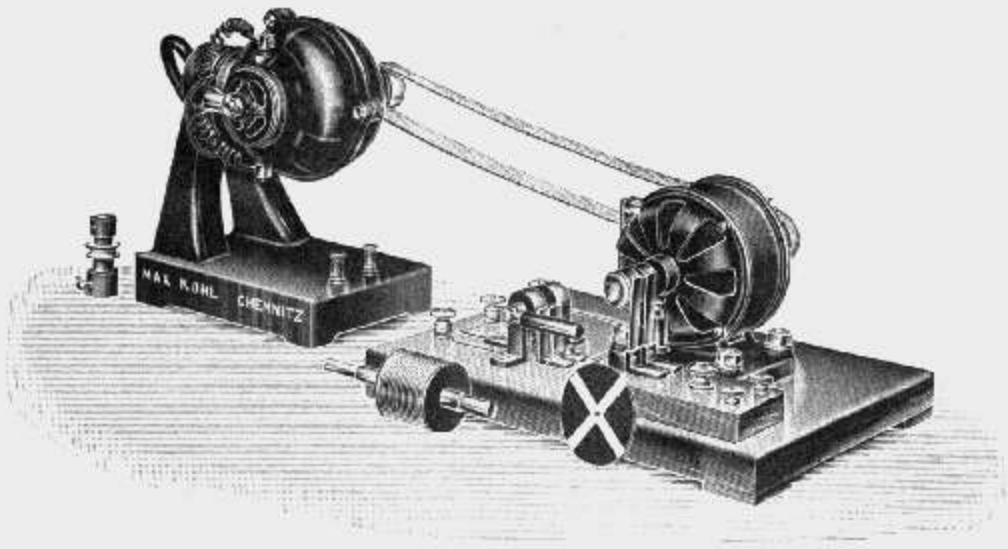
The first attachment is intended for centre-point shafts, the second for tapering shafts. The third attachment is used when neither centre-point nor taper is available or if the end of the shaft is not accessible. It is formed by a disc 24 mm diameter which is pressed on to the outer periphery of the shaft to be measured.

62,894. **Hand Tachometer** with spring axis for automatically setting the ranges, Figure, for 100—4000 revs., for dynamos and shafting, with attachment, in case, 60 mm scale diameter . . . . . £ 5. 0. 0

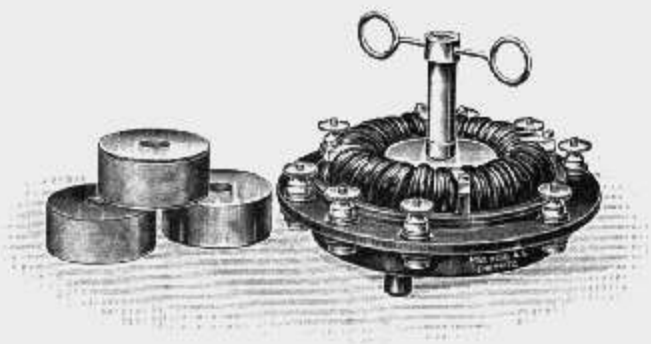
The tachometer has three different ranges: 100—400, 300—1200, 1000—4000. In this new instrument, provided with spring axis, the trouble of setting the range and transferring the cam to other axes is obviated. It is also impossible to damage the tachometer by over-running the pendulum shaft.

62,895. — idem, for 300—12 000 revs., with attachments, in case . . . . . £ 5. 0. 0

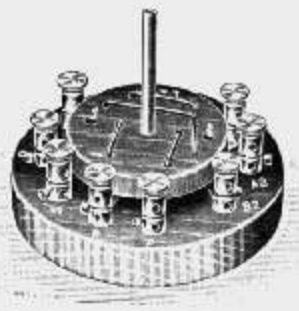
The ranges are: 300—1200, 900—3600, 3000—12 000.



62 896, 51 972. 1 : 8.



62 898. 1 : 4.



62 899. 1 : 4.

Alternating and Three-phase Current.

Universal Dynamos for generating Direct Current, Alternating and Three-phase Current: see pp. 992 and 994.

£. s. d.

62,896. **Alternating and Three-phase Current Machine** after Weinhold, Figure (W. D. Fig. 578); can be used as a generator for single and three-phase current; as a Synchronous Motor or as an Asynchronous Motor (Induction Motor) for Alternating or Three-phase Current 10. 0. 0

The Machine can easily be taken apart and a 4-pole rotor inserted for excitation with Direct Current (for using the machine as a generator or synchronous motor for mono-phase or three-phase current); or a short-circuited rotor can be inserted (for using the machine as an asynchronous motor for mono-phase or three-phase current).

This Machine is excellently adapted for demonstrating the mode of action of the model machines actually used in practice, as its construction is in accordance with that of such machines.

Lantern Slides for explaining the connections and method of working of this small machine: see No. 62,901.

62,897. **Driving Device** for hand drive, for above 2. 10. 0

As a **driving motor** for above we can recommend No. 51,972 or 51,973, p. 998 (cf. the illustration).

62,898. **Model of a Three-phase Motor,** after Weinhold, Figure (W. D. Fig. 595) . . . 5. 0. 0

This Model is used for studying the behaviour of a three-phase motor when various types of rotor are inserted. The model can be operated with machine No. 62,896 as used as a three-phase dynamo. Supplied with the model are a squirrel-cage rotor composed of laminated iron sheets and provided with copper bars; also a copperless rotor of sheet iron with paper layers between, and held together with four brass rivets; a solid wrought iron rotor and a hollow drum composed of sheet iron.

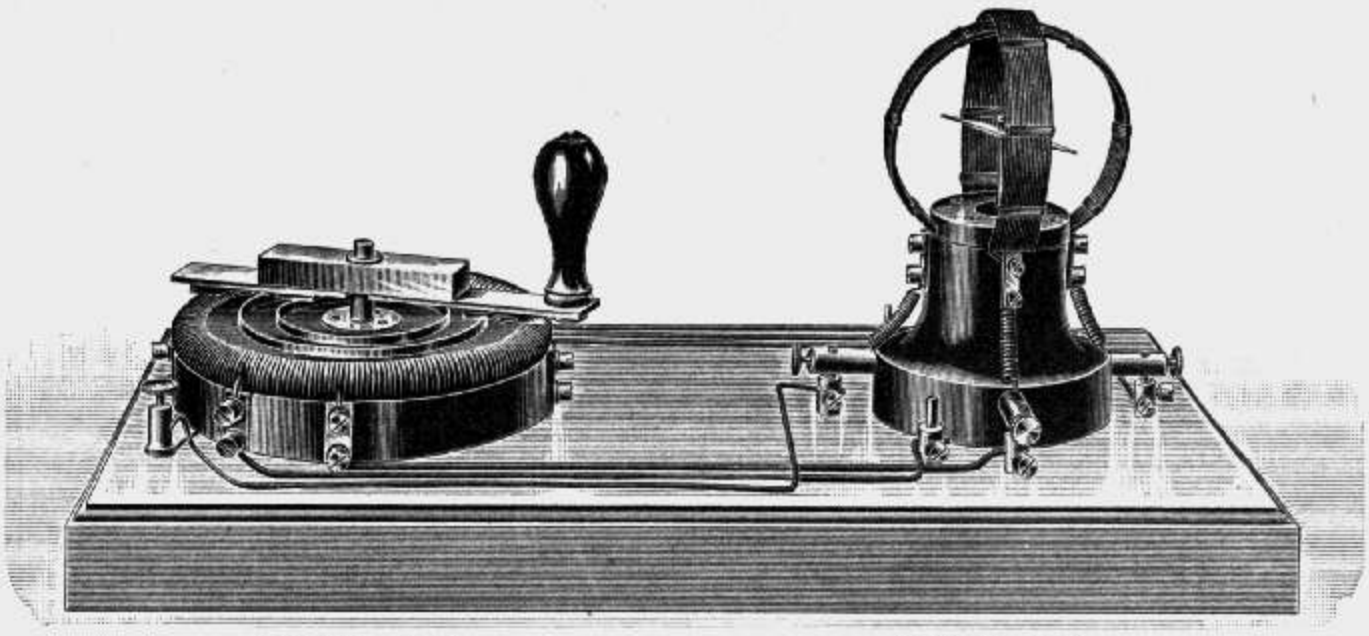
62,899. **Reversing Switch** for above, Figure (W. D. Fig. 599), to enable the model to be used also as a mono-phase motor 0. 16. 0

62,900. **Polarisation Battery** for starting or driving Motor No. 62,898 with mono-phase A. C. (W. D. p. 928) 0. 10. 0

Cl. 4709, 5558, 5557.

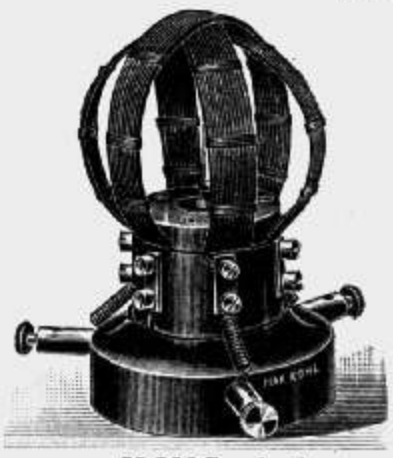
Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.

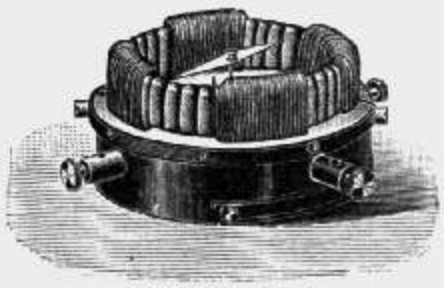


62 902 A. 1 : 3.

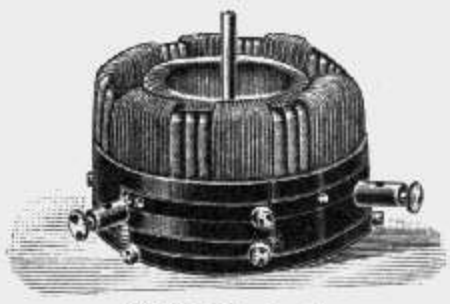
62 902 B. 1 : 3.



62 902 C. 1 : 3.



62 902 D. 1 : 3.



62 902 E. 1 : 3.

62,901. **Lantern Slides for Explaining the Connections and Mode of Action** of Generator No. 62,896, of A. C. Motor Model No. 62,898 and of the Demonstration Apparatus for rotary field experiments, No. 62,902 (W. D. Figs. 579—581, 583—587, 596 and 598). Each — £. s. d. 0. 1. 6

(a) Alternator (Fig. 579),
(b) Magnetic Axis of the Alternator (Fig. 580),
(c) Stator Winding of the Three-phase Machine I (Fig. 581),
(d) Curve for Mono-phase A. C. (Fig. 583),
(e) Curve for two-phase A. C. (Fig. 584),
(f) Curve for three-phase Current (Fig. 585),
(g) Star and Delta Connection (Fig. 586),
(h) Stator Winding of three-phase machine II (Fig. 587),
(i) Connections used as three-phase motor (Fig. 596),
(k) Connections used as mono-phase motor (Fig. 598).

62,902. **Demonstration Apparatus for Rotating Field Experiments (Battery A. C. Apparatus)**, after Weinhold, Figs. A—E (Ztschr. f. d. phys. u. chem. U. **6**, p. 7; W. D. Fig. 582) — 5. 10. 0

The complete apparatus consists of: **current distributing apparatus,** Fig. A; Ferraris Double Coil Fig. B; **Ferraris triple coil,** Fig. C; **4-coil iron ring,** Fig. D; **6-coil iron ring,** Fig. E; **magnetic needle** and **sheet-iron disc** with agate cap; **squirrel-cage rotor; glass disc** with iron filings.

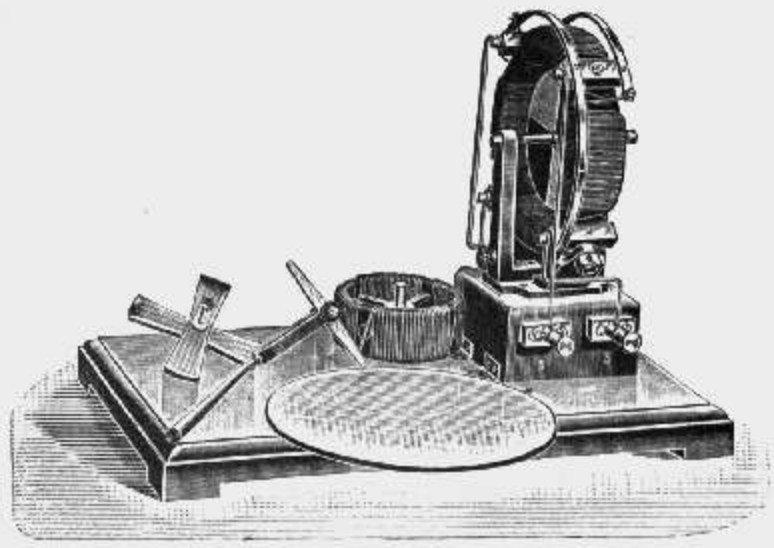
The apparatus permits of carrying out the Alternating and Three-phase Current experiments in a convenient and practical manner. The following pertain to the apparatus: 1—2 Bunsen cells or an accumulator the current of which is transformed into Alternating or Three-phase Current by the distributing apparatus, Fig. A. This current flows through double or triple crossed different-coloured wire rings, Fig. B or C, in which a magnetic needle or an iron disc can be inserted. The bodies inserted in the coils rotate under the influence of the rotating field. Instead of these iron rings an iron ring can be attached consisting of four or six coils and wound with covered wires of different colour (Tesla Ring), Figs. D and E; with these it is possible to obtain synchronous rotation by inserting a magnetic needle or an iron disc; or asynchronous rotation may be produced by an iron ring wound with copper wire (short-circuited rotor). It is possible to show the migration of the lines of force of the field in a very pretty manner by means of a glass disc over which iron filings have been strewn.

62,903. — i d e m, but with Weinhold Coils, for the Horizontal Projection Apparatus, instead of the crossed coils after Ferraris (W. D. Fig. 592) . . . . . — 6. 0. 0

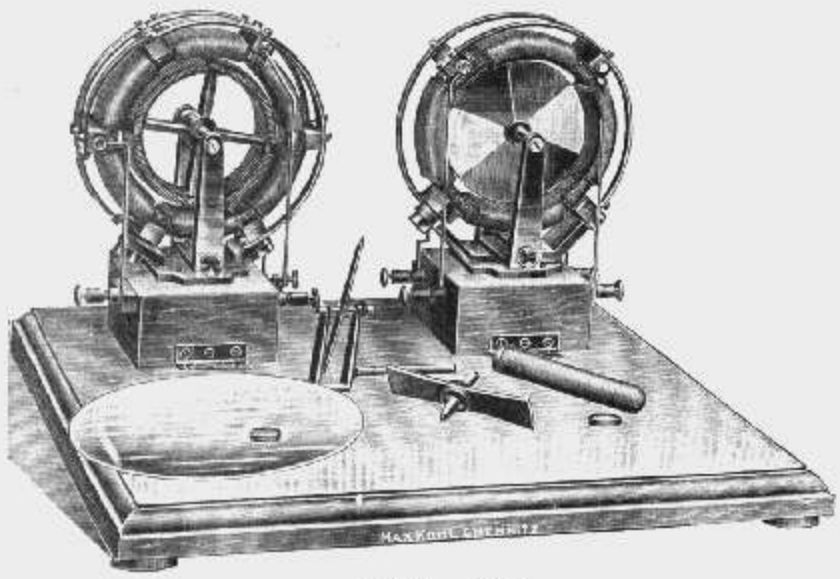
62,904. **Glow Wires** for above (W. D. Fig. 591), consisting of three marble sockets, one with one wire, one with two wires in star connection, and one with three wires connected in delta, with protecting caps . . . . . — 0. 15. 0



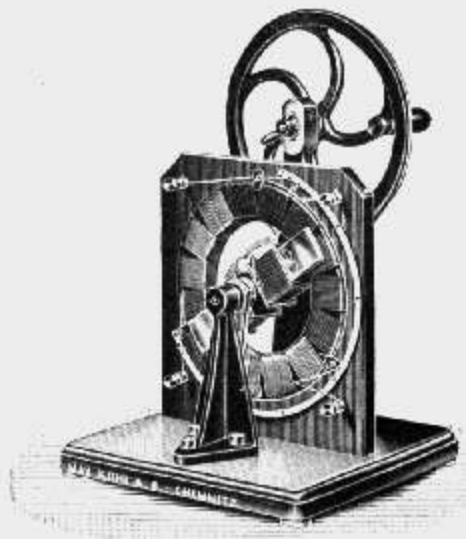
62 905. 1 : 4.



62 908 A. 1 : 5.



62 912. 1 : 5.



62 915. 1 : 10.

62,905. **Model of a Three-phase Motor (Tesla Motor)**, for a pressure of approximately 2 volts. Figure, with six groups of turns and short-circuited rotor. The winding is done in three colours and the connections are laid open, being connected in star and coloured. The apparatus is very comprehensive and suits No. 62,902 . . . . . £ 3. 0. 0

62,906. — idem, for pressures of 6—12 volts, suitable for Dynamos No. 62,774 and 62,787/9 3. 0. 0

62,907. — idem, for pressures of 20—40 volts, suitable for Dynamos Nos. 62,775/6 a, and suitable also for connecting to heavy current three-phase networks by the aid of Lamp Resistance No. 61,504 . . . . . 3. 0. 0

62,908. **Model of a Two-phase A. C. Motor** for a pressure of approx. 2 volts, same pattern as No. 62,905, with 4 coloured groups of turns, short-circuited rotor and coloured connections laid in the open, suiting No. 62,902 . . . . . 3. 0. 0

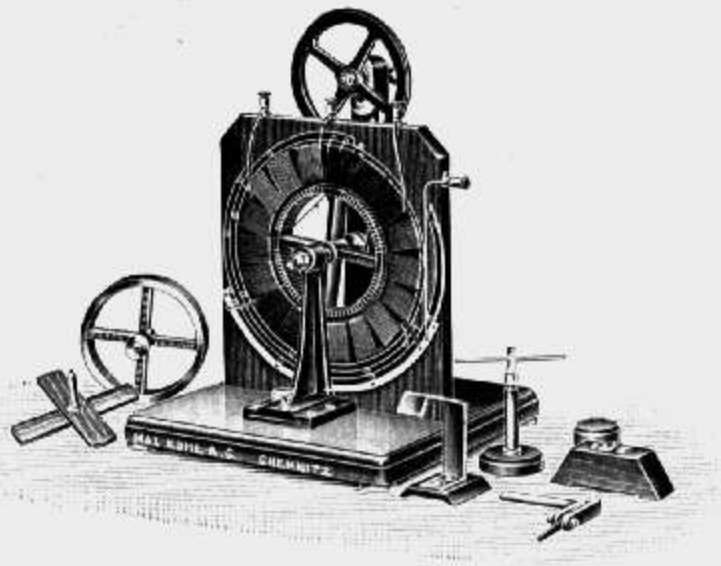
62,909. — idem, for pressures of 6—12 volts, suiting Dynamos Nos. 62,774 and 62,787/9 3. 0. 0

62,910. — idem, for pressures of 20—40 volts, suiting Dynamos Nos. 62,775/6 a, and also for connecting to heavy current two-phase networks by using Lamp Resistance No. 61,504 3. 0. 0

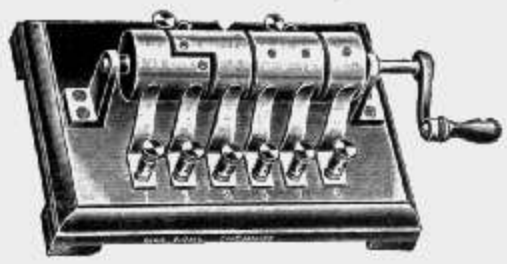
62,911. **Extra Price** for Models Nos. 62,905—62,910 constructed as in Fig. 62,908 A . . . 1. 0. 0

In this construction the motor can be canted over and the rotor easily removed. In addition to the short-circuited rotor are given in: 1 test magnetic needle in mount with handle; 1 iron cross; 1 iron disc divided into coloured plots; 1 glass disc and iron filings for demonstration the migration of the lines of force in the rotating field. With this apparatus it is possible to explain the three-phase or two-phase motors quite well.

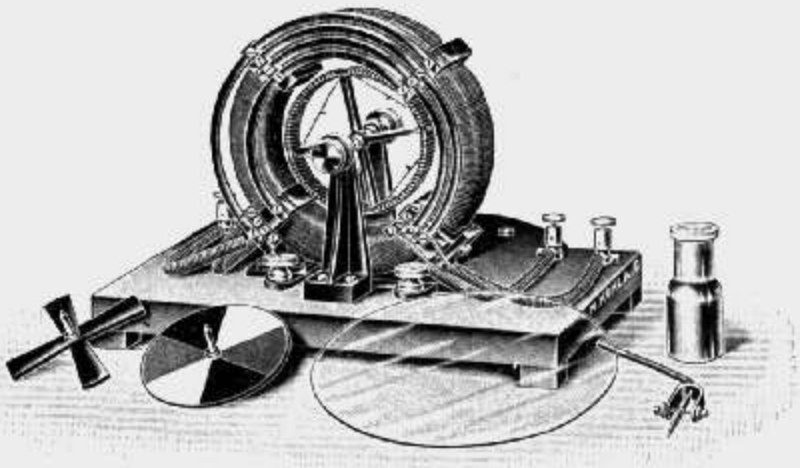
Cl. 2726, 2727, 2728, 5572.



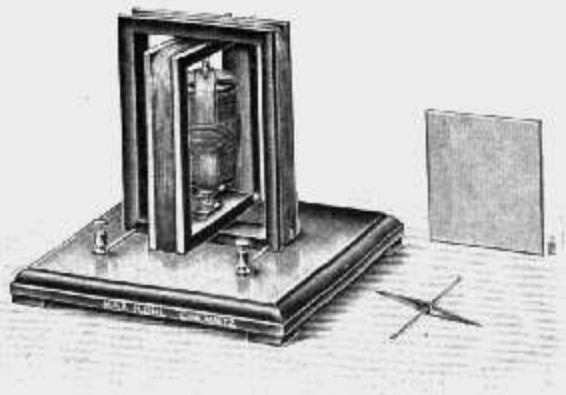
62916. 1 : 10.



62920. 1 : 5.



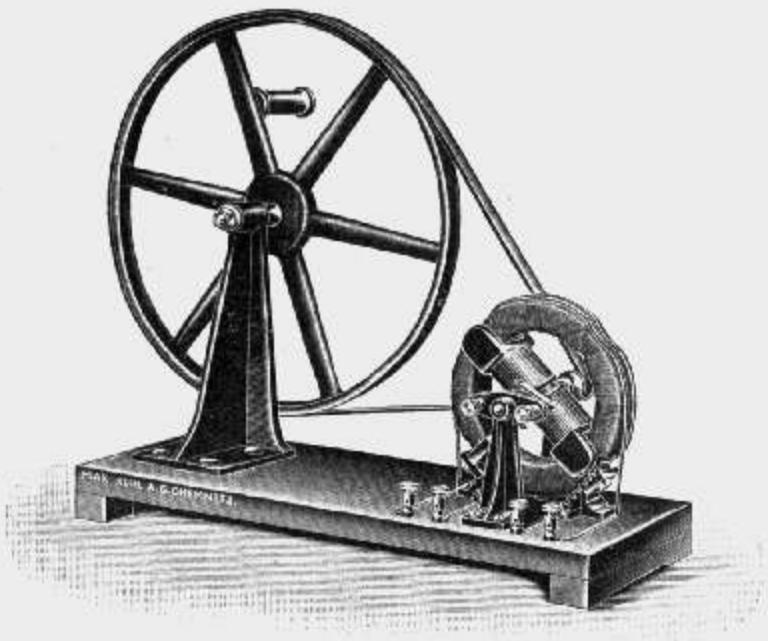
62921. 1 : 6.



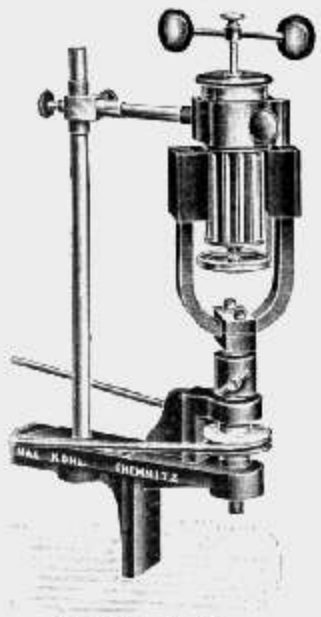
62922. 1 : 8.

	£. s. d.
62,912. **Three-phase Motor and Two-phase Motor;** both can be tilted over; on one board; Figure, with the same accessories as under No. 62,911, for approx. 2 volts, suiting No. 62,902	7. 10. 0
62,913. — idem, for pressures of 6—12 volts, suitable for Dynamos Nos. 62,774 and 62,787 to 62,789	7. 10. 0
62,914. — idem, for pressures of 20—40 volts, suitable for Dynamos Nos. 62,775/6a and for connecting to heavy current networks by using No. 61,504	7. 10. 0
62,915. **Alternator** after Braun, Figure	6. 10. 0
62,916. **Three-phase Motor** after Braun, Figure, suitable for No. 62,915 (Ztschr. f. d. phys. u. chem. U. **5**, p. 186)	7. 10. 0
Following are supplied as Accessories: magnetic needle rotating in fork; light iron cross on stand; sheet iron strip (with spring) on base; light iron piece with base; iron cross; iron ring and ring wound with copper wire as rotor; different coloured flexible leads.	
62,917. **Two-phase Alternator** after Braun, construction as No. 62,915	6. 0. 0
62,918. **Two-phase A. C. Motor** after Braun, construction and accessories as No. 62,916	7. 0. 0
Apparatus Nos. 62,915—8 are very comprehensively built and permit of demonstrating in a very pretty manner the electrical transmission of power with polyphase A. C.	
Three-phase Current Model after Prof. Weiler (Ztschr. f. d. phys. u. chem. U. **5**, p. 189; **6**, p. 53), comprising:	
62,920. **Double Pachytrope** after Weiler, Figure	2. 10. 0
62,921. **Tesla Motor** after Weiler, can be tilted back, Figure, with test magnetic needle, iron disc, iron cross for insertion, also glass plate for rendering the lines of force visible by means of the iron filings supplied	5. 0. 0
62,922. **Crossed Coils** after Ferraris, Figure	5. 0. 0

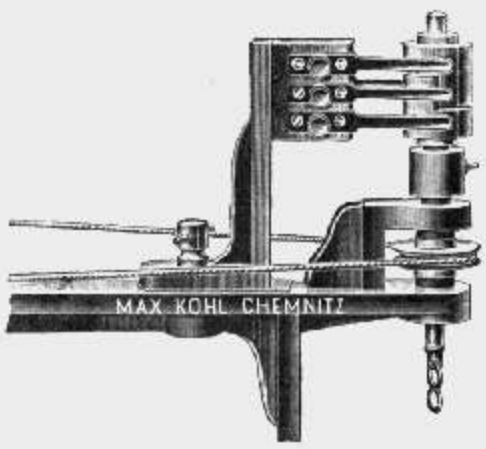
Cl. 5570, 2729, 6051, 4097.



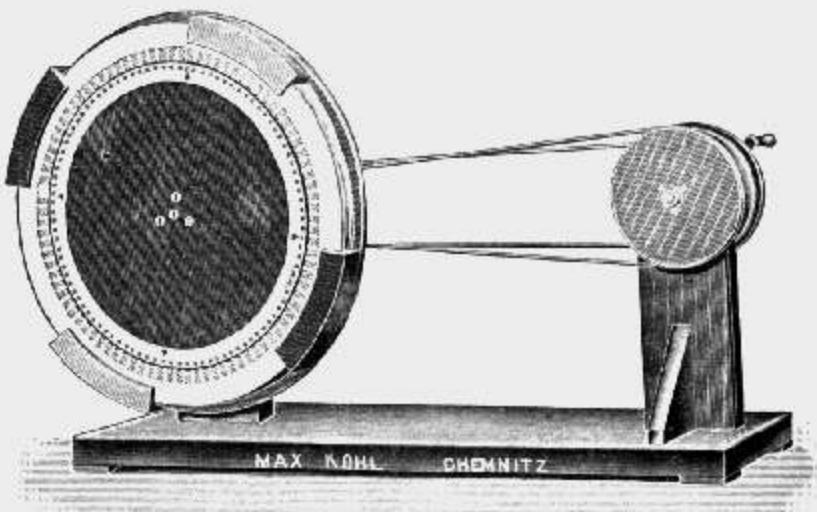
62 923. 1 : 6.



52 068. 1 : 6.



62 924. 1 : 5.



62 926. 1 : 16.

62,923. **Two-phase Alternator,** Figure, with driving stand. The machine can be used instead of the double pachytrope for working Nos. 62,921 and 62,922 . . . . . £. s. d. 8. 0. 0

The machine can be employed for taking off both single-phase and two-phase alternating current. Two to three accumulators are used for exciting. Its mode of action is easily understandable as the coils are of different colours.

62,924. **Commutator** for Transforming Low Pressure D. C. into A. C., Figure, for the Whirling Table 0. 18. 0

52,068. **Model for Demonstrating the Behaviour of a Short-circuited Rotor in the Rotary Magnetic Field,** Figure, after Friedr. C. G. Müller (M. T., Fig. 222), for placing on the Whirling Table; with a squirrelcage rotor which can be used both with and without an iron core 2. 10. 0

62,926. **Apparatus for Demonstrating Synchronism and Asynchronism,** Figure, after Götze 10. 0. 0

A cord rotates (1) the 4-pole periphery, representing the rotating field; and (2) the innermost disc provided with a thick point at the periphery (rotor as tunnel armature). The ring (stator) placed between these has black strips on the outer periphery (slots). The rotor disc can be rotated at the same speed or at a lower velocity by means of a stepped pulley, so that in the first place synchronism is present and in the other case asynchronism (slip).

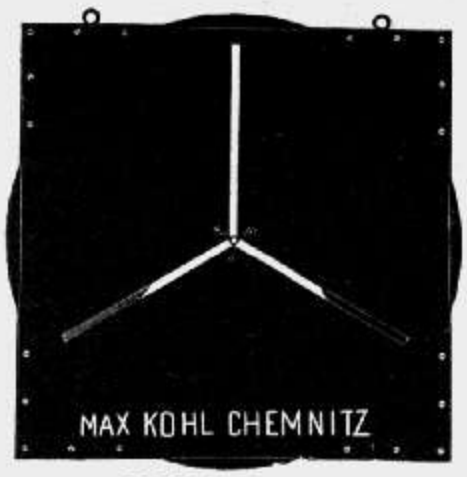
62,927. — idem, smaller 7. 0. 0

62,928. **Aluminium Egg** after Thomson 0. 6. 0

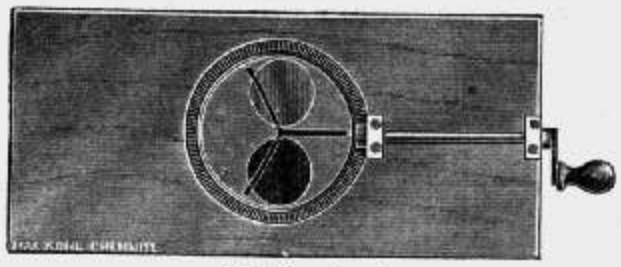
The hollow bipartite egg, which can be used either filled with iron filings or without these, rotates on its point in the rotating field. For making the experiment, use is made of one the Apparatus Nos. 62,905/14 in the tiltable pattern by placing the ring horizontally on a glass plate and inserting the egg in it.

Cl. 6054, 4684, 2719, 4013.

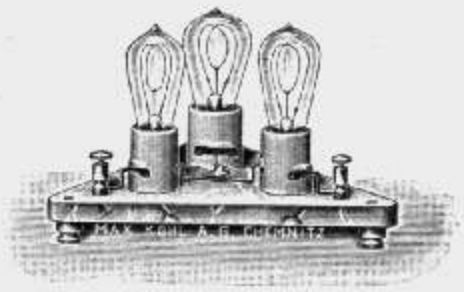
Max Kohl A. G. Chemnitz, Germany.



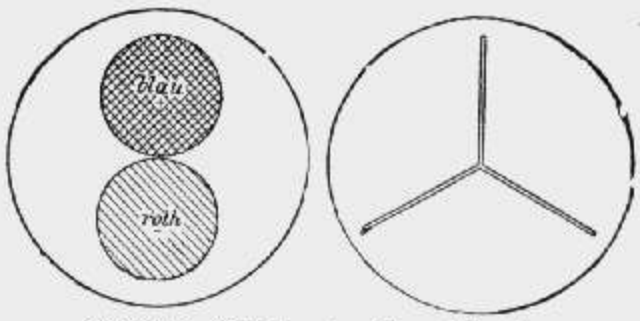
62 930 A. 1 : 10.



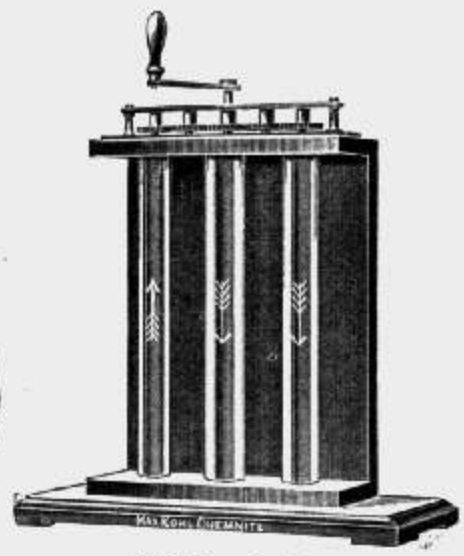
62 931. 1 : 4.



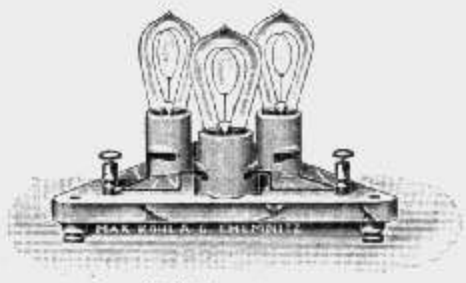
62 933. 1 : 6.



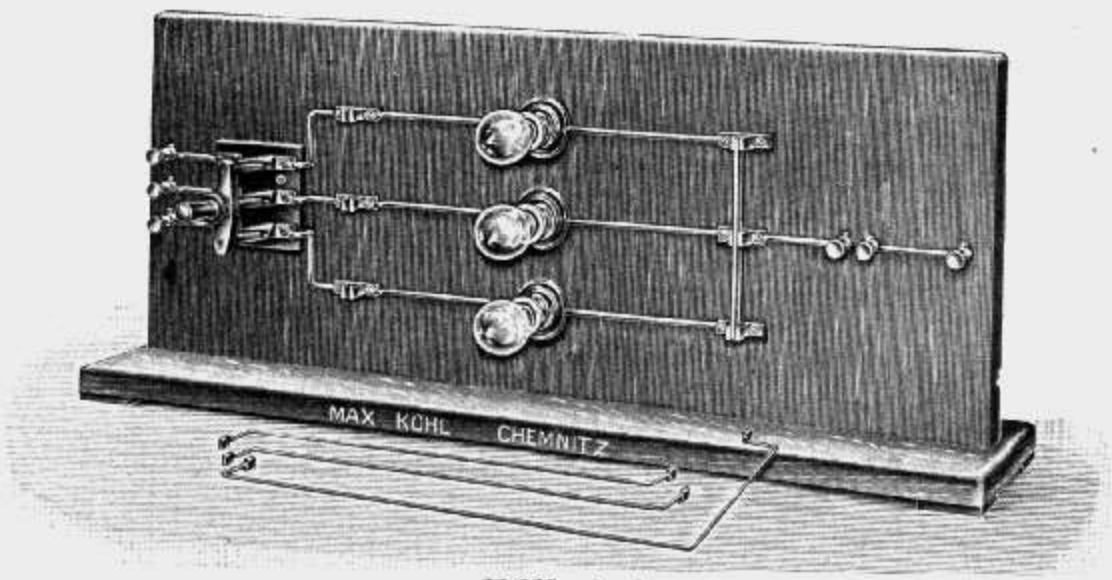
62 930 B, 62 931. 1 : 10 and 1 : 2.



62 932. 1 : 7.



62 934. 1 : 6.



62 935. 1 : 9.

62,930. **Apparatus** after Behrend **for Demonstrating the Flow of Current in Three-phase Conductors,** Figs. A and B (Ztschr. f. d. phys. u. chem. U. **5,** p. 44) . . . . . £. s. d. 0. 14. 0

62,931. — i d e m, transparent, for the Projection Lantern, F i g u r e s 1. 10. 0

62,932. **Apparatus** after Moser, F i g u r e, **for showing the flow of current in three-phase leads** 2. 8. 0

By means of a gearing three glass tubes combined on a wood stand are rotated at the same speed. These glass tubes, representing sections of the three-phase leads traversed by the current, are provided with sheet iron strips. One side of all the latter is painted red and provided with an arrow, the others being blue and having arrows pointing in the opposite direction. Since these iron strips are placed at angles of each 120° relative to each other, the apparatus gives, according to the different positions of the observer, a clear image of the momentary current-density (apparent width of metal strips) and of the current-direction (colour of the strip and direction of arrow) in the individual leads.

62,933. **Model of a Star Connection,** with three glow-lamps, on marble, F i g u r e 1. 10. 0

62,934. **Model of a Delta Connection,** with three glow-lamps, on marble, F i g u r e . . . 1. 10. 0

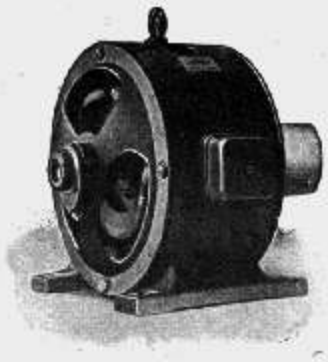
62,935. **Board for Explaining the Star and Delta Methods of connecting** in Three-phase Plants, after Götze, F i g u r e 5. 10. 0

Cl. 2732, 407, 6059, 406, 2735, 6062, 3889.

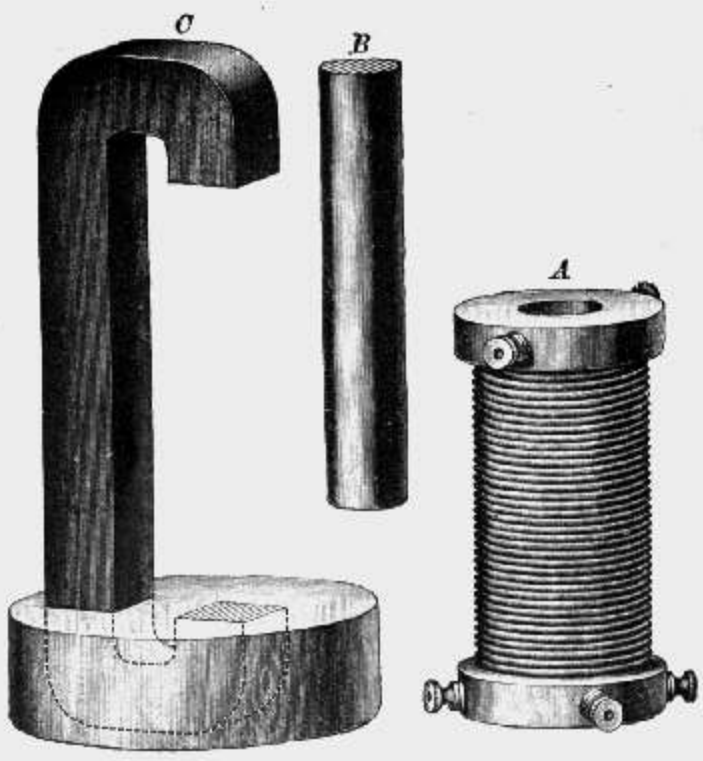
Max Kohl A. G. Chemnitz, Germany.



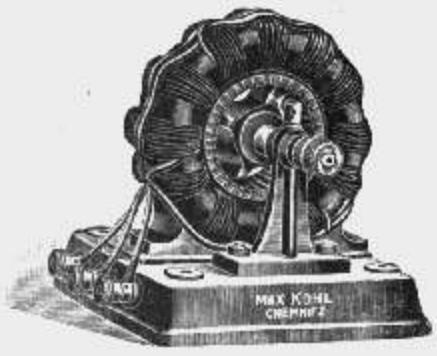
62936. 1 : 4.



62946.



62966. 1 : 3.



62964. 1 : 4.

Max Kohl A. G. Chemnitz, Germany.

Electric Motors for Alternating and Three-phase Current, Figures:

Type of Current	System of Motor	Approx. Effic. HP.	Approx. r. p. m.	For 110 Volts 50 periods List No.	£. s. d.	For 220 Volts 50 periods List No.	£. s. d.	Starting Resistance List No.	£. s. d.
Mono-phase A. C.	Commutator Motor, Speed variable	1/20	1700	62 936	3. 10. 0	62 947	4. 0. 0	62 956	0. 15. 0
		1/10	1700	62 937	5. 0. 0	62 948	5. 10. 0	62 957	0. 15. 0
	Motor with short-circuited Rotor; speed not variable	1/16	1350	62 938	3. 15. 0	62 949	4. 0. 0	—	—
		1/8	1400	62 939	4. 15. 0	62 950	5. 0. 0	—	—
		0.175	1400	62 940	6. 5. 0	—	—	62 960	1. 10. 0
		0.35	1400	62 941	6. 15. 0	62 951	6. 15. 0	62 961	1. 15. 0
		0.7	1410	62 942	7. 10. 0	62 952	7. 10. 0	62 962	1. 15. 0
Three-phase Current	Motor with short-circuited Rotor; Speed not variable	1/16	1320	62 943	2. 15. 0	62 953	3. 0. 0	—	—
		1/8	1320	62 944	3. 15. 0	62 954	4. 0. 0	—	—
		1/4	1400	62 945	6. 0. 0	—	—	—	—
		1/2	1400	62 946	6. 15. 0	62 955	6. 15. 0	62 963	2. 0. 0

The prices are to be taken as including standard cord or belt pulley. Motors are quoted for on application for other voltages and periodicities.

62,964. **Three-phase Motor,** open type, Figure, for pressures of 6 12 volts, suitable for Machines Nos. 62,774 and 62,787—62,789 . . . . . 3. 4. 0

62,965. — idem, for 20—40 volts, suitable for machines Nos. 62,775—62,776a 3. 4. 0

Transformers.

62,966. **Alternating Current Transformer,** after Weinhold, can be taken to pieces; Figure; for use with open and closed magnetic circuit (W. D. Fig. 590) 2. 4. 0

The transformer has three groups of windings — one group of 36 turns of thick wire, and two groups each of 1,000 turns thin wire. The transformer suits Machine No. 62896. The thin winding, however, can be connected for a short time to 100—120 volts when used with iron core. The following ratios can be produced 1 : 1; 1 : 28; 1 : 55.

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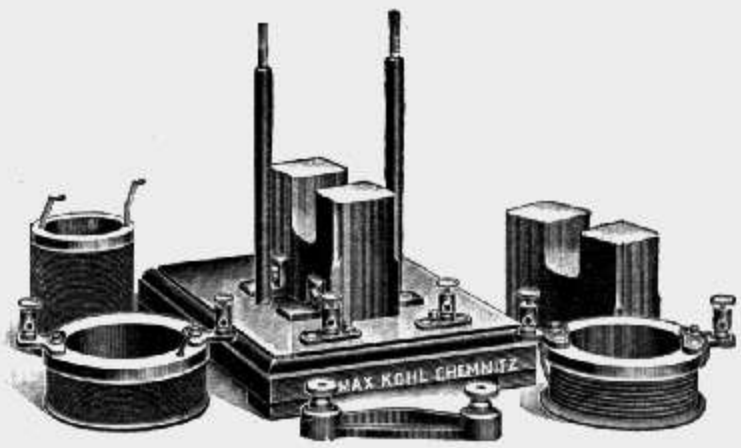
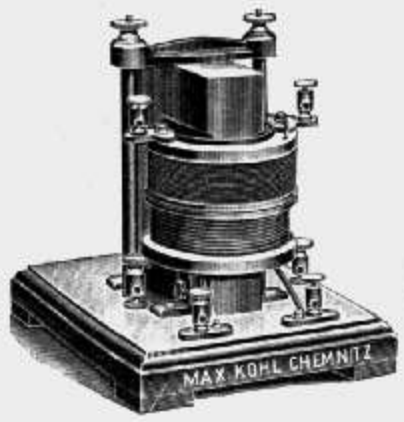
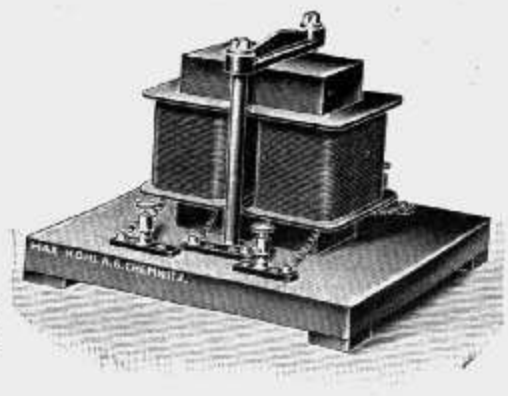


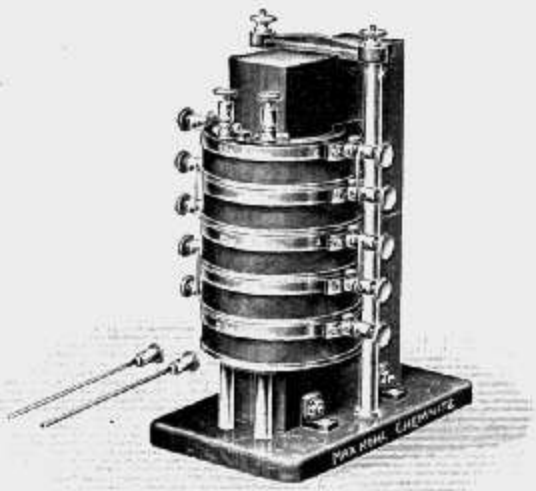
62 967 A. 1 : 5.



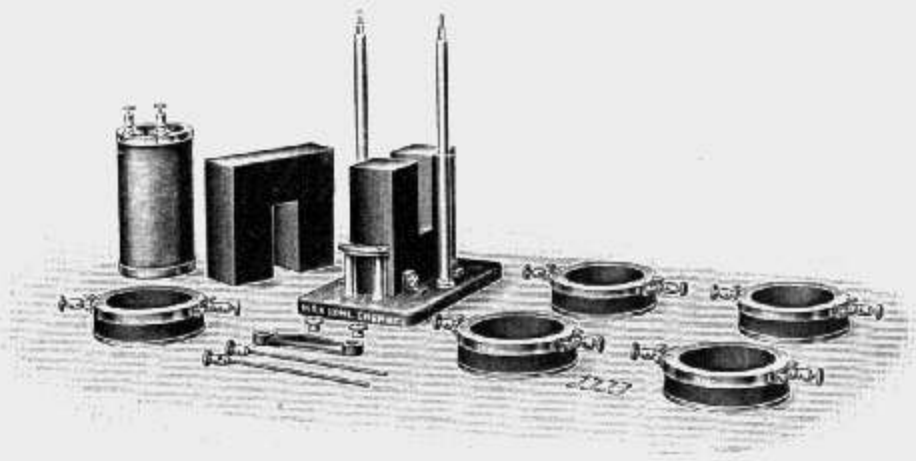
62 967 B. 1 : 5.



62 970. 1 : 6.



62 969 A. 1 : 5.



62 969 B. 1 : 5.

62,967. **Alternating Current Transformer** (Core Transformer), Figs. A and B, for demonstration purposes; **it can be taken entirely to pieces** . . . . . £. s. d. 3. 12. 0

The transformer has the following coils: (1) the inner one having 196 turns; (2) an outer one with 28 turns; (3) an outer one with 686 turns. The following ratios can thus be established: 1 : 7; 3.5 : 1; 1 : 24.

The transformer is suitable for A. C. pressures from 24 to 44 volts when the inner coils is used as a primary coil, and the instrument therefore suits Machines Nos. 62,775/6 a. Suppose, for instance, that it is used with Machine No. 62,776; the following pressures can be obtained:

$$34 \cdot \frac{1}{7} = 4.8 \text{ Volts}; \quad 34 \cdot \frac{3.5}{1} = 119 \text{ Volts}; \quad 34 \cdot \frac{1}{24} = 1.4 \text{ Volts}.$$

These pressures apply on no-load; they fall somewhat when load is applied. The thin wire external coil can also be connected for a short time to 110—120 volts.

62,968. — idem, for A. C. pressures from 7—14 volts, suiting Machines Nos. 62,774 and 62 787/9; **Ratios:** 1 : 7; 3.5 : 1; 1 : 24 . . . . . 3. 12. 0

62,969. **Alternating Current Transformer,** Figs. A and B, completely dismountable; total capacity up to 120 watts 6. 0. 0

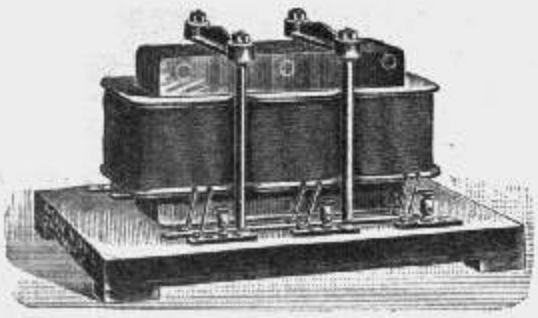
The inner coil has 1000 turns; the five outer coils have 200 turns each and can be put in parallel and series with the copper pieces supplied. The ratios 1 : 5, 1 : 2.5, 1 : 1.67, 1 : 1.25, 1 : 1 can be established and it can be easily shown that the secondary pressure increases with the number of turns of secondary. When using the inner coil as a primary the transformer can be connected to pressures of 80—125 volts.

62,970. **Alternating Current Transformer** (Core Transformer), Figure; ratio 1 : 10, for primary pressures of 80—125 volts, secondary giving 8—12 volts; output about 100 watts 3. 12. 0

On each core are wound a primary and a secondary coil over each other.

62,971. — idem, for connecting to pressures of 24—44 volts, suiting Machines Nos. 62,775/6a 3. 12. 0

62,972. — idem, for connecting to pressures of 4—14 volts; ratio 10 : 1, suiting Machines Nos. 62,774 and 62,787—62,789 . . . . . 3. 12. 0



62 973. 1 : 6.

62 978 A, 62 981. 1 : 7.

62 976. 1 : 4.

	£. s. d.
62,973. **Three-phase Transformer** (Core Transformer), Figure, with star connections; ratio 1 : 10; for primary pressure of 80—125 volts, secondary giving 8—12 volts; output about 150 watts	4. 10. 0
62,974. — idem, for connecting to pressures of 20—40 volts, suiting Machines Nos. 62,775/6 a	4. 10. 0
62,975. — idem, for connecting to pressures of 6—12 volts, suiting Machines Nos. 62 774 and 62,787/9	4. 10. 0
62,976. **Alternating Current Transformer** (Shell Type), Figure; ratio 5 : 1, for connecting to 24—44 volts primary pressure, for transforming the current of Machines Nos. 62,775/6 a to five times the voltage	2. 10. 0
62,977. — idem, for pressures of 7—14 volts, suiting Machines Nos. 62,774, 62,787/9 .	2. 10. 0

Inductive Repulsion.

62,978. **Apparatus** after Elihu Thomson, **with complete Accessories, for proving the repelling action of a Magnetic Field, generated by A. C., on good conducting metal masses** (Elektrotechn. Ztschr. **1890**, pp. 387, 399 and 435) 7. 10. 0

The following pertain to the complete apparatus and are supplied with it: **1 magnetizing Coil,** resting on three pillars, with stage and apparatus holder, with sliding **core** formed of a bundle of thin iron wire; 1 **Iron Membrane** with **tube** (fastened to the apparatus itself in Fig. A) attached; **1 Balance** with copper disc, Fig. B; **1 Grip with Fork** for fixing **one copper disc** and **one iron disc having copper rim,** both painted with coloured sectors, Figs. C and D; **1 Iron Prism** for the iron disc having copper rim, Fig. D; **1 Copper Hollow Sphere** with **wood ring and watch-glass** as support, Fig. E; **1 Coil** of coloured **Aluminium Wire** with cork and glow-lamp, also **1 Glass Vessel** for carrying out the experiment under water, Fig. F; **1 Copper, 1 Iron, and 1 Glass Disc; 1 Wood Frame** with a **copper ring** suspended on fibres; Fig. G; **1 Copper Hollow Ring** with **attachment tube; 1 Copper Ring with pendulum suspension,** Fig. H; **1 Wide Copper Ring; 1 Wide Aluminium Ring; 1 Mercury Gutter.**

For making the experiments with this apparatus an alternating current (110—120 volts) supplied direct from a power station, is suitable, of which 12—16 amperes are used for working the apparatus; when using D. C. this must be converted into a pulsating current by means of the Wehnelt Interrupter (No. 62,666, see below).

Cl. 2780, 5379, 2820.



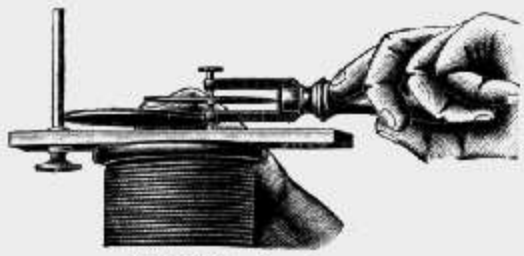
62 978 B. 1 : 6.



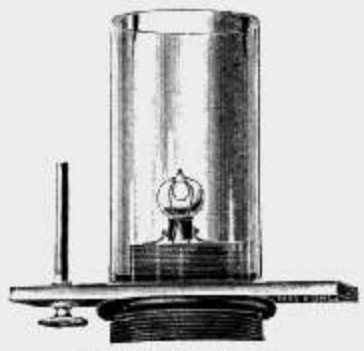
62 978 D. 1 : 5.



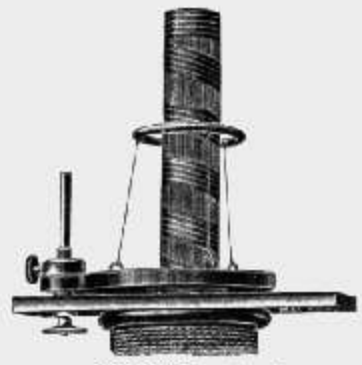
62 978 E. 1 : 5.



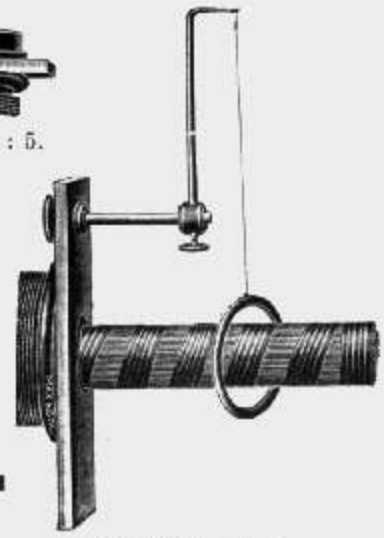
62 978 C. 1 : 5



62 978 F. 1 : 5.



62 978 G. 1 : 5.



62 078 H. 1 : 5.

The experiments which can be carried out with the above collection of apparatus are essentially the following:

1. **Singing Membrane,** Fig. A. The iron core is slipped down to its lowest point in the coil and the iron membrane, with a space of approximately one millimetre, fastened above it. When the magnet is excited the membrane gives a tone corresponding with the frequency of the alternating current.

2. **Balance with Copper Disc,** Fig. B. The balance is inserted on the apparatus holder in such manner that the copper disc is 2 mm above this when the magnet is unexcited. When the current is closed the copper disc is then repelled.

3. **Rotating Copper Disc,** Fig. C. In the fork intended for the purpose is inserted the copper disc, fitted with coloured sectors and with axis; the disc is held horizontally above the magnet while the thick copper disc is inserted in such manner that one-half of the field is covered.

4. **Rotating Iron Disc with Copper Rim,** Fig. D. This is inserted in the fork in place of the previous disc; it is characterised by having two parts, a central iron part and an outer narrow copper margin. In this experiment it is best to raise the iron core somewhat so that it is projecting about 3 centimetres above the coil, and the iron prism is then set upon it. The fork is held in such wise that the disc is perpendicular; moreover, as in the preceding experiment, the field is partially covered by the stout copper disc.

5. **Rotating Ball,** Fig. E. If one-half of the electromagnet is covered with the thick copper disc and the wood ring, together with watch-glass and ball placed on the magnet, the ball is set rolling. This experiment works particularly well if instead of the wood ring and watch-glass the glass vessel is used and filled with enough water to allow the hollow ball to float. The rotation of the ball is then extremely rapid and takes place about a horizontal axis.

6. **Spiral with Glow Lamp,** Fig. F. Owing to the use of light material this device is so constructed that it can only just sink under water. If the device, together with the water-vessel, is placed on the electromagnet and the latter excited, the lamp is rendered brightly incandescent. On the other hand a repulsion occurs; the spiral with the glow lamp is raised up in the water and the luminosity of the lamp appreciably decreases at the same time owing to the field becoming weaker. This is a very striking experiment.

   It is also possible to show with this arrangement the damping effect of different materials. If the copper plate is placed under the glass vessel the whole phenomenon almost disappears; this is also the case to a lesser degree when the iron plate is used, while the glass plate is without influence.

7. **Wood Frame with Ring,** the latter suspended on fibres, Fig. G. The magnet core is lifted as far as possible out of the magnetizing coil, the frame and ring slipped over the same and the latter fastened to the carrier. Under the influence of the current the ring is raised up and is held suspended by the fibres.

   Owing to eddy currents in the ring this becomes considerably heated in a very short time; this heating also takes place to a corresponding extent in the other experiments.

8. **Broad Aluminium and Copper Ring.** The copper ring remains suspended approximately in the centre of the excited magnet core when placed above it, while the aluminium ring is entirely hurled away.

9. **Ring with Pendulum Suspension.** Fig. H. The apparatus is placed horizontally as shown in Figure and the core pushed into the coil somewhat so that the oscillating ring can swing out. The experiment is a variation of the preceding one.

10. **Hollow Copper Ring with Attachment Tube.** Some water is poured into the vessel and the small tube closed with a cork. The water, being heated by the eddy currents, evaporates; the cork is driven out with a pop and a jet of steam issues from the small tube.

11. **Mercury Trough.** If this is filled with mercury and set upon the upright apparatus, the mercury is set into a wavy motion by inductive influence.

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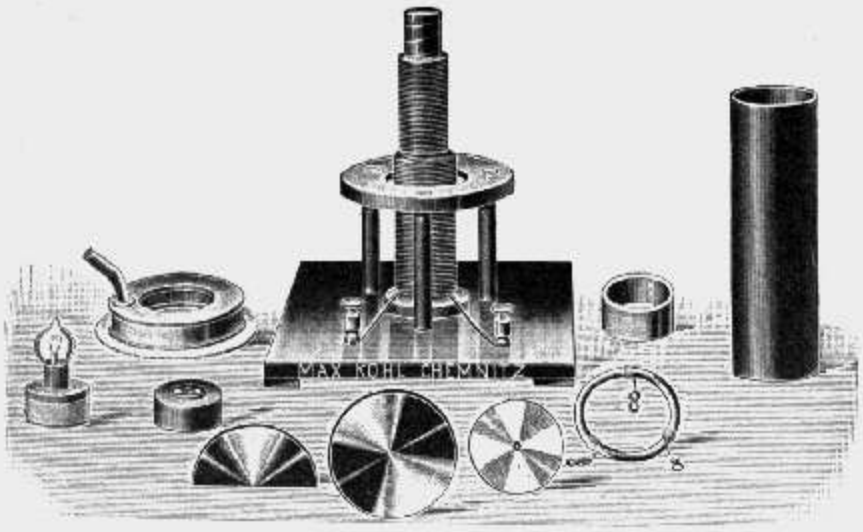
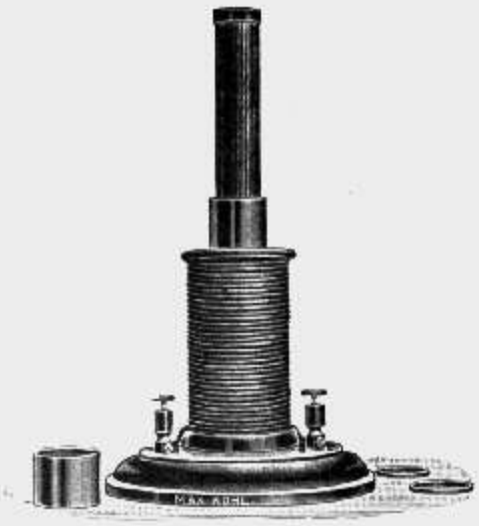


62979. 1 : 7.



62980. 1 : 5.

	£ s. d.
62,989. **Apparatus** after Elihu Thomson, same style as No. 62,978, but considerably larger	12. 0. 0
62,979. **Apparatus** after Elihu Thomson, smaller pattern than No. 62,978 and with simpler fittings, Figure	4. 4. 0
The following are delivered with the apparatus as auxiliaries: 1 thick Copper Ring with 3 Cords, 1 Aluminium Ring, 1 Spiral with Glow Lamp, 1 large Copper Disc, 1 small Copper Disc with agate pivot, Stand and semi-circular Copper Disc, 1 Copper hollow Ring with annex tube, 1 Metal Cylinder.	
62,980. **Apparatus** after Elihu Thomson, Figure, simple, with 4 rings, one each wide and narrow, of copper and aluminium	1. 8. 0
This apparatus can be connected direct to a 110—120 volt lighting circuit, but a Resistance must be connected up between (e. g., No. 50,521, £ **2. 15. 0**).	
62,981. **Magnetizing Ring** after Elihu Thomson, Figure, as addition to Apparatus No. 62,978	1. 0. 0
This magnetizing ring, constructed of fine iron wire, slotted and wound, repels with a considerable amount of force a precious-metal coin, e. g., a half-crown or five-shilling piece, which is held in the narrow space between its poles, when the ring is excited by alternating current. With this apparatus also (which takes 5—7 amps.) use is made, as in the case of No. 62,980, of a series resistance (e. g., No. 50,521, £ **2. 15. 0**) when the apparatus is used on 110—120 volt A. C.	
62,666. **Wehnelt Interrupter** with 1 mm thick platinum pin, Fig. 62,666, p. 982, for connecting apparatus Nos. 62,978—62,981 to 65—220 volt Direct Current	3. 15. 0
50,521. **Series Resistance** for above, 30 ohms, 5—25 amps.	2. 15. 0

Prof. E. Grimsel's Apparatus for the Experimental Introduction of Electromagnetic Units.

	£ s. d.
The references refer to Vol. II, No. 2 of the Abhandlungen zur Didaktik und Philosophie der Naturwissenschaften: E. Grimsehl, Experimentelle Einführung der Elektromagnetischen Einheiten, published by Julius Springer, Berlin, 1907.	
60,135. **Magnetic Pole Balance** after Grimsehl, Figure on p. 796 (also p. 3 of above work)	2. 14. 0
60,194. **2 Glass Rods with glass spheres** in order to enable the pole balance to be used also as an absolute electrometer (p. 4 of above work)	0. 8. 0
63,000. **Apparatus for Demonstrating the Lines of Force Images of a linear Wire,** also of a circular current similar to Berghoff's, cf. Fig. 62,370 L, N, O, p. 963 (Figs. 1, 2, 6, 7 of above work)	1. 0. 0
60,172. **Foot Terminal** after Holtz, Figure on p. 799	0. 6. 0

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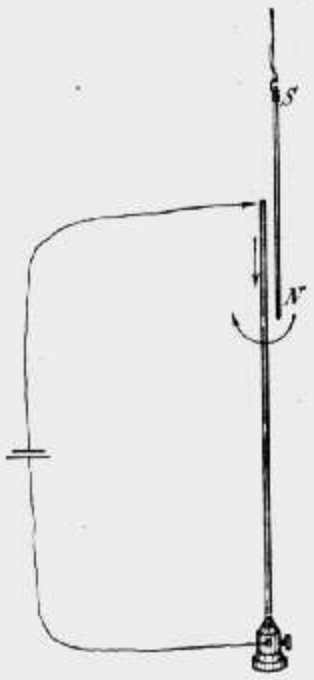
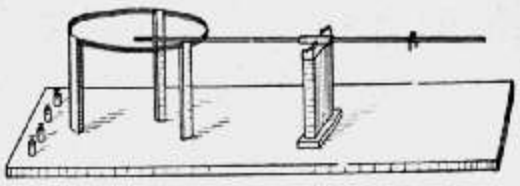


63 001. 1 : 10.



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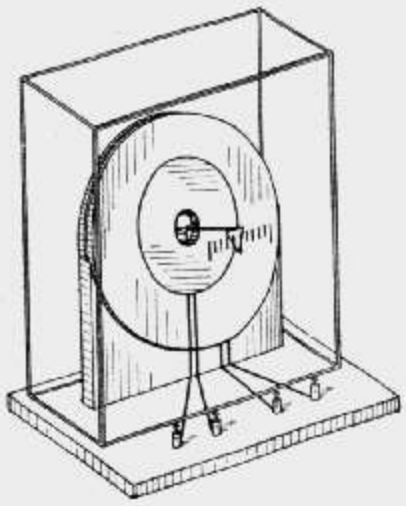

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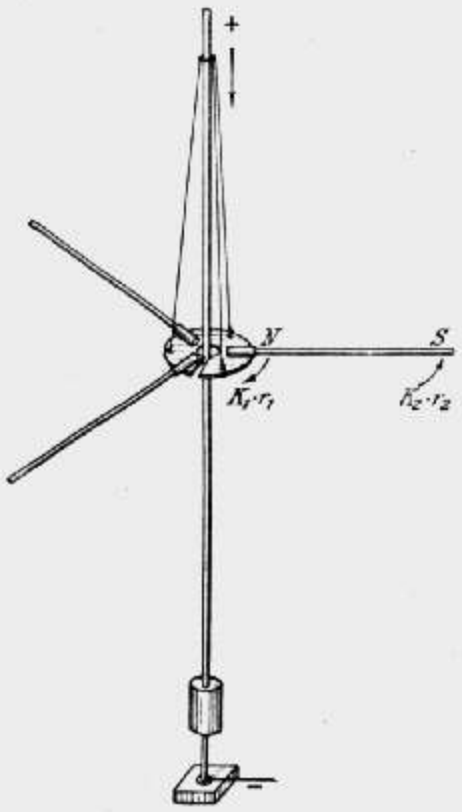
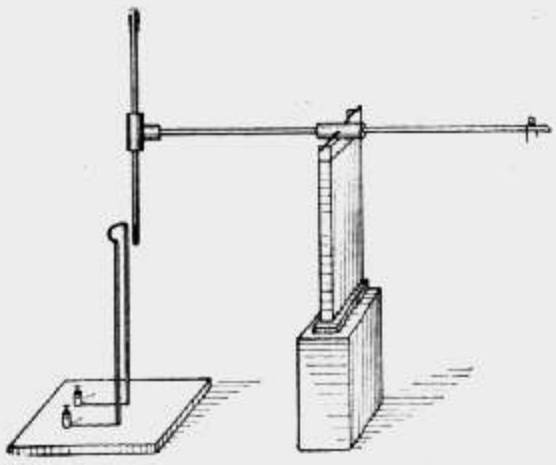


63 002. 1 : 8.



63 005, 60 135. 1 : 7.

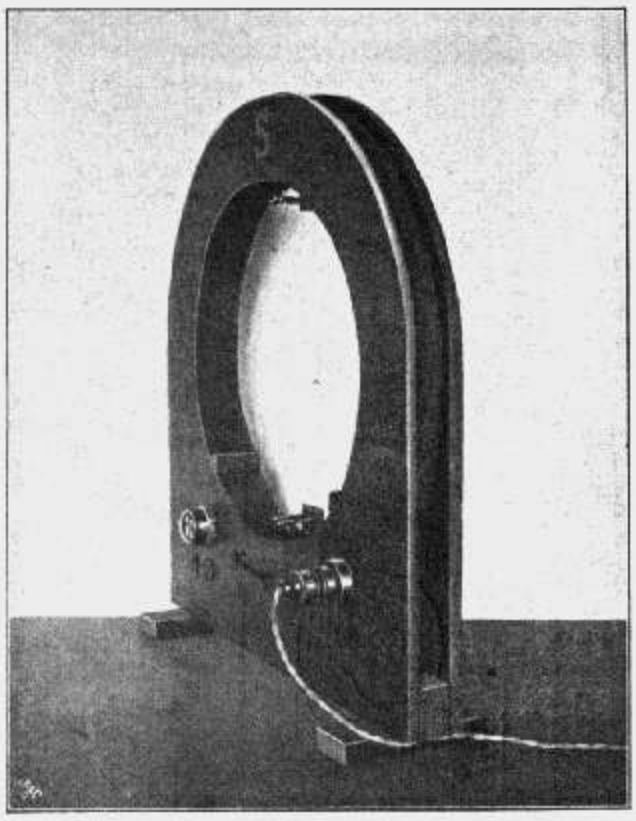
63,001. **Brass Rod** 50 cm long, with base and magnetic rod with suspension hook, Figure (see Figs. 3 and 4 of Grimsehl's work), without cell . . . . . £ s. d. 0. 7. 0

63,002. **Brass Disc with 3 Magnetic Needles** for quantitative investigation of the magnetic field, Figure (*loc. cit.* Fig. 5) 0. 12. 0

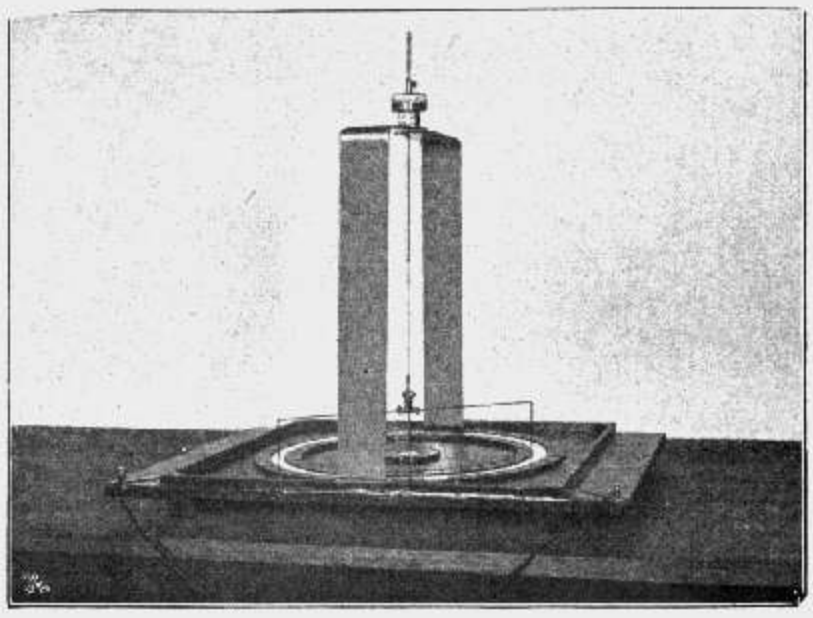
63,003. **Apparatus for Measurements of the Density of the Magnetic Field** of Circular Currents, Figure (*loc. cit.* Fig. 8) 1. 0. 0

63,004. **Device for showing the Dependence of the Density of the Magnetic Field on the Radius of the Current-carrying Ring,** Figure (*loc. cit.* Fig. 9) 2. 8. 0

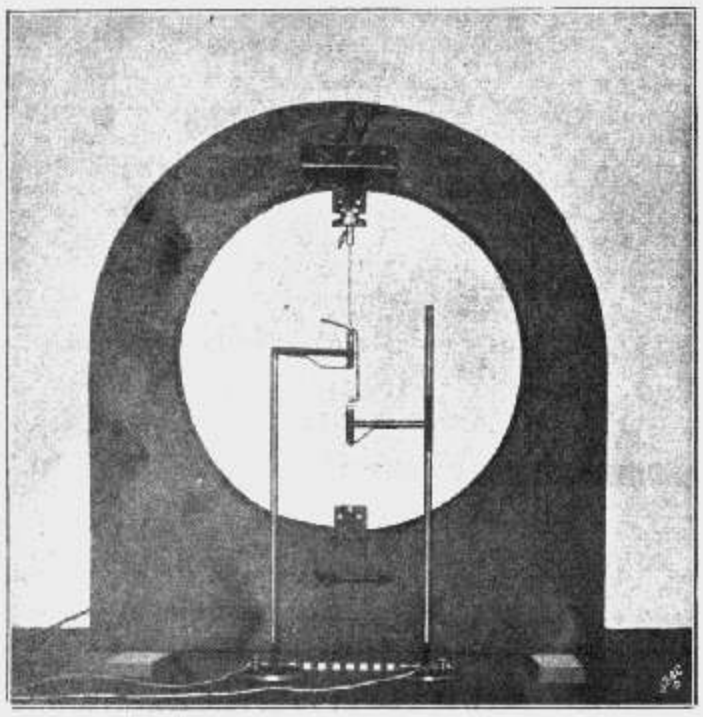
63,005. **Complementary Parts to Pole Balance No. 60,135,** in order to show with it the unit of electric current-density, Figure (*loc. cit.* Fig. 10) 0. 12. 0



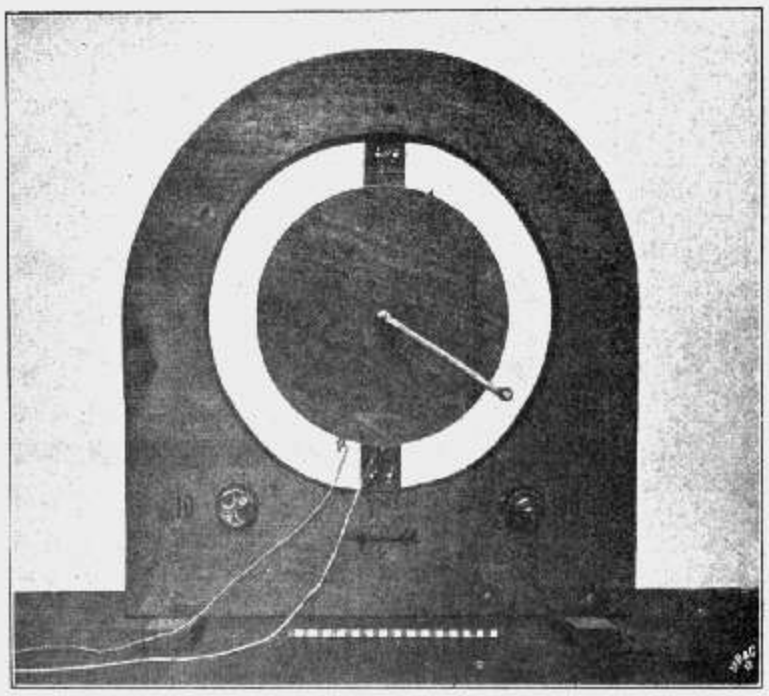
63 006 A. 1 : 12.



63 006 C. 1 : 12.



63 006 B. 1 : 12.



63 006 D. 1 : 12

63,006. **Coil for Generating a Homogeneous Magnetic Field,** Figs. A to E (cf. Grimsehl, Figs. 960, 964, 967), with accessories for demonstrating following experiments: . . . £ 15. s. 0. d. 0

(a) **Ponderomotive Effect,** Fig. B (*loc. cit.* Figs. 12 and 13) and Fig. C (*loc. cit.* Figs. 14 and 15);

(b) **Quantitative Measurements on Electromagnetic Induction,** Fig. D (*loc. cit.* Fig. 19);

(c) **Generation of Alternating Current,** Fig. E (*loc. cit.* Fig. 23);

(d) **Calibration of a Ballistic Galvanometer** (*loc. cit.* p. 35).

63,007. **Electromagnet with 2 Foot Terminals, 1 Switch and Flexible,** Figure (*loc. cit.* Fig. 17; Grimsehl, Fig. 958), without cells 2. 5. 0

63,008. **Pole-determining Cell** (*loc. cit.* p. 26) with double flexible soldered on 0. 3. 0

Cl. 5909, 5913, 5911, 5912.

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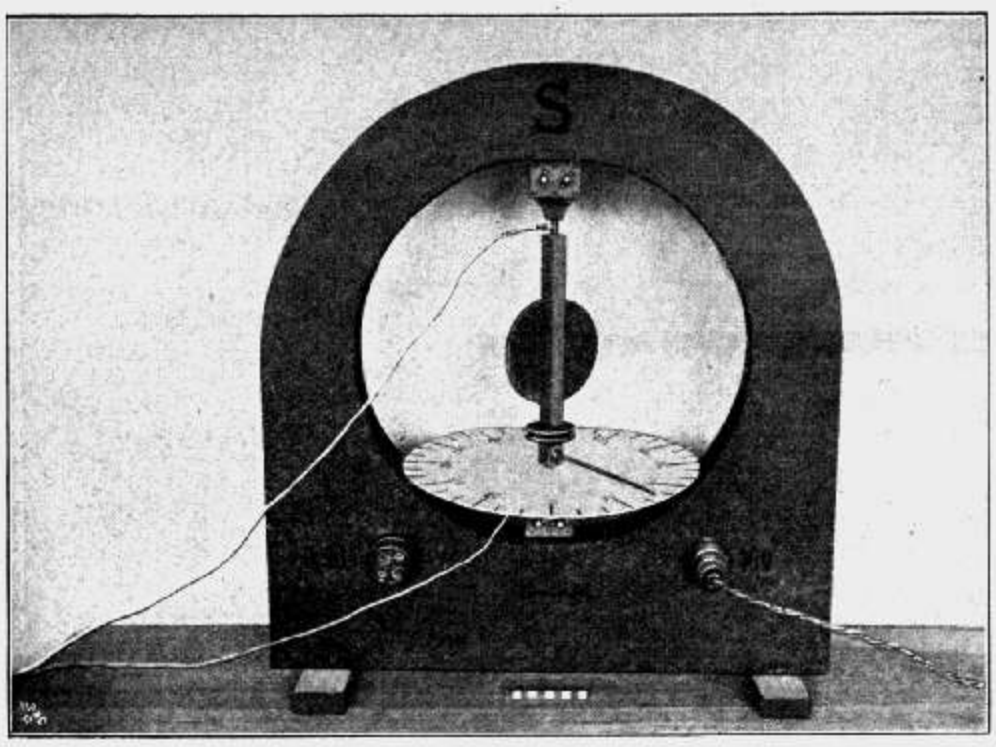
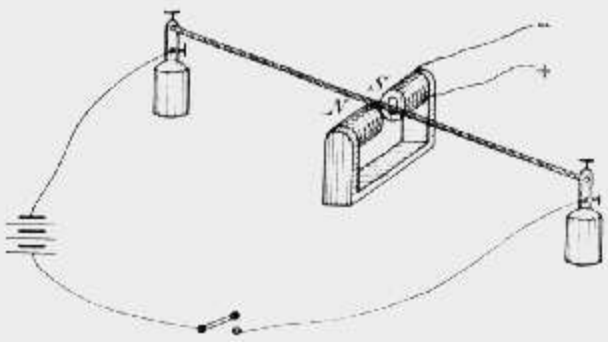
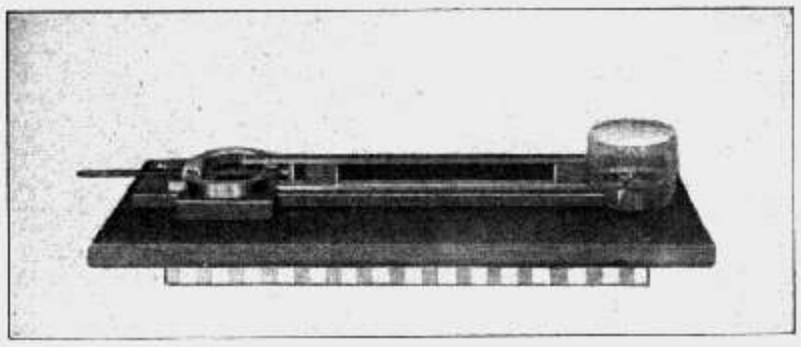


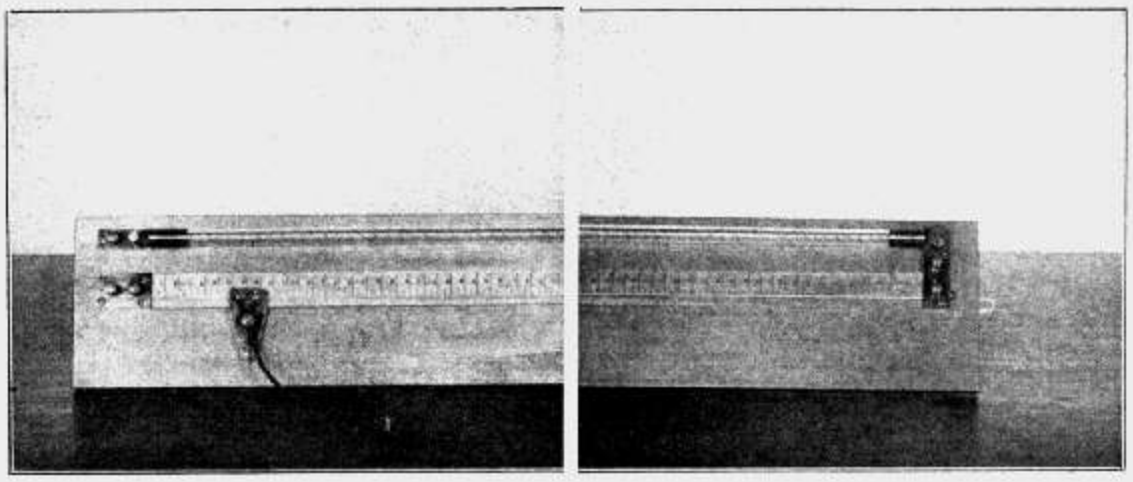
63 006 E. 1 : 12.



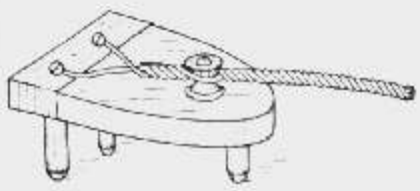
63 007.



63 009. 1 : 5.



63 010 A.



63 010 B.

63,009. **Device for Generating a powerful Induction Current** by moving a single conductor in a magnetic field, Figure (*loc. cit.* Fig. 18; cf. Grimsehl, Fig. 959), consisting of ring magnet, galvanoscope and a low resistance conductor . . . . . £ 2. 16. 0

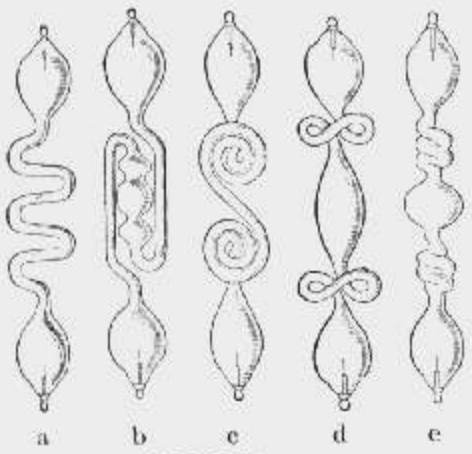
63,010. **Device for Shunting small Potential-differences** for Galvanometer Calibrations and the like, Figs. A and B (*loc. cit.* Figs. 20 and 21) 2. 5. 0

62,094. **Paper Condenser,** 2 mfds., for calibrating a ballistic galvanometer (*loc. cit.* p. 36). 4. 10. 0

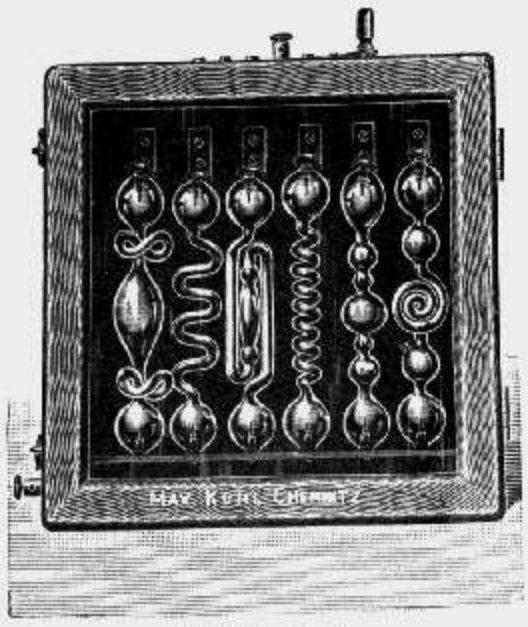
61,138. **Pohl's Mercury Switch** for above 1. 4. 0

61,302. **Mirror Galvanometer** after Weinhold, cf. Figure on p. 877 . . . . . 7. 10. 0

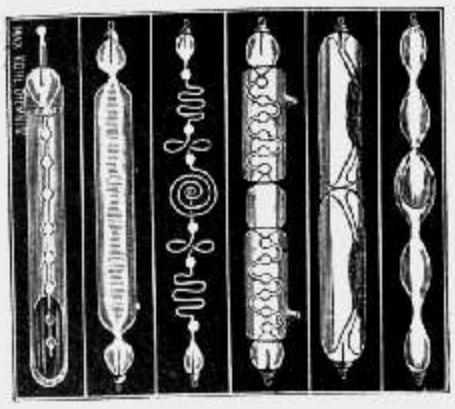
Cl. 5910, 5918, 5916, 5915, 5914, 5923.



63 020/24 a—e.



63 028. 1 : 5.


63 032. 1 : 6.

Section 8: Electric Conduction in Gases.

Geissler Tubes.

£ s. d.

Electric Eggs and Geissler Tubes evacuating automatically: see p. 830, items Nos. 60,577/8.

6 Geissler Tubes of different shape and colour, in cardboard box. Figs. 63,020 to 63,024 a—e show a few of the shapes.

List No.	63,020	63,021	63,022	63,023	63,024
Approx. length cm	12	16	20	25	30
£	0. 5. 0	0. 6. 0	0. 8. 0	0. 10. 0	0. 12. 0

63,025. **New Geissler Tubes** consisting of five kinds of glass and lighting up in different colours (dark red, violet-purple, yellow, uranium green and neutral), about 20 cm long . . . 0. 3. 0

63,026. — idem, approximately 30 cm long 0. 4. 0

63,027. — idem, approximately 40 cm long 0. 5. 0

63,028. **6 Geissler Tubes of different shape and colour,** Figure, each about 20 cm long, in small wood box with glass lid, with switch to permit of one tube after the other being lit up without having to change the leads 1. 12. 0

63,029. — idem, the tubes approx. 25 cm long 1. 18. 0

63,030. — idem, the tubes approx. 30 cm long 2. 4. 0

63,031. **4 Geissler Tubes** approx. 20 cm long, in cardboard box, as follows:
1 tube with fluorescent liquid, 1 ditto with phosphorescent substance, 1 ditto with uranium glass beaker, 1 ditto with spirals 0. 12. 0

63,032. **6 Geissler Tubes,** Figure, approx. 25 cm long, in cardboard box, as follows:
1 tube with fluorescent liquid, 1 ditto with phosphorescent substance, 1 ditto with 2 gases, 1 ditto with uranium and white glass, 1 ditto changing colour when heated, 1 ditto containing mercury which lights up when shaken 0. 16. 0

63,033. **7 Geissler Tubes** approx. 35 cm long, in cardboard box, as follows:
1 tube with 2 fluorescent liquids, 1 ditto with 2 phosphorescent substances, 1 ditto with 2 Gases, 1 ditto with uranium and white glass, 1 ditto changing colour when heated, 1 ditto lighting up when shaken, 1 ditto with stratified light 1. 10. 0

63,034. **Geissler Tube,** with 1 fluorescent liquid, cylindrical, Figure, approx. 25 cm long 0. 3. 0

63,035. — idem, with 2 liquids, cylindrical, approx. 35 cm long 0. 6. 0

63,036. **Geissler Tube,** Figure, with four fluorescent liquids, with wood base, 30 cm high 0. 10. 0

63,037. — idem, with 2 fluorescent liquids, on wood base, approx. 25 cm high 0. 5. 0

Cl. 6516, 6520, 6517, 6518, 6519, 2898, 2899.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



63 034. 1 : 5.



63 038. 1 : 6.



63 039.



63 040. 1 : 4.



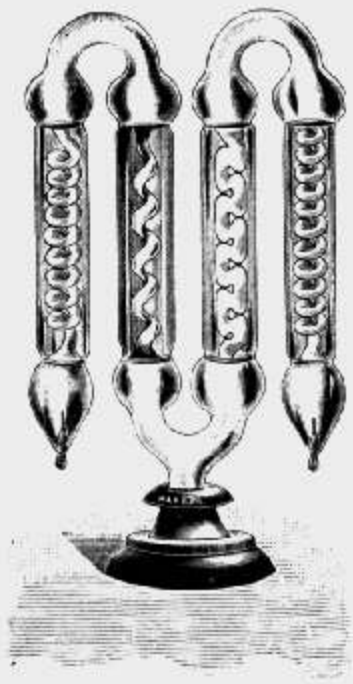
63 042. 1 : 10.



63 043. 1 : 5.



63 046. 1 : 5.



63 036. 1 : 4.



63 048. 1 : 7.

	£ s. d.
63,038. **Geissler Tube,** large pattern, with 2 fluorescent liquids, approx. 50 cm high, Figure, on base	1. 0. 0

Geissler Tubes, Figures, **with pulverulent phosphorescent substances**

List No.	**63,039**	**63,040**	**63,041**
Number of Substances	1	2	4
Approx. Length cm	25	35	50
£	**0. 3. 0**	**0. 5. 0**	**0. 12. 0**

63,042. **Geissler Tube,** Figure, with luminescent gas, bent simply, approx. 60 cm long	0. 15. 0
63,043. **Geissler Tube,** Figure, with stratified light, cylindrical, approx. 35 cm long	0. 4. 0
63,044. — idem, 50 cm long	0. 6. 0
63,045. — idem, 100 cm long	0. 10. 0
63,046. **Geissler Tube with stratified light,** Figure, with bulbs, approx. 50 cm long (cf. Gan.-Man. Fig. 678; Gan.-Rein. Fig. 993)	0. 10. 0
63,047. — idem, approx. 100 cm long	0. 18. 0
63,048. **Geissler Tube,** Figure, filled with three different gases, approx. 75 cm long	0. 15. 0
63,049. — idem, approx. 100 cm long	1. 0. 0
63 050. — idem, approx. 150 cm long	1. 10. 0
63,051. — idem, **filled with 2 gases,** approx. 35 cm long	0. 5. 0

Spectrum Tubes: see p. 515 of this price list.

Cl. 6521, 2900, 2901, 6585, 6522, 2904, 2905, 2906, 2907.



63 052. 1 : 6.



63 056. 1 : 8.



63 055. 1 : 6.



63 058. 1 : 6.



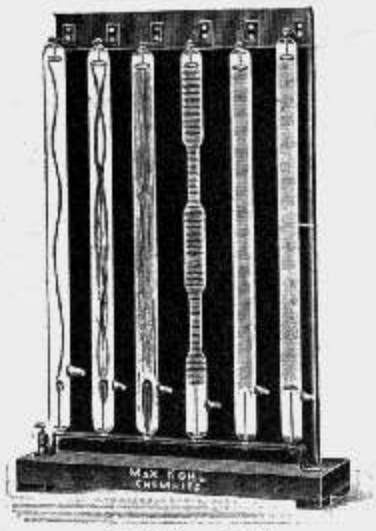
63 057. 1 : 4.



63 060.



63 059. 1 : 5.



63 061. 1 : 9.



63 062.

63,052. **Geissler Tube,** Figure, with uranium glass bulbs outside and stratified light in the centre, 60 cm long . . . . . £ 0. 9. 0

63,053. — idem, 100 cm long 0. 15. 0

63,054. — idem, 150 cm long 1. 5. 0

63,055. **Geissler Tube lighting up by friction,** Figure, 50 cm long 0. 8. 0

63,056. **Geissler Tube,** Figure, **with mercury,** lighting up by shaking, 35 cm long . . . 0. 5. 0
These tubes are used in spiritualistic demonstrations for producing "spirit hands".

63,057. **Geissler Tube,** Figure, **with mercury salts,** the colour changing when heated, 35 cm long 0. 3. 0

63,058. **Holtz's Tube,** Figure, 40 cm long, double 0. 10. 0
The glow light passes in one direction only through the funicular apertures. The induction coil used must work without closing current.

63,059. **Hittorff's Tube,** Figure, with base 0. 15. 0
The current takes the longer path through the spiral-shape bent tube, since the discharge at the points of the electrodes is prevented by the static electricity of the tube surrounding them.

63,060. **Absolute Vacuum Tube,** Figure 0. 12. 0

63,061. **Vacuum Scale** after Cross, Figure, with stand and change-over switch, with tubes 50 cm long 2. 4. 0
The scale consists of six vacuum tubes evacuated to different degrees, viz., (1) luminous thread (de la Rive's apparatus); (2) luminous band; (3) stratified formation; (4) Geissler vacuum; (5) Tesla vacuum; (6) Crookes's vacuum — Röntgen vacuum. The change-over arrangement is double-pole thus obviating any illumination of the tubes which are not connected up.

Vacuum Bulbs with different degree of vacuum and differently illuminating types of glass:

63,062. — with luminous strips, with base, Figure 0. 6. 0

63,063. — with luminous band, with base 0. 6. 0

63,064. — with Geissler light, with base 0. 6. 0

63,065. — with white stratified light (CO_2), with base 0. 7. 0

63,066. — with Tesla vacuum, with base, Figure 0. 7. 0

63,067. — with Crookes vacuum and green phosphorescent glass, with base 0. 8. 0

63,068. — with Crookes vacuum and bluish-white phosphorescent glass, with base 0. 8. 0

63,069. — with Crookes vacuum and red phosphorescent glass (didymium-cerium glass), with base 0. 10. 0

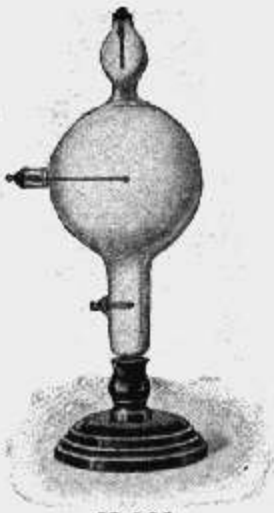
63 070. X-RayTube, for automatic evacution, with rubber tube attachemet, Figure . . 1. 0.

For X-Ray Tubes for Practical Purposes: see p. 985.

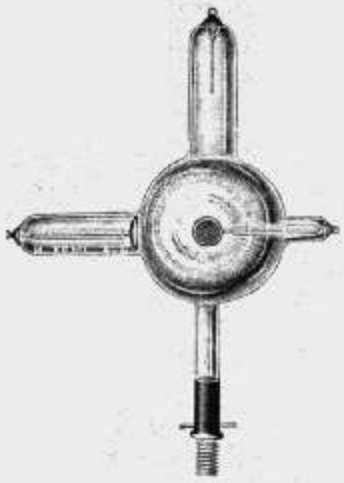
Cl. 2908, 6524, 6523, 2911, 2910, 2913, 2912, 2914, 6506.

Max Kohl A. G. Chemnitz, Germany.

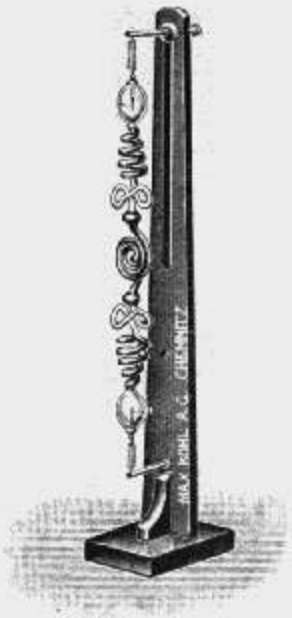
Max Kohl A. G. Chemnitz, Germany.



63 066.



63 070. 1 : 6.



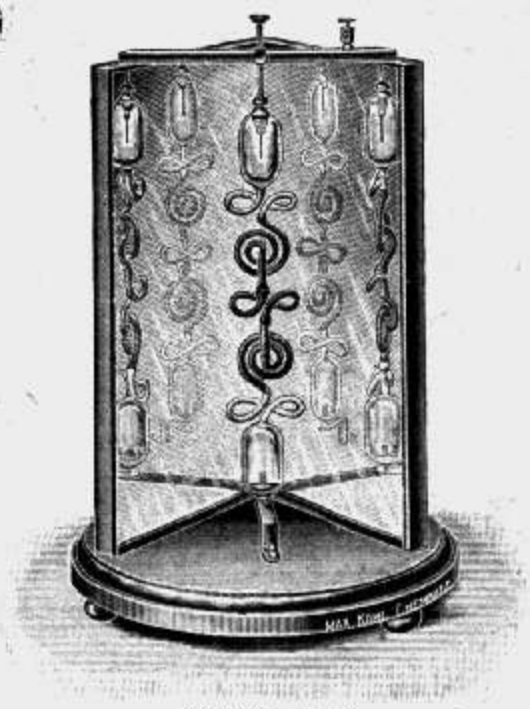
63 071. 1 : 5.



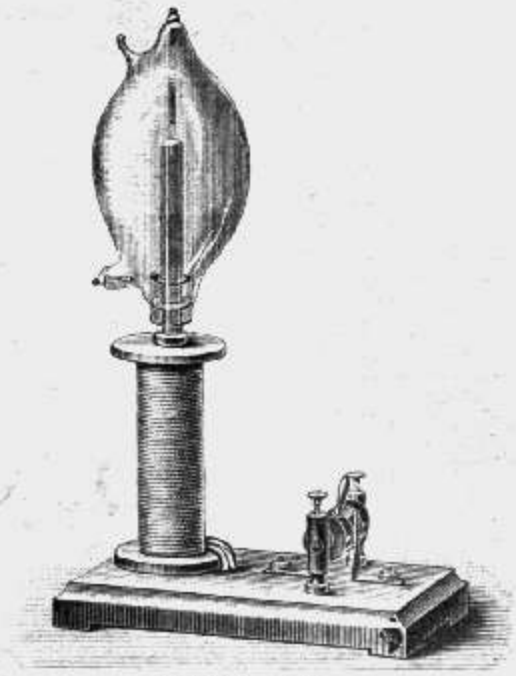
63 075. 1 : 10.



63 076.



63 077. 1 : 6.



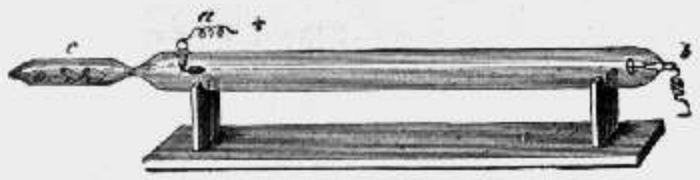
63 079. 1 : 5.

	£ s. d.
Stands for clamping Geissler Tubes, Figure, for tubes to 30 cm length; prices without tubes:	
List No. **63,071** **63,072** **63,073** For 1 2 3 tubes £ **0. 10. 0** **0. 12. 0** **0. 15. 0**	
63,074. — idem, for a Geissler tube to 60 cm length	0. 15. 0
63,075. **Ozone Generating Tube** after Siemens, Figure	0. 15. 0
63,076. — idem, after G. Müller, Figure	0. 12. 0
63,077. **Angle Mirror for Geissler Tubes,** for manifolding the phenomenon, for tubes of 30 cm length, Figure	1. 10. 0
62,321. **Electromagnetic Motor for rotating Geissler Tubes** of length up to 20 cm, Figure on p. 958	0. 16. 0
52,057. **Rotating Device for Geissler Tubes** of 30—50 cm length, for the Whirling Table, Figure on p. 287	1. 18. 0
52,058. **Poggendorff's Disc,** for illuminating by Geissler Tube, Figure on p. 287, for shewing the intermittent course of the luminous flux (M. P. 9th Edn., III, Fig. 763), with a Geissler tube	0. 15. 0
63,078. **Apparatus** after De la Rive, **for shewing the rotation of the electric luminous flux about an electromagnet,** on stand, without commutator	1. 2. 0
63,079. — idem, with commutator, Figure	1. 8. 0
63,080. — idem, arranged so that it can be evacuated, with glass stopcock	1. 10. 0

Cl. 6504, 5362, 5538, 5003, 3022, 3859, 2916.



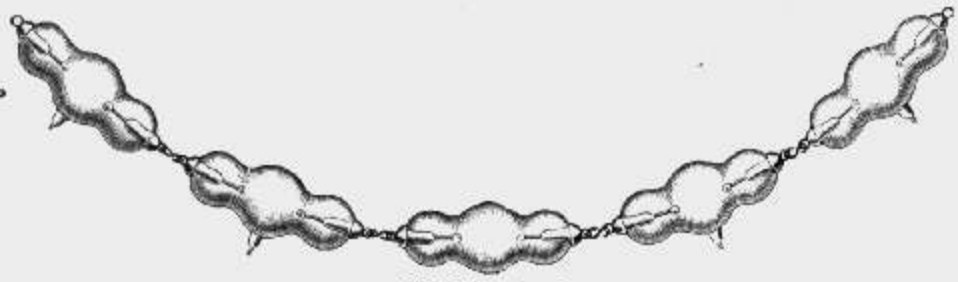
63 082.



63 086. 1 : 4.



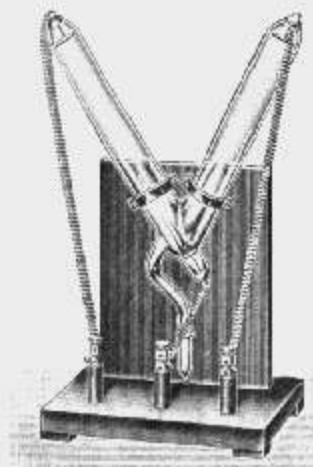
63 083. 1 : 5.



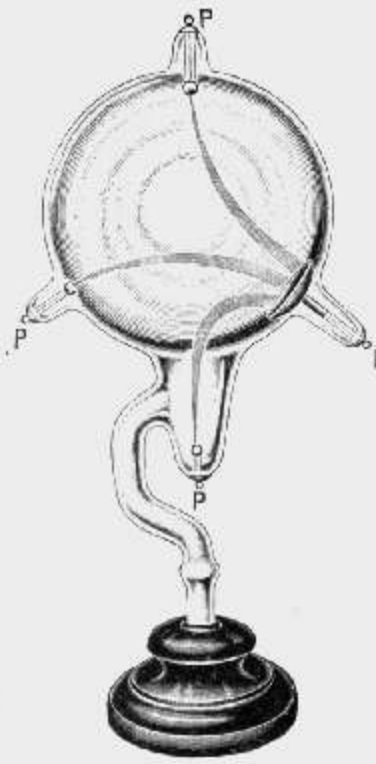
63 084. 1 : 5.



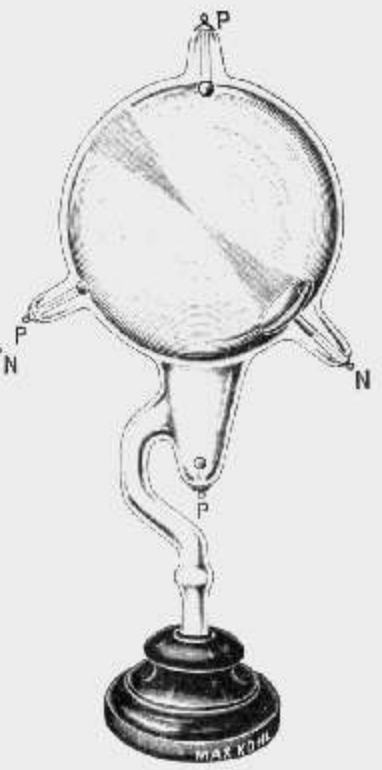
63 085. 1 : 4.



63 087. 1 : 5.



63 088 a. 1 : 4.



63 088 b.



63 089. 1 : 4.

Cookes Apparatus for Experiments on Radiant Matter.

The numbers of the tubes correspond to the figure-numbers of the work:

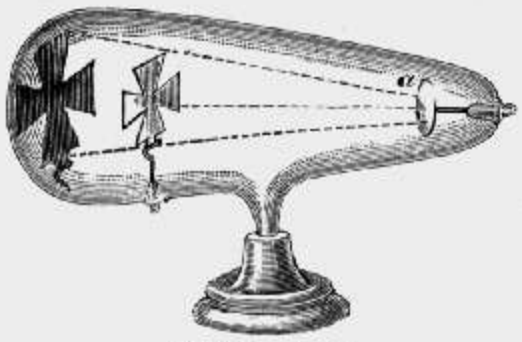
	£ s. d.
63,081. **Radiant Matter, or the fourth Aggregate Condition,** by William Crookes, German text by Dr. H. Gretschel, Leipsig, Quandt and Händel, 1879	0. 2. 6
The text beyond the bracket corresponds to the titles of the chapters.	
63,082. No. 1. With base, Figure (M. P. 9th Edn., III, Fig. 769), for demonstrating the dark space	0. 8. 0
63,083. No. 2. Without stand, 3 tubes, Figure	0. 10. 0
63,084. — idem, 5 tubes, Figure	1. 4. 0
63,085. No. 4. With base, Figure (M. P. 9th Edn., III, Fig. 766)	0. 8. 0
63,086. No. 5. With stand, Figure (M. P. 9th Edn., III, Fig. 772)	0. 12. 0

Radiant Matter exerts a powerful phosphorogenic action where it occurs.

Cl. 2921, 2918, 2917, 2919, 2920, 6099, 2923, 2924.

Max Kohl A. G. Chemnitz, Germany.

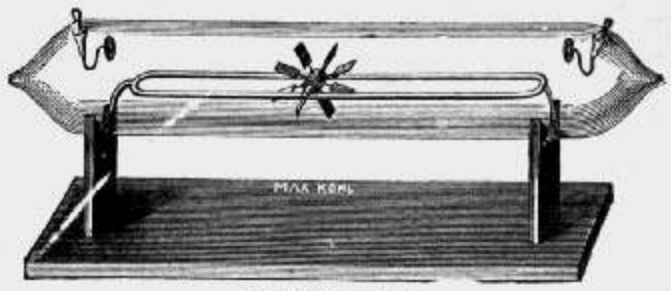
Max Kohl A. G. Chemnitz, Germany.



63 090. 1 : 4.



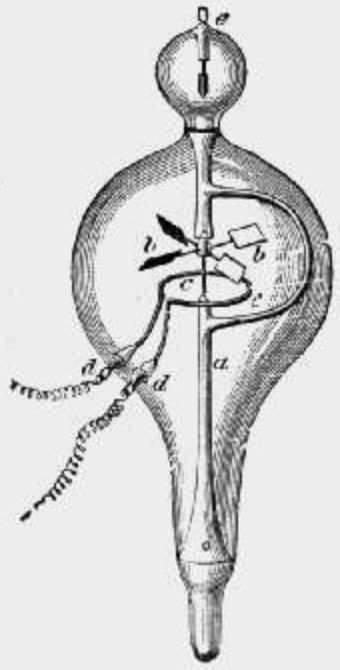
63 019. 1 : 4.



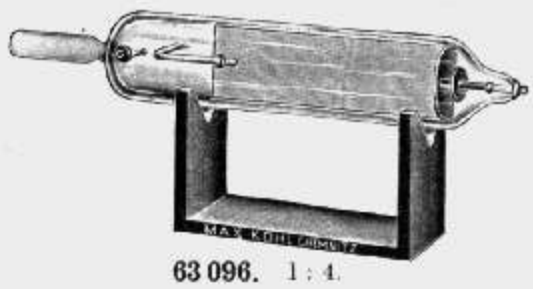
63 092. 1 : 3.



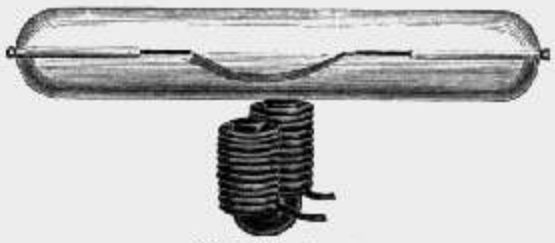
63 091. 1 : 4.



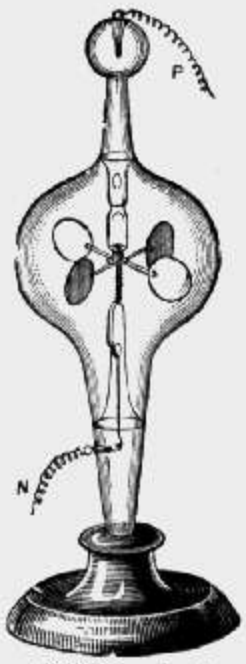
63 094. 1 : 4.



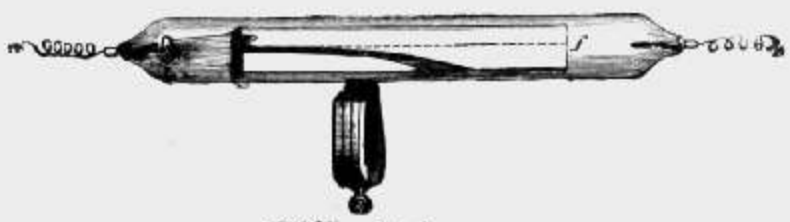
63 096. 1 : 4.



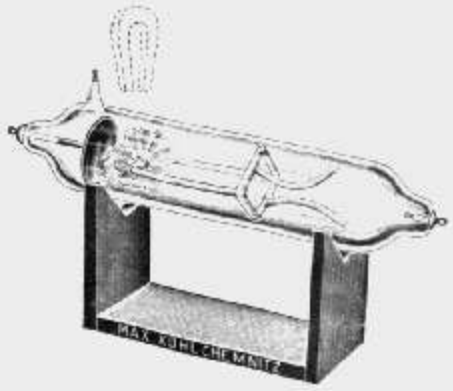
63 097. 1 : 4.



63 093. 1 : 4



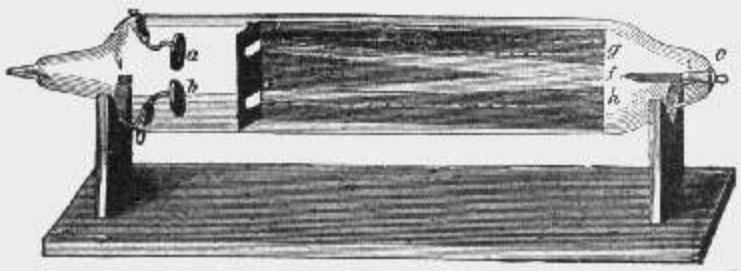
63 095. 1 : 4.



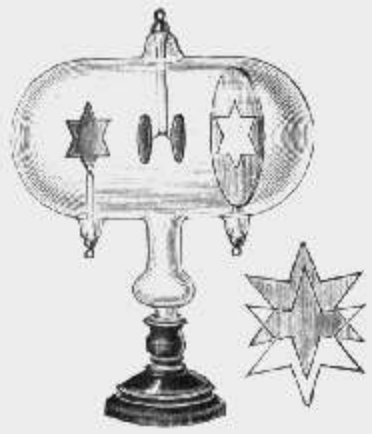
63 098. 1 : 5.

		£ s. d.
63,087. No. 6. With Stand, Figure	Radiant Matter moves in straight lines. . . .	1. 0. 0
63,088. No. 7a and b. With base, Figures (M. P., 9th Edn., III, Fig. 770; Gan.-Rein. Fig. 994)		0. 16. 0
63,089. No. 8. With base, Figure		0. 8. 0
63,090. No. 9. With base, Figure (M. P., 9th Edn., III, Fig. 771; Gan.-Man. Fig. 681; Gan.-Rein., Fig. 995) (radiant matter intercepted by a solid casts a shadow)		0. 12. 0
63,019. **Cross-shadow Tube** after Crookes-Fleming, Figure, for use with the magnet coil listed below		0. 15. 0
63,091. **Tubular Magnet Coil** for above, Figure . . . . . If this magnet coil is slipped over the tube the crossed shadow is deflected to one side or the other according to the direction of the current in the winding.		1. 0. 0
63,092. No. 11. With stand, Figure (M. P., 9th Edn., III, Fig. 773; Gan.-Rein., Fig. 996)	Radiant Matter exerts a powerful mechanical action where occurring. . . .	0. 16. 0
63,093. No. 12. With base, Figure		0. 9. 0
63,094. No. 13. With base, Figure		0. 9. 0
63,095. No. 14. With Stand, but without magnet, Figure (M. P., 9th Edn., III, Fig. 780)	Radiant Matter is deflected by a magnet. . . .	0. 11. 0
63,096. No. 15. With Stand, but without magnet, Figure		0. 11. 0
63,097. No. 16. With Stand, but without magnet, Figure		0. 4. 0
63,098. No. 17. With Stand, but without magnet, Figure		0. 16. 0

Cl. 2925, 3563, 2926, 3564, 2930, 2928, 2931, 2927, 2929, 2932.



63 099. 1 : 3.



63 105. 1 : 5.



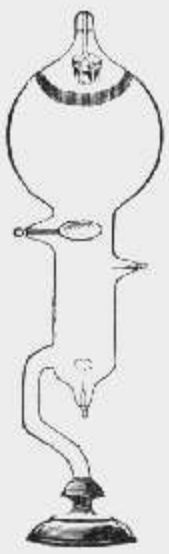
63 100. 1 : 6.



63 101. 1 : 4.



63 103. 1 : 5.



63 104. 1 : 6.



63 106. 1 : 5.

		£ s. d.
63,099. No. 18. With Stand, Figure		0. 13. 0
63,100. No. 19. With base, Figure	Radiant Matter generates heat when impeded.	0. 8. 0
63,101. No. 21. With base, Figure (M. P., 9th Edn., III, Fig. 774; Gan.-Rein. Fig. 997)		0. 12. 0

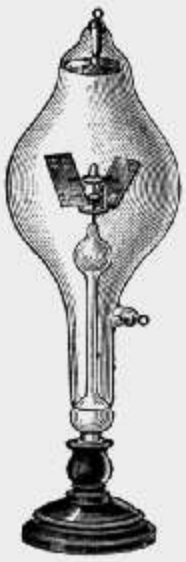
Puluj's Apparatus for Experiments on Radiant Electrode Matter.

The numbers in brackets refer to the figure-numbers in the work:

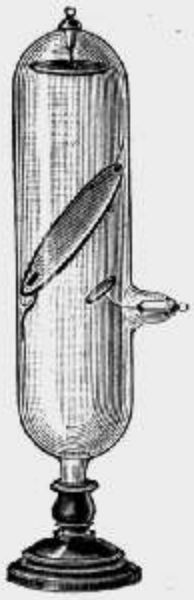
63,102. **Strahlende Elektroden-Materie,** by Dr. J. Puluj, Vienna: Carl Gerolds Sohn	0. 2. 6
63,103. (3) **Apparatus for Demonstrating the Conduction of Heat in Mica** and the phosphorescence phenomenon connected therewith, Figure	0. 12. 0
63,104. (4) **Apparatus for Phosphorescence in the Electric Shadow,** Figure	0. 12. 0
63,105. (7) **Tube with light and dark Cross,** Figure	0. 12. 0
63,106. (38) **Electric Radiometer,** Figure, with rotating mica cylinder	1. 0. 0
63,107. (40) — with semi-cylindrical vanes	0. 9. 0
63,108. (43) — with phosphorescent vanes, Figure	0. 15. 0

Cl. 2933, 2937, 2934, 2935, 2936, 6515, 2938.

Max Kohl A. G. Chemnitz, Germany.



63 108. 1 : 5.



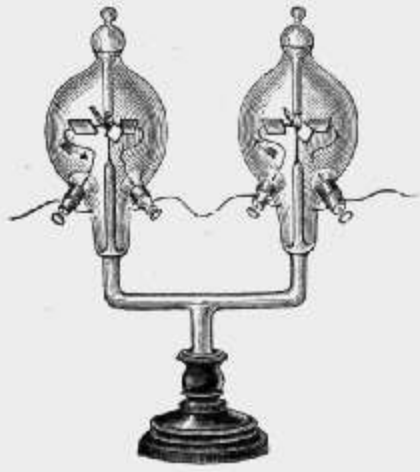
63 111. 1 : 5.



63 112. 1 : 6.



63 113. 1 : 5.



63 114. 1 : 5.



63 115. 1 : 5.



63 116. 1 : 5.



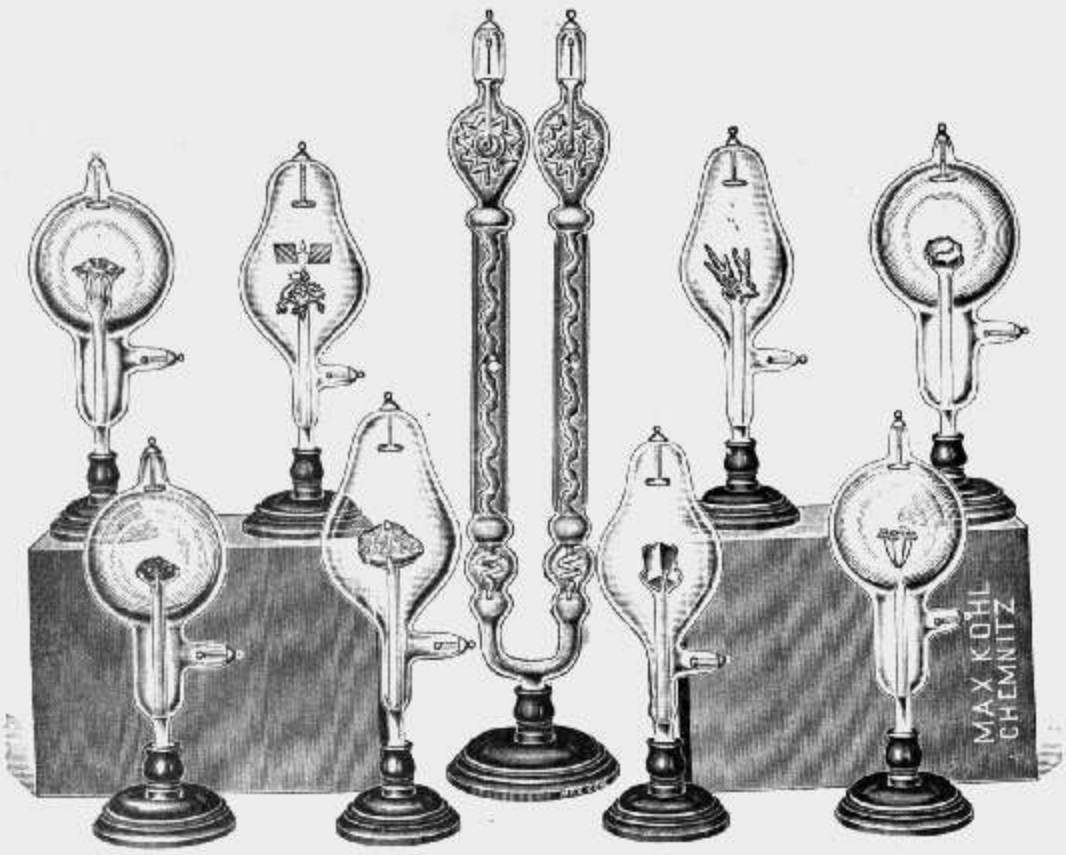
63 117. 1 : 5.



63 118. 1 : 5.

	£ s. d.
63,109. (44) **Electric Radiometer,** with fixed vanes and rotating phosphorescent disc . . .	0. 15. 0
63,110. (45) — with fixed vanes and 2 discs rotating in opposite directions	1. 2. 0
63,111. (46) **Phosphorescent Lamp,** Figure	0. 14. 0
63,112. **Puluj's Lamp with 2 phosphorescent colours,** Figure	0. 18. 0
Under the action of cathode rays the two circular halves light up in the same colour but subsequently phosphoresce in different colours.	
63,113. (50) **Valve Tube,** Figure	0. 8. 0
When the vacuum is high the discharge can only pass in one direction through the tube, since this charge is influenced by the static charge of the glass walls. This tube is the original copy of the valve-tubes now used in X-ray practice for suppressing the light occurring on making.	
63,114. (54) **Zöllner's Double Radiometer,** Figure, with normal and abnormal rotation, with base	1. 0. 0
63,115. **Vacuum Tube** with phosphorescent mineral, Figure, with base	0. 13. 0
63,116. **Vacuum Tube with three different phosphorescent minerals,** constructed of phosphorescent glass, Figure	1. 4. 0
63,117. **Vacuum Bulb** with butterfly, Figure, with base	0. 16. 0
63,118. **Radiometer** with bouquet, Figure, with base	1. 10. 0

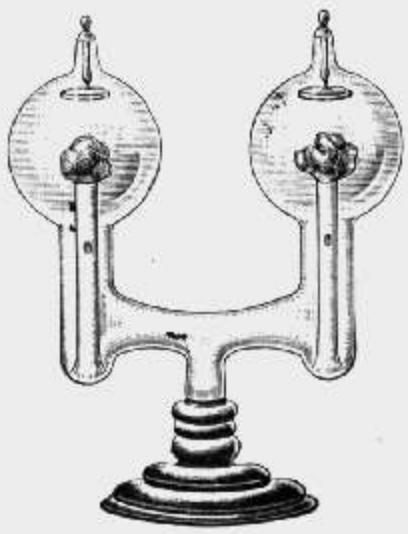
Cl. 2939, 2941, 3565, 2941 a, 2942, 2943, 2944, 2946, 2947.



Tube with 5 phosphorescent Minerals | Radiometer with Bouquet | Geissler Tube | Tube with Coral | Tube with Dolomite

Tube with Lava | Tube with artificial Ruby | Tube with Double Spar | Tube with 2 Cape Diamonds and 2 Ceylon Rubies and 1 Apatite.

63 119. 1 : 8.



63 124.

63,119. **Collection of 8 Vacuum Tubes and 1 Geissler Tube,** 55 cm high, with 2 fluorescent liquids, Figure . . . . . £ 9. 10. 0

The set comprises: 1 Tube with Coral (£ **0. 12. 6**); 1 Tube with Dolomite (£ **0. 12. 6**); 1 Tube with Double Spar (£ **0. 12. 6**); 1 Tube with Lava (£ **0. 12. 6**); 1 Tube with **5** different Phosphorescent Minerals (£ **0. 16. 0**); 1 Tube with artificial Ruby (£ **1. 2. 0**); 1 Tube with 2 Cape Diamonds, 2 Ceylon Rubies, and 1 Apatite (£ **2. 10. 0**); 1 Radiometer with bouquet (£ **1. 10. 0**) and 1 Geissler Tube with 2 fluorescent liquids (£ **1. 5. 0**).

63,122. **Vacuum Tube with 2 Cape Diamonds, 2 Ceylon Rubies, 1 Apatite** (cf. Fig. 63,119) . £ 2. 10. 0

63,123. **Vacuum Tube of Didymium-cerium Glass,** phosphorescing red, with 7 ground glass stones, which when mixed with metallic oxides phosphoresce differently . . . . . £ 1. 7. 0

63,124. **Vacuum Double Bulb,** after Winkelmann, Figure, for showing oscillatory discharges with spark-gap connected in parallel (Ztschr. f. d. phys. u. chem. U. **17**, 1904, p. 37) . . . . . £ 1. 4. 0

Goldstein Tubes.

63,125. **Deflection Tube,** cathode consisting of 2 parallel aluminium wires, with base . . . £ 0. 11. 0

63,126. — idem, cathode consisting of a star-shaped bent wire, Figure, with base. . £ 0. 11. 0

63,127. — idem, cathode consisting of star-shaped cut-out concave mirror, Figure, with base . . . . . £ 0. 11. 0

63,128. **Vacuum Tube,** with piece of gold or stamped aluminium sheet, with base, Figure £ 0. 11. 0

63,129. **Canal Ray Tube,** Figure, with base . . . . . £ 0. 17. 0

The cathode (**a**) consists of a grill-shaped aluminium sheet, while (**b**) is the anode. Violet rays are emitted from the canals formed by the grill. These rays are difficult to influence, and indeed this can only be done by powerful magnets, while the cathode rays which cause the phosphorescence of the glass and also the anode light-pencil in the lower tube can, as is well known, easily be deflected.

Max Kohl A. G. Chemnitz, Germany.



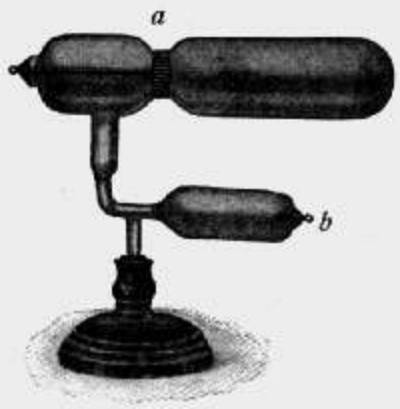
63 126. 1 : 5.



63 127. 1 : 5.



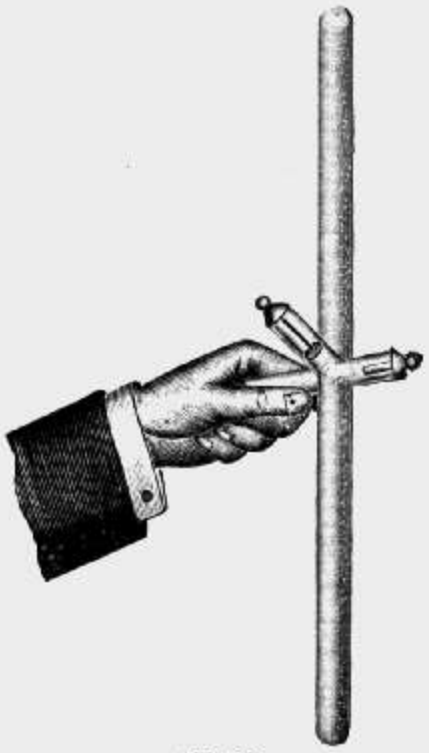
63 128.



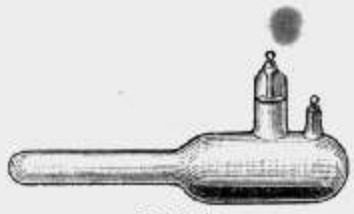
63 129.



63 130. 1 : 4.



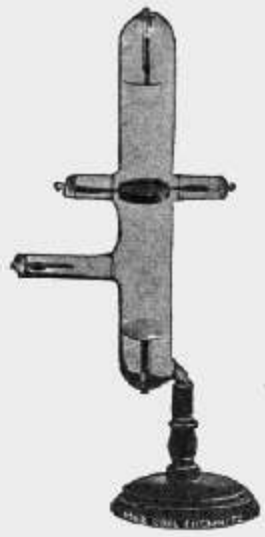
63 133.



63 132.



63 134.



63 131. 1 : 4.

63,130. **Canal Ray Tube** after Goldstein, new, simpler pattern; with polished wood base, Figure . . . . . £ 0. 15. 0

63,131. — idem, after Wien, with polished wood base, Figure . . . . . £ 1. 4. 0

This tube permits of showing the positive and negative charges of the cathode and canal rays. The perforated plate is earthed, the aluminium wire being the anode. If, then, the first electrode disc is connected with the negative terminal of a well-insulated induction coil, the cathode rays pass through the perforated plate, strike on the other disc and give a current of negative electricity if this latter disc is connected with a sensitive electrometer. If, now, the negative terminal of the induction coil is connected with the perforated plate (the earth connection remaining) instead of with the disc, a current of positive electricity is obtained from the cathode rays which are then emitted.

63,132. **Goldstein Tube,** Figure, filled with powdered sodium chloride, potassium chloride, potassium iodide, or potassium bromide. The substances mentioned change colour under the action of the cathode rays (Annalen der Physik und Chemie, Vol. 60, 1897, p. 491) £ 0. 6. 0

The lead (a quite flexible stranded conductor) from a small induction coil (of not more than 3 cm spark-length) is slung fast to the platinum eyes. The thinner portion of the tube is clamped in a wood retort-holder or the like and while the current is passing through, the powder is approriately shaken up. In a few seconds this powder has assumed the characteristic colouring under the influence of the cathode rays, and this colour only disappears after a fairly considerable lapse of time. If only a large induction coil is available a 2—3 centimetre spark-gap must be put in parallel with the tube.

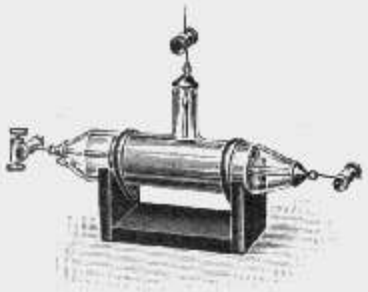
63,133. **Goldstein Tube** with powders phosphorescing in different colours; for tilting over, Figure . . . . . £ 0. 12. 0

Cathode Ray Tubes after Braun: see p. 899.

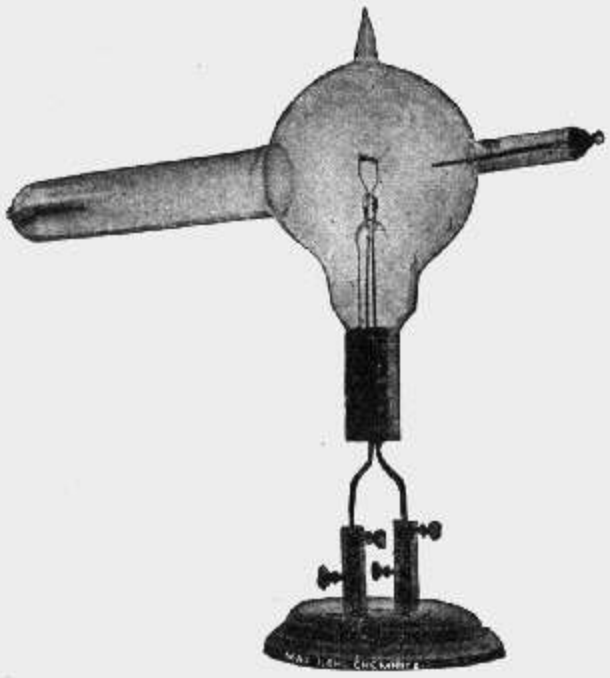
63,134. **Vacuum Tube** after Thomson, Figure, for studying the deflectivity of the cathode rays by static electricity and by magnets, with osmose regeneration to enable the vacuum to be maintained uniform . . . . . £ 2. 5. 0

63,135. **Wood Stand** for above . . . . . £ 0. 6. 0

Cl. 2949, 2950, 6507, 6505, 3566, 6508, 6502, 6503, 3572.



63 136. 1 : 4.



63 137. 1 : 4.



63 138. 1 : 4.

Wehnelt Valve Tubes.

£ s. d.

63,136. **Small Valve Tube** after Wehnelt, Figure (Drudes Ann. d. Phys. 1904, Vol. 14, p. 425; Ztschr. f. d. phys. u. chem. U. **18**, 1905, p. 193) 1. 2. 0

This tube is used more particularly for converting weak currents of high frequency into pulsating direct current, and can be employed as a wave-detector (audion) for wireless telegraphy, as well as for demonstrating saturation-current phenomena. It has a cylindrical metal anode, and wire-shaped cathode coated with a metallic oxide.

Metals coated with oxides behave very differently at high temperatures as regards the emission of electrons. If a discharge tube having an incandescent electrode coated with an oxide and one or more metal electrodes is connected up to an A. C. circuit, the tube acts as a valve to the current, allowing the current to flow in one direction only. By utilising a number of tubes both phases of the A. C. can be used for conversion into pulsating D. C., or it is even possible to employ all phases of a triphase current. The oxide-coated metal electrode of the valve tube is heated by means of a small transformer or a few accumulators, a suitable regulating resistance being inserted until a yellow glow is attained (1300 to 1400° C.).

63,137. **Large Valve Tube** after Wehnelt, Figure, for transforming heavy currents, with base 1. 10. 0

This tube has a second anode contained in a cylindrical annex, by using which a magnificent stratified discharge is obtained.

63,138. **Cathode Ray Tube** (Valve Tube), Figure, with base 1. 10. 0

This is used for demonstrating the diffraction of the cathode rays into a circle in a homogeneous magnetic field (determining the ratio of charge to mass and velocity of the cathode ray particles) and the practically parabolic curvature of the rays in the electrostatic field in this instance.

The cathode has only a small oxide-spot from which a sharply defined cathode ray pencil issues when the current passes through. The experiments in which the tube has not to act as a valve are most conveniently carried out with a 110—120 volt D. C., in which case the incandescent oxide electrode serves as a cathode.

63,139. **Liquid Resistance** for putting in series with the Valve Tubes for preventing disturbance at the electrodes 0. 1. 0

The liquid used is water, which can be rendered slightly alkaline for reducing the resistance.

63,140. **Vacuum Tube for Deflection Experiments** after Braun-Wehnelt, with oxide cathode (Physikal. Ztschr. **6**, p. 732), Figure, with small horse-shoe magnet and stand . 2. 0. 0

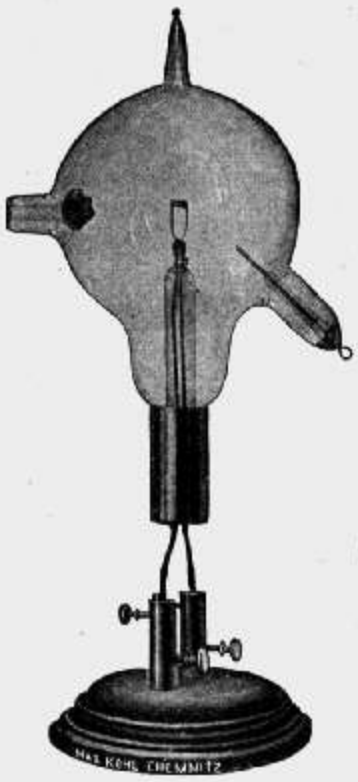
63,141. **Vacuum Tube with Oxide Cathode and Phosphorescent Mineral,** Figure, with base 1. 10. 0

63,144. **Thomson's Luminous Sphere** for demonstrating the luminous zones in vacuum bulbs inside a discharge circuit (Ztschr. f. d. phys. u. chem. U. **5**, 1892, p. 207) 0. 3. 0

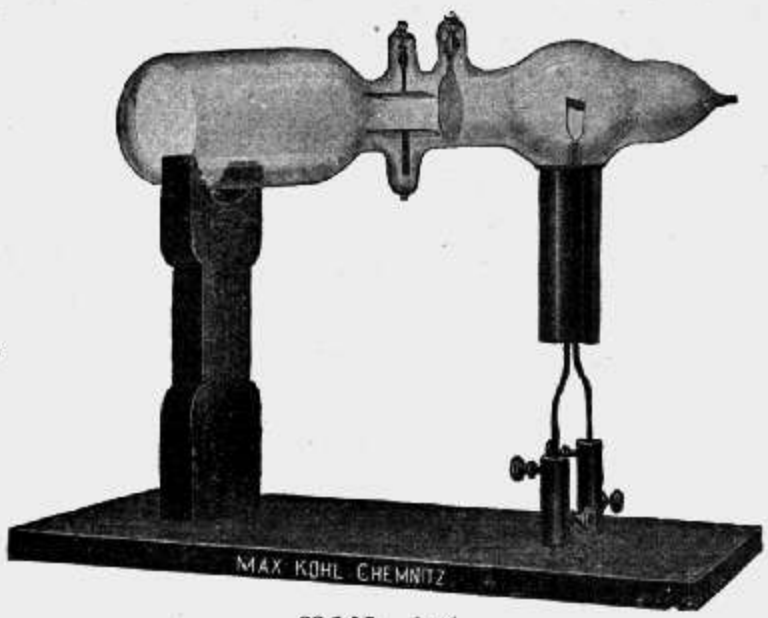
63,145. — idem, larger, specially adapted for the experiment for demonstrating the electrodeless circular current in gases 0. 14. 0

Cl. 5402, 3568, 3569.

Max Kohl A. G. Chemnitz, Germany.



63 141. 1 : 4.



63 140. 1 : 4.



63 146. 1 : 4.



63 148. 1 : 5.

Vacuum Tube Illumination after Mac Farlane Moore.

		£ s. d.
63,146.	**Vacuum Vibrator,** Figure, with holder, magnet coil, and connecting terminals (Elektrotechn. Ztschr. **1896**, p. 637) . . . . . A Wagner hammer interrupter vibrating in an evacuated glass tube produces such clear interruptions that the self-induction currents induced in the magnet coil are sufficient to excite vacuum tubes.	2. 14. 0
63,147.	**Vacuum Vibrator alone**	1. 2. 0
63,148.	**Electrodeless Tube,** Figure, 0.5 m long	0. 6. 0

Section 9: Electron Theory and Radioactivity.

Apparatus for School Experiments on the Theory of Electrons, after Prof. G. Mahler.

£ s. d.

(cf. Ztschr. f. d. phys. u. chem. U., 22, 1909, p. 98.)

63,149.	**Elder Pith Ball** on 3 m long silk fibre	0. 0. 6
63,150.	**Hollow Polished Metal Sphere,** 100 mm diameter, on insulating stand	0. 18. 0
60,176.	**2 Leaf Electroscopes** . . . . . Each £ **0. 10. 0**	1. 0. 0
63,151.	**Small Wood Board** with 2 terminals for stretching glow wires	0. 4. 0
	Glass Rods, Ebonite Rods, see p. 797; Influence Machines, p. 819; Electric Needles, p. 798 of this price list.	
63,152.	**Leyden Jar,** 16 cm high, with hollow ball 100 mm diameter	0. 14. 0
63,153.	**Ebonite Disc** 200 mm diameter, coated one side with tinfoil	0. 3. 0
63,154.	**Cardboard Disc** with hole 6 mm diameter	0. 0. 3
63,155.	— idem, with a number of concentric holes	0. 0. 4
63,156.	**Electroscopic Powder** with pulverising apparatus	0. 10. 0
62,731.	**Apparatus for showing that the Air is Ionised by Röntgen Rays,** cf. p. 986 . . .	2. 0. 0
63,046.	**Vacuum Tube** with stratified light	0. 10. 0
60,012.	**2 Bar Magnets** for above . . . . . Each £ **0. 2. 6**	0. 5. 0

Tubes for Deflecting Cathode Rays: see p. 1019.

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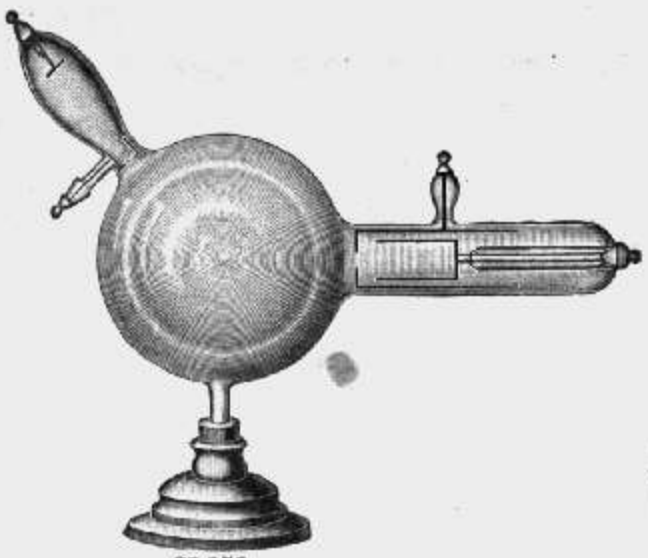


63 159.



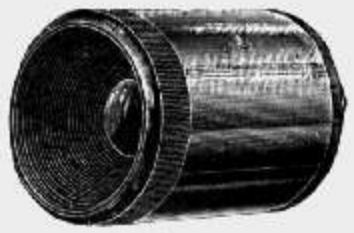
63 160.



63 163.



63 167. 1 : 1.



63 168. 1 : 1.

	£ s. d.
63,159. **Vacuum Tube** after Perrin, for demonstrating the negative charge produced by cathode rays, Figure, on base	1. 10. 0
63,160. **Glow Lamp** for the Edison Effect, Figure	1. 14. 0
The electrons issuing from the incandescent carbon loop give a negative charge to an insulated aluminium sheet contained in the same. A sensitive galvanoscope between aluminium sheet and positive pole of the lamp, gives a deflection, while showing no current between aluminium sheet and negative lead of lamp.	
63,161. **Glass Plate** with covering, for the Hall Effect	0. 4. 0

Apparate for Opto-electrical Experiments.

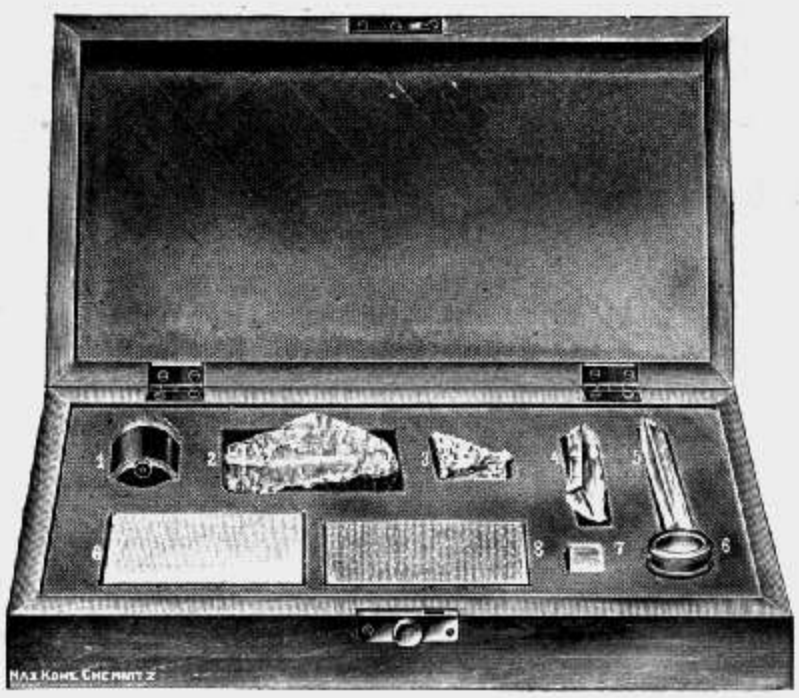
63,162. **Zinc Disc,** amalgamated, with insulating holder, with terminal	0. 5. 0
The zinc disc is connected with a sensitive electrometer by a thin wire. If the electrometer be negatively charged, a quick discharge occurs when the zinc disc is brilliantly lighted by an electric arc lamp, or, better still, by a mercury vapour lamp made of glass permeable to ultra-violet rays (Uviol Lamp No. 63,198). When the electrometer is positively charged no discharge occurs on illumination. The uncharged electrometer becomes positively charged when the illumination is applied. The first two experiments can be carried out with a sensitive leaf electroscope (c. g., 60,176, 60,186, 60,196, 60,202); a sensitive electrometer (c. g., quadrant electrometer No. 60,720) is necessary for the third experiment. The zinc disc must be freshly amalgamated before use.	
When ultra-violet light is allowed to fall upon a spark gap connected up to an induction coil it is bridged over at a considerable distance, as without the action of light (cf. Grätz, Die Elektrizität, 15th Edn., p. 348).	
A transparent gypsum slab does not effect the discharge much, while a glass plate annuls it, since the action chiefly depends on the ultra-violet light.	
63,198. **Uviol Mercury Vapour Lamp** with Stand, for connecting to 65—220 volts D. C. .	5. 10. 0
63,163. **Potassium Cell** after Elster & Geitel, Figure (Wied. Ann. d. Phys., 1894, Vol. 52, p. 433)	2. 0. 0
The cell also acts with white light and gives an opto-electrical current. It is placed in a darkened box and put in series with a very sensitive mirror galvanometer of high resistance and with a 100—200 volt battery, the tension being regulated in such manner that no current overflows at the cell. The surface of the potassium metal is connected to the negative pole and a wire-shaped aluminium electrode with a positive pole. If the surface of the potassium is lighted by sunlight or a sufficiently strong source of light, a passage of the current takes place in the cell, the intensity of which is proportional to the strength of the light.	
63,164. **Sodium Cell** for the same experiment	1. 15. 0
63,165. **Potassium-Sodium Amalgamating Cell**	3. 0. 0
63,166. **Sodium Cell with Quartz Window**	3. 0. 0
63,199. **Sodium-Amalgam Cell** for opto-electrical discharge by daylight (cf. Grätz, Die Elektrizität, 15th Edn., Fig. 337)	1. 2. 0

Radioactivity.

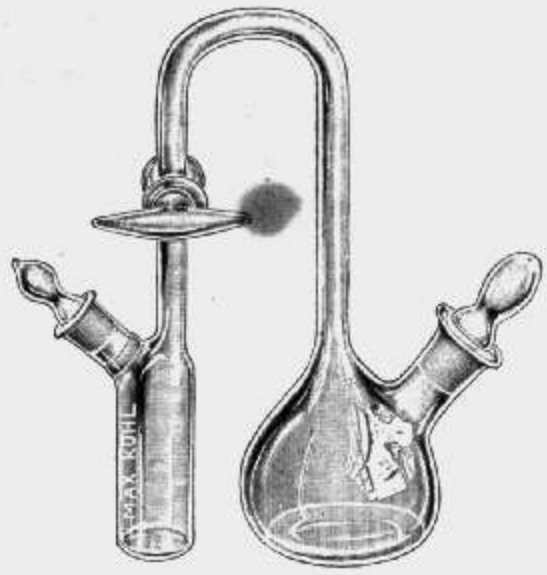
63,167. **Radium Cell,** Figure, without charge	0. 3. 0
The radium cell consists of an ebonite chamber containing on one side a small flat cavity for the radium bromide charge. A mica plate secured by a metal cover having a hole in the middle, closes the cell off on this side. The active rays of the radium bromide can issue at this open side of the cell through the mica plate, the back of the cell acting as a screen.	
Radium Bromide for above quoted for on application.	
For filling the cell 5 to 10 milligrammes radium bromide are employed.	

Cl. 1965, 6510, 5277, 3821, 1966

Max Kohl A. G. Chemnitz, Germany.



63 170. 1 : 3.



63 180. 1 : 2.

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	£ s. d.
63,168. **Spinthariscope,** Figure	1. 8. 0

The apparatus consists of a small brass tube on the back end of which is a small light screen of zinc sulphide. In front of this screen a metal pointer is fitted which can be moved up and down over the screen externally by the finger. At the lower side (i. e., the side opposite the luminous screen) the indicator contains a little radium bromide. The radium-bromide permanently radiates and the rays encounter the zinc sulphide screen, which lights up like a billowy, sparkling sea of light when the screen is looked at through the magnifier placed on the front of the apparatus.

The observation must be made in a perfectly dark room and the eye must rest for some time (5 to 10 minutes) so as to become rid of other impressions and thus observe the phenomenon thoroughly well.

63,169. **Spinthariscope without Magnifier,** for use under the microscope	0. 12. 0
63,170. **Case containing Collection of Radioactive Preparations,** Figure	5. 0. 0

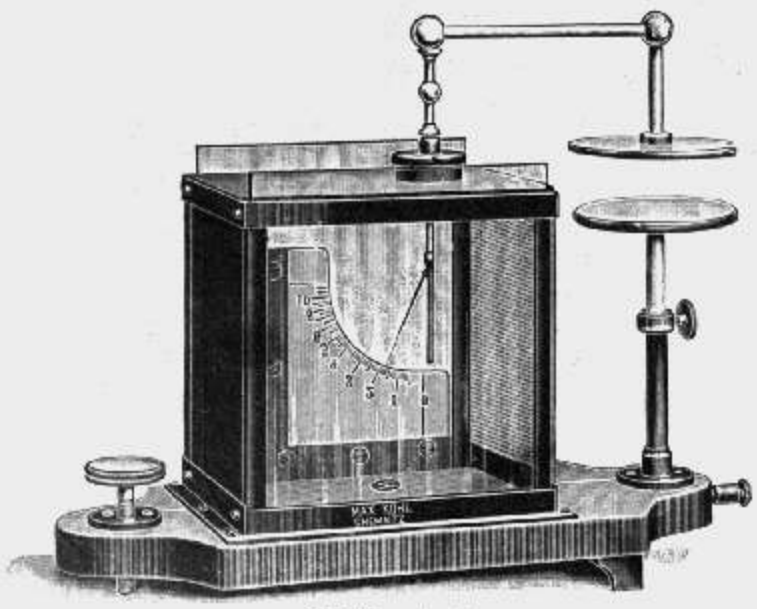
The case contains: 1 spinthariscope (No. 1); 1 piece uranium pitch blende (No. 2); 1 piece willemite (No. 3); 1 piece Kunzite (No. 4); 1 piece calc-spar (No. 5); 1 radium cell (No. 6); 1 cube fluorspar, 13 mm side (No. 7); 1 barium platino-cyanide screen (No. 8) and one zinc-sulphide screen (No. 9).

The various apparatus and preparations contained in the collection are also sold singly at the prices named below.

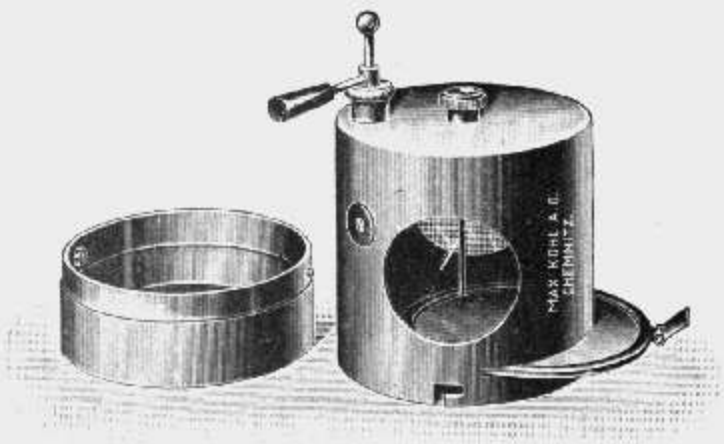
The radium cell included in the collection is unfilled. If it is desired that it should be supplied filled with radium-bromide the quantity and quality of the material desired should be specially indicated. Prices quoted on application.

63,171. **Uranium Pitchblende** for comparative experiments on radium, in pieces of 50—300 grammes. Per 100 g	0. 6. 0
63,172. **Uranium metal, quite** pure, for use as unit of radiation. . . . . Per gramme	0. 3. 0
63,173. **Willemite,** phosphorescent, in pieces of approx. . . . . 30 g	0. 8. 0
63,174. **Kunzite,** fluorescent, in pieces of 6—8 grammes	0. 10. 0
63,175. **Calc-spar,** approx. 40 × 15 × 6 mm	0. 6. 0
63,176. **Fluorspar Cube,** approx. 13 mm side	0. 12. 0
63,177. **Barium platinocyanide Screen,** 65 × 45 mm	0. 8. 0
63,178. **Zinc-sulphide Screen,** 65 × 45 mm.	0. 6. 0
63,179. **Mixture of Radium and Zinc-sulphide,** in small sealed glass tube, phosphorescing in the dark . . .	1. 0. 0
63,180. **Apparatus for Studying Induced Radioactivity,** Figure (cf. Besson, Le radium et la radioactivité, Paris, 1904, Fig. 21)	0. 8. 0

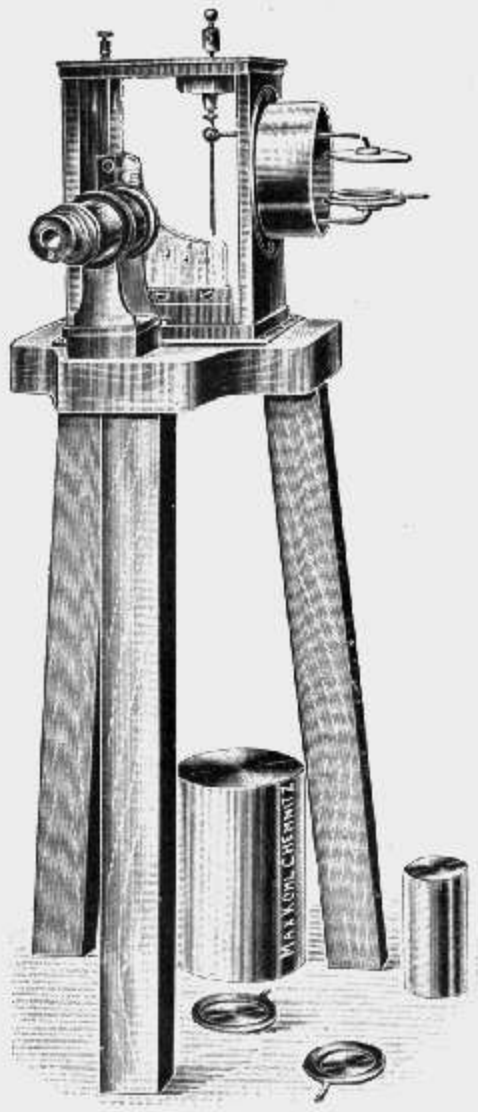
The apparatus consists of a small cylinder and a glass flask connected by a double-bent tube; the tube is provided with a stopcock. The cylinder receives the concentrated solution of a radium salt and the glass flask the material which it is desired to render active, or the preparation which it is desired to render phosphorescent. The communication is effected by opening the stopcock and interrupted again by closing it. Both the cylinder and the glass flask are provided with tube and stopper in order that the materials can be changed.



63 181. 1 : 4



63 184. 1 : 4.



63 182. 1 : 6.

Max Kohl A. G. Chemnitz, Germany.

£ s. d.

63,181. **Electrometer,** Figure, specially arranged for **investigating radioactive substances.** 4. 0.0

The apparatus corresponds to a Kolbe No. 61,096 Aluminium Leaf Electrometer, p. 802, and has a projection-calibration scale and amber tube in ebonite plug, one extra ebonite plug with amber tube, conductor rod and paper leaves. The instrument has a small stage at the side on which are placed the substances to be investigated.

The electrometer is charged by influence by allowing an ebonite rod, electrified by friction, to act on the upper plate. The aluminium leaf is deflected from its perpendicular position and conserves this deflection for a very long period, provided no radioactive substances are allowed to act on it. If, however, radioactive substances in the form of fine powder are placed in a thin layer in a special sheet iron plate, and put on the lower slab, the rays emitted render the air between the two plates conductive, thus discharging the electrometer. The velocity with the which the aluminium leaf moves during the discharge gives a measure for the intensity of the radiation of radioactive substances.

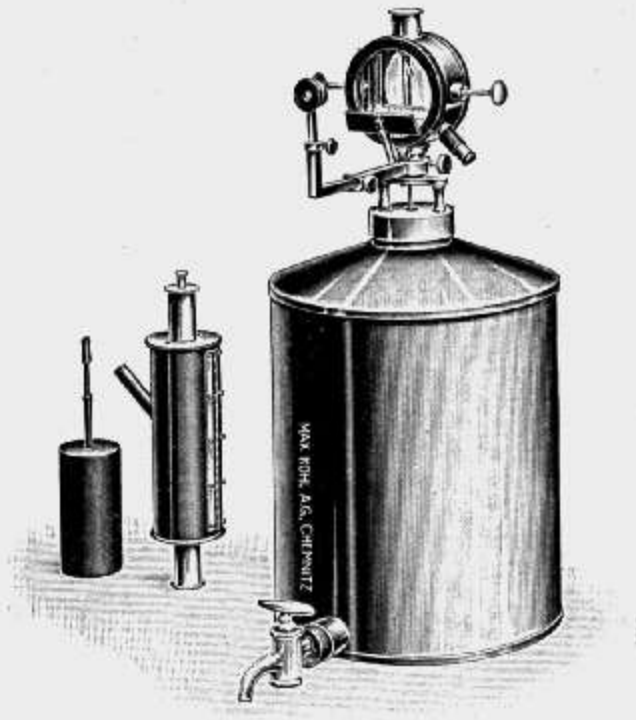
63,182. **Electrometer** after Curie, Figure, on wood stand, with reading microscope . . 7. 10. 0

The Electrometer is built into a metal housing covered by two glass plates. The two horizontal metal plates are covered by a cap, this being removed when introducing the substances and replaced for carrying out the measurement. This part of the apparatus can be easily cleaned and any trace of dust of radioactive substances should be avoided. The electrometer proper is well closed, since the necessary cleaning would be attended with difficulties. The electrometer is charged at the upper knob, protected by a special cap. For taking the substances to be introduced special small plates are supplied with the apparatus.

In order to estimate the velocity of the leaf the lower and of the same should be observed by means of the fixed microscope having micrometer ocular. With the aid of a seconds clock the time is noted which is necessary for the image of the front edge of the leaf in the micrometer to move over a definite number of divisions.

63,183. — idem, without reading microscope 6. 0.0

63,184. **Simple Portable Electroscope** for investigating weakly radioactive substances, Figure 2. 0.0



63 200. 1 : 8.



63 204. 1 : 10.

Max Kohl A. G. Chemnitz, Germany.

Accessories:

	£ s. d.
63,185. **Reading Telescope** with micrometer ocular for same (for accurate measurements)	2. 16. 0
63,186. **Ebonite Rod** with Rubber	0. 3. 0
63,187. **6 Closing Discs**	0. 8. 0
63,188. **Disc with Uranium Oxide** as radioactivity standard	1. 0. 0
63,189. **Carrying Case** for the Electroscope with accessories	0. 18. 0

63,200. **Fontactoscope** after Engler and Sieveking, F i g u r e, for determining the radioactivity of waters (Schiffner, Radioaktive Wässer in Sachsen), with accessories 12. 10. 0

The foregoing price includes:

(a) **1 Electroscope** after Elster & Geitel, modified by Engler & Sieveking, with amber insulation (£ **3. 5. 0**);
(b) **1 Arrangement for Parallax-free Reading** of the Deflection of the Leaves, consisting of a scale with mirror and sliding magnifier (£ **1. 13. 0**);
(c) **1 Dissipation Cylinder** for suspending (£ **0. 10. 0**);
(d) **1 Can** of nickelled brass sheet, 10 litres content, for spring water testing (£ **1. 0. 0**);
(e) **1 Can with plate,** of nickelled sheet brass, for investigating solids (£ **1. 3. 0**);
(f) **1 Rubber Stopper** with glass stopcock, for closing the aperture at the bottom of the can (£ **0. 7. 0**);
(g) **1 Rubber Stopper** for closing this aperture during transit (£ **0. 1. 0**);
(h) **1 Large Rubber Stopper** for closing the neck of the can (£ **0. 4. 0**);
(i) **1 Melta Lid** for the neck of the can, arranged for setting up the electroscope (£ **0. 15. 0**);
(k) **1 Zamboni Dry Pile,** 300—350 volt pole-tension, for charging the electroscope; as desired, with a stand for suspending the pile, or with a metal sheath, in which both poles are insulated, so that the pile keeps well (£ **1. 13. 0**);
(l) **1 Transit Case** with leather carrier (£ **2. 2. 0**).

Instead of the dry pile listed under No. 63,200 k we supply, if desired:

63,201. **Zamboni Pile** with protecting neck. The poles of the pile are laid in ebonite plates having artificially enlarged surfaces. A special needle permits of utilising also sub-divisions of the pile (alone £ **2. 18. 0**) . . . . . **Extra price** 1. 5. 0

63,202. **Case** for Electrometers Nos. 63,200 a and 63,200 b, for use where a carrying case is not desired. **Decrease in price** for this Case instead of Transit Case 1. 10. 0

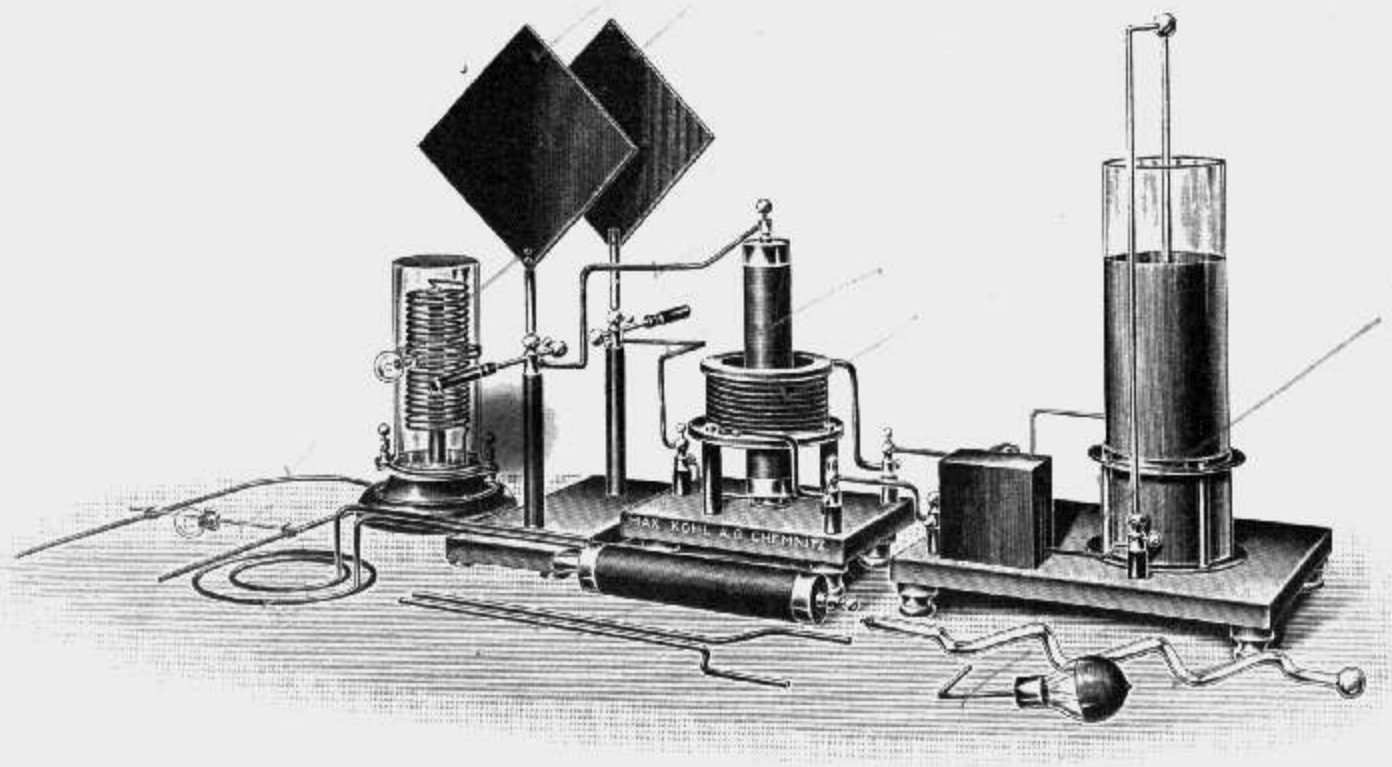
63,203. **Case,** for Electrometer No. 63,200 a and b alone 0. 8. 0

63,204. **Electrometer for Radioactive Measurements, especially on waters,** after H. W. Schmidt, F i g u r e, Travelling Apparatus with reading microscope, dissipation vessel with level, stand, agitating flask, rubber bellows, rubber tubing, stop-watch, thermometer and charging rod (Physikal. Ztschr. Vol. **6,** 1905, p. 561) 14. 0. 0

A complete special list concerning apparatus 63,200—63,204 sent on application.
Exact directions for use are appended to each apparatus.

Cl. 5388, 5265.

Section 10: Electrical Oscillations. Wireless Telegraphy.



63 206. 1 : 8.

Apparatus for Tesla's Experiments with Currents of High Frequency and Tension.

£ s. d.

(cf. in this respect Ztschr. f. d. phys. u. chem. U. 9, 1896, p. 139.)

(a) For small-scale Experiments with an induction coil of 60—150 mm spark-length.

63,206. **Complete Apparatus for the Experiments with Currents of High Frequency and Tension,** after Tesla, with Elster & Geitel **High Tension Transformer,** Figure 9. 10. 0

The apparatus consists of: 1 Leyden jar 40 cm high and 1 spark micrometer with zinc points, all mounted on polished oak board; 1 Elster & Geitel high tension transformer, cf. Fig. 63,210, and 1 sparking pillar, cf. Fig. 63,216; 2 induction spirals insulated from each other by a glass cylinder, the secondary spiral carrying a glow lamp, cf. Fig. 63,213; 1 copper stirrup with 1 glow lamp for the impedance phenomenon, cf. Fig. 63,219; 2 brass plates as conductors, cf. Fig. 63,222; 2 circular thick copper wires for concentrating the brush discharges, cf. Fig. 63,225; 2 parallel wires for the same experiment, cf. Fig. 63,226; 1 Tesla lamp with a fine, long filament and an external electrode and with fittings, cf. Fig. 63,227; and 1 electrodeless Tesla tube 50 cm long, cf. Fig. 63,228.

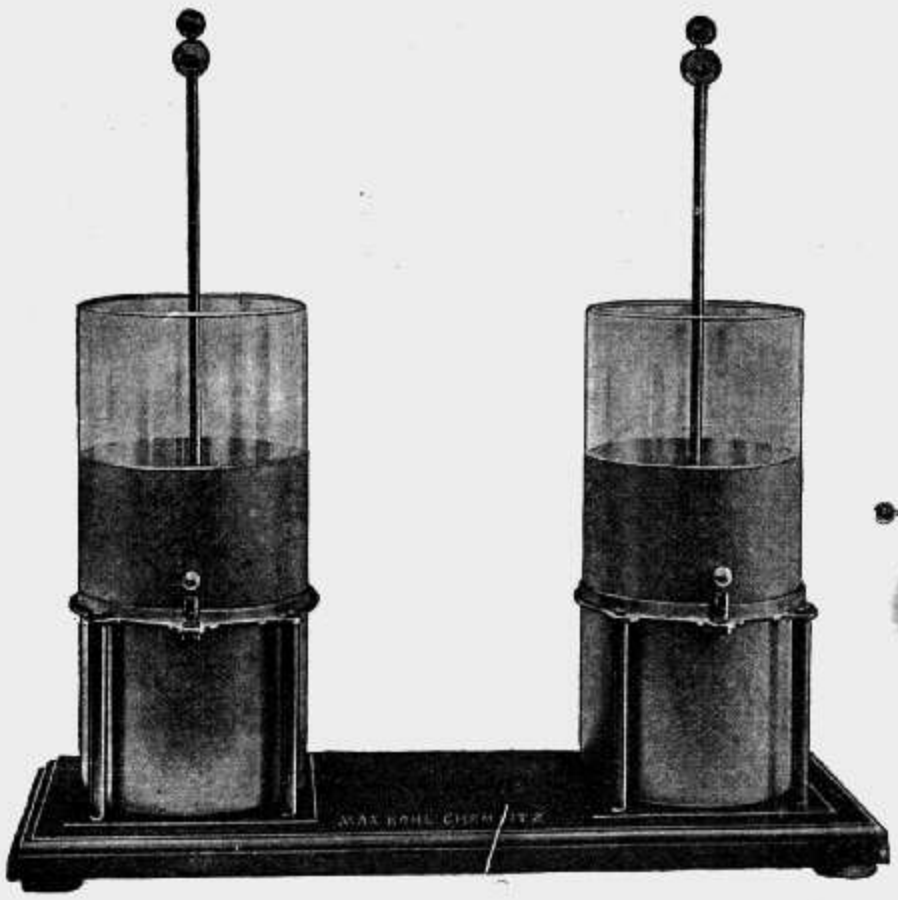
In addition it is advisable to provide a few of the Tesla Tubes listed under Nos. 63,232—63,240.

(b) For Large-scale Experiments with an Induction Coil of 200—600 mm spark-length.

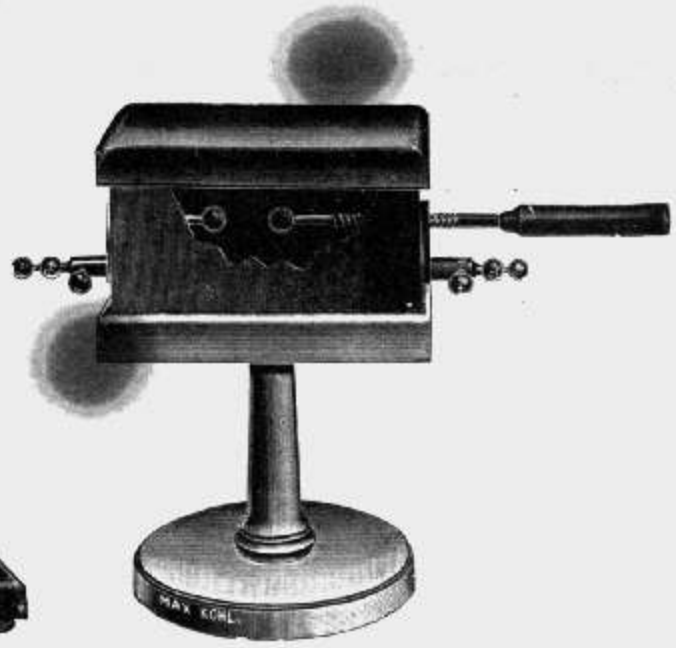
The most important apparatus and those suitable for forming a collection of instruments on the subject are marked †.

† 63,207. **Leyden Jar Battery,** Figure, with 2 jars 40 cm high, for connecting in series, on polished wood board 2. 6. 0

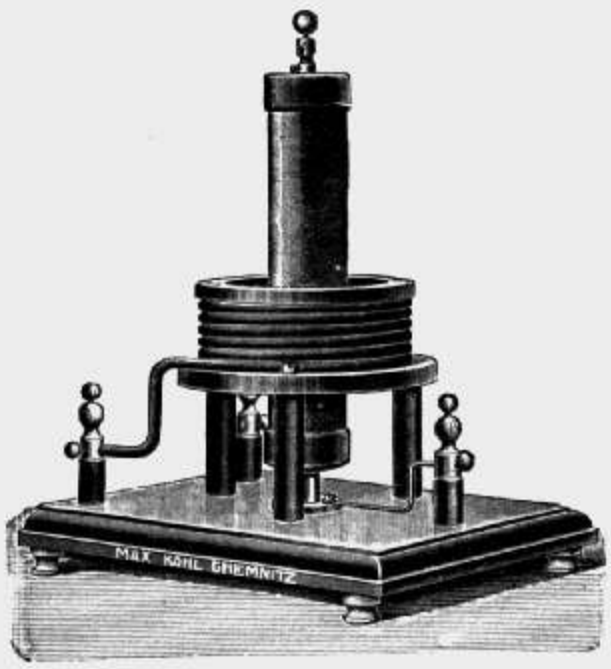
Max Kohl A. G. Chemnitz, Germany.



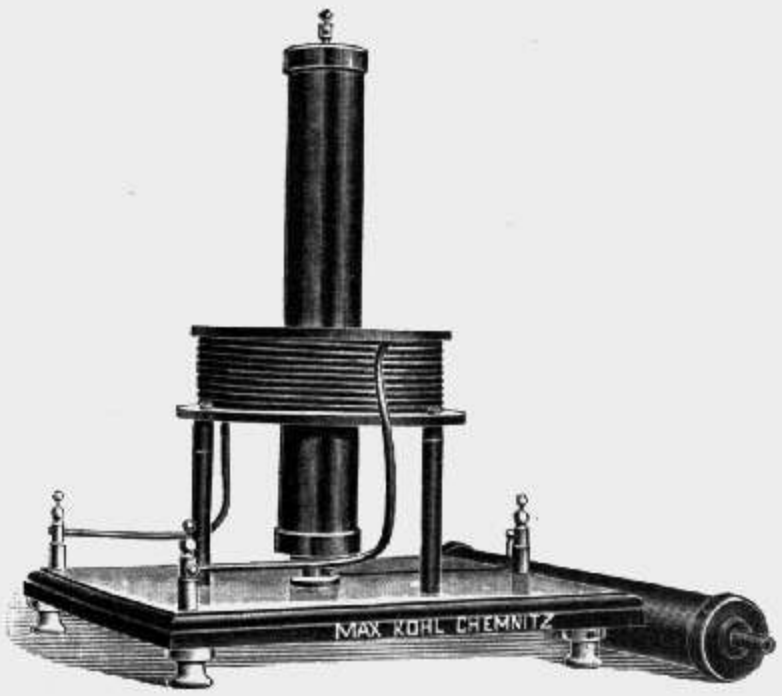
63 207. 1 : 6.



63 208. 1 : 5.



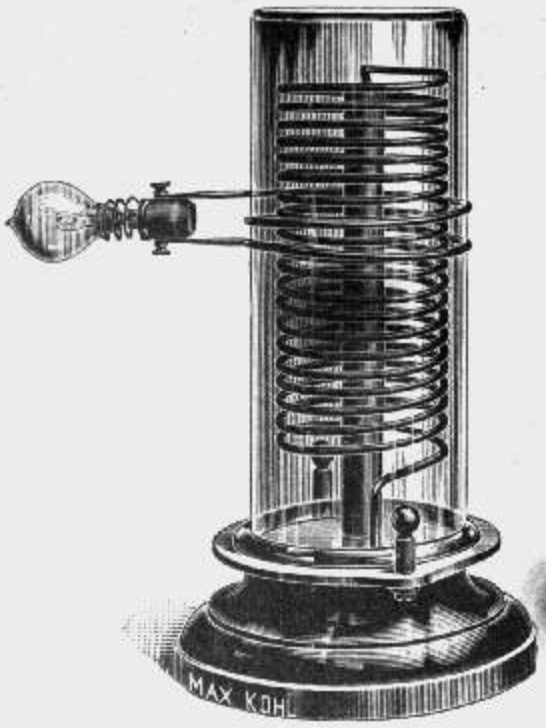
63 210. 1 : 6.



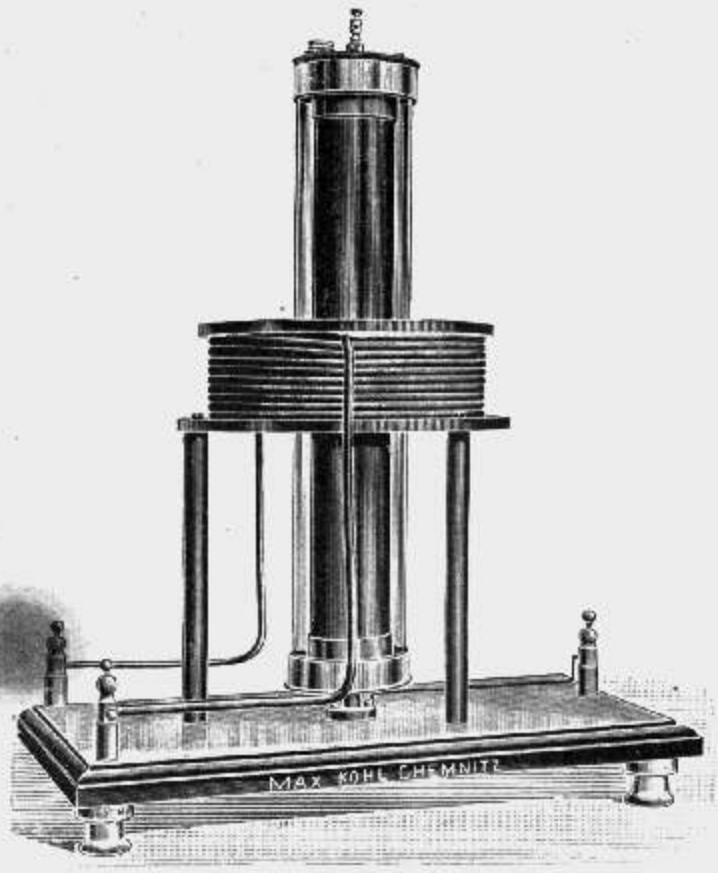
63 211. 1 : 9.

	£ s. d.
† 63,208. **Spark Micrometer,** Figure, in black glass box, on serpentine stone base . .	1. 6. 0
63,209. — idem, with silencing box of wood	1. 16. 0
† 63,210. **High Tension Transformer, without oil insulation,** after Elster & Geitel, with two differently wound secondary coils, 425 mm high, for induction coils to 250 mm spark-length	3. 10. 0
† 63,211. — idem, considerably larger, Figure, 640 mm high, for induction coils of 250—600 mm spark-length	5. 0. 0

Cl. 3039, 2981, 2970, 2984.



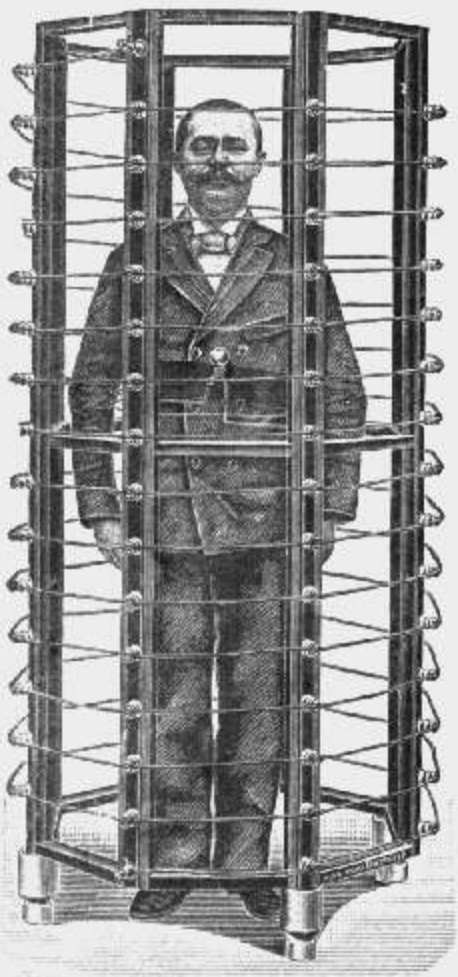
63 213. 1 : 4.



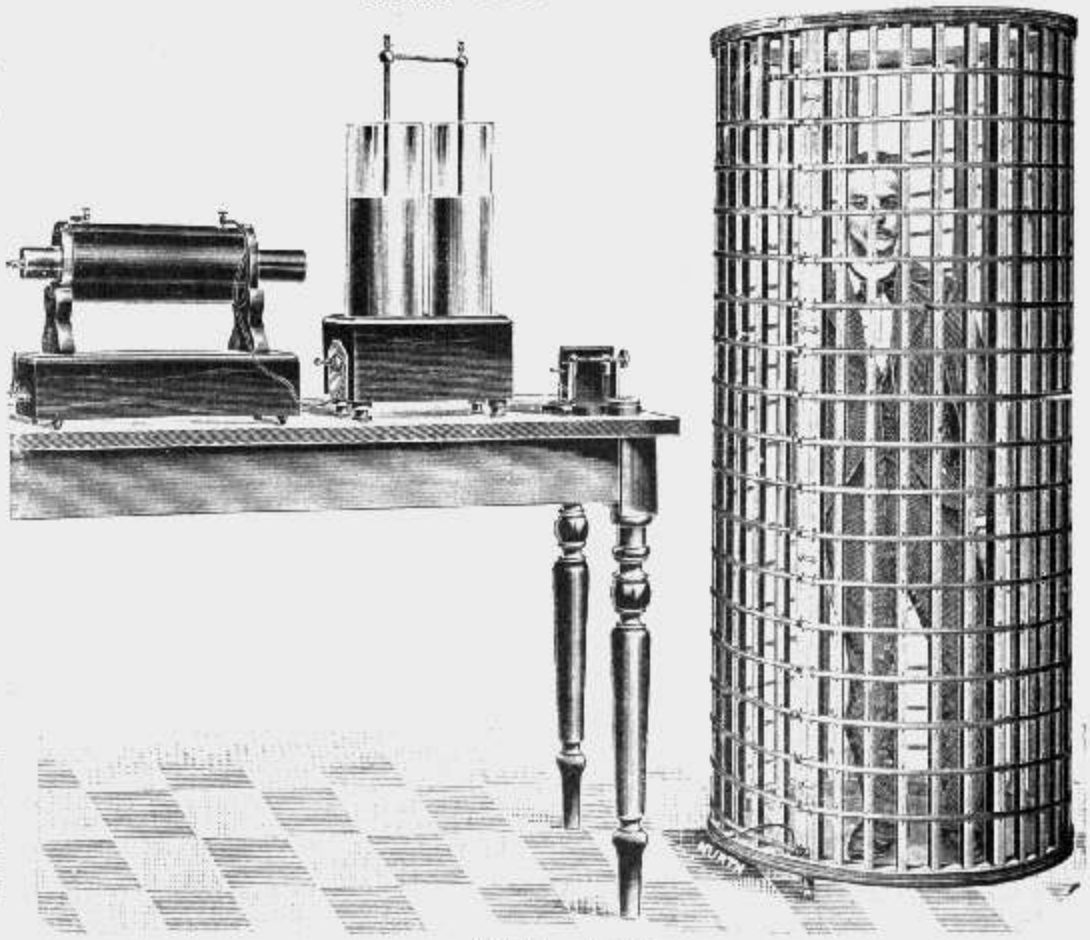
63 212. 1 : 8.



63 218. 1 : 6.



63 214. 1 : 18.



63 215. 1 : 17.

63,212. **High Tension Transformer with Oil Insulation,** after Elster & Geitel, Figure, with a secondary coil, 700 mm high, for induction coils of 300—600 mm spark-length . . . . . £ 6. 0.0

† 63,213. **2 Induction Spirals** separated by a glass cylinder, with glow lamp, Figure 1. 2.0

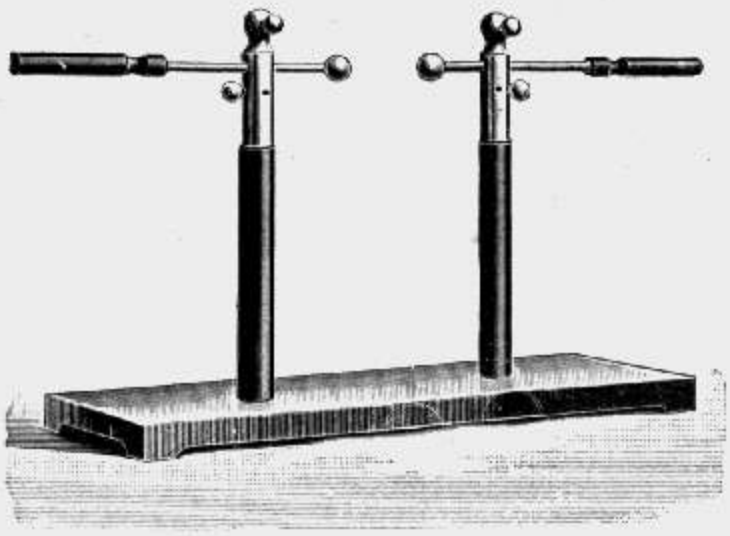
63,214. **Apparatus after d'Arsonval,** Figure, comprising a 1.7 m high spiral for containing a man, with a spiral having glow lamp fixed on a belt 5.10.0

63,215. — idem, cf. Fig. 63,215, 1.75 m high and 0.75 m diameter, provided with a door for convenience of entry. Price without accessories illustrated 11. 0.0

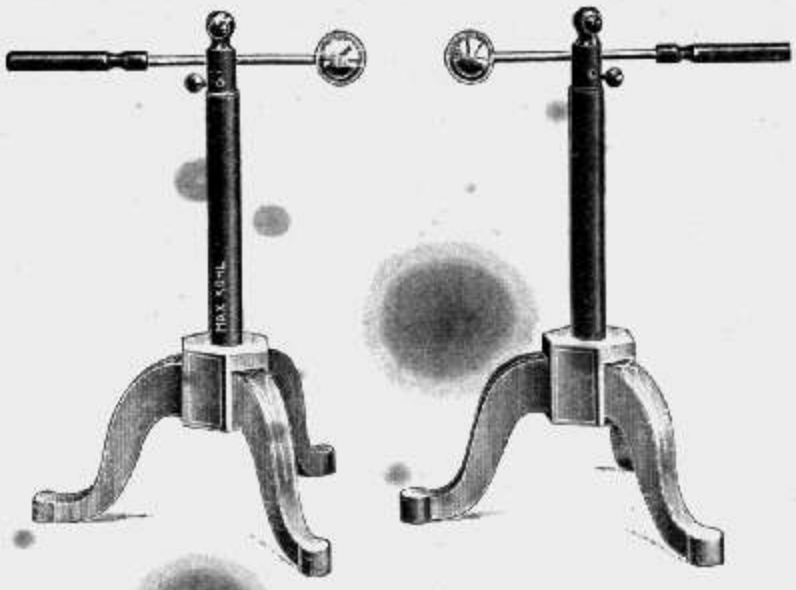
A complete description and directions for use for the experiments are appended to each apparatus.

Cl. 2972, 2985, 6132, 2986, 2987.

Max Kohl A. G. Chemnitz, Germany.



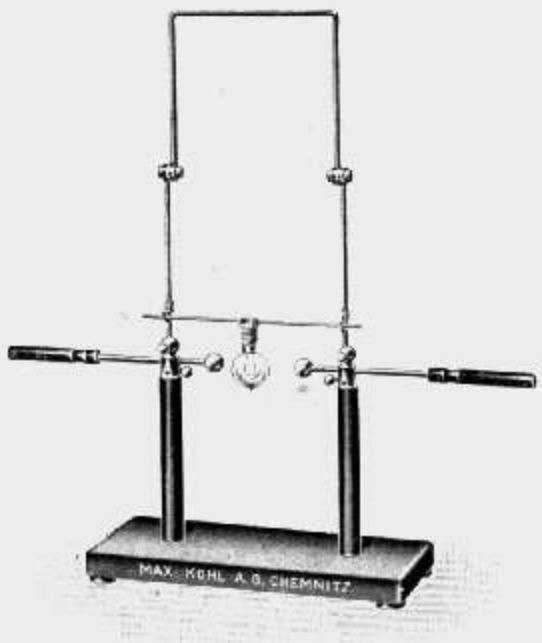
63 216. 1 : 5.



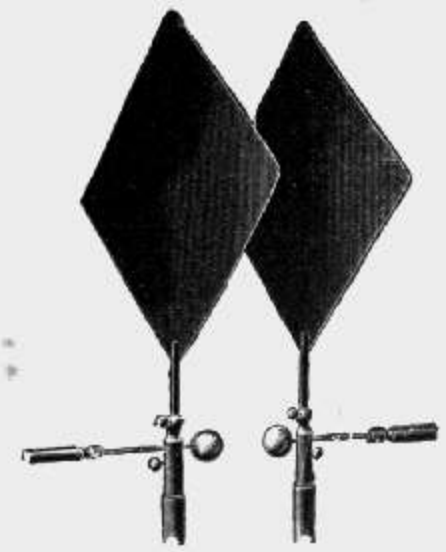
63 217. 1 : 7.



63 219.
1 : 17.



63 216, 63 221. 1 : 6.



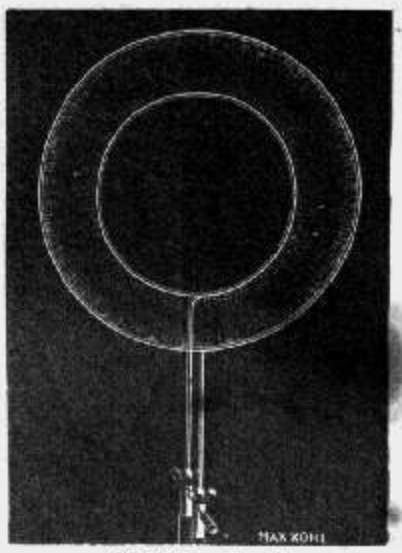
63 222. 1 : 12.



63 224. 1 : 30.

		£	s.	d.
†	63,216. **Discharger,** Figure, with ebonite pillars on polished wood board	1.	0.	0
	63,217. — idem, larger, on iron feet, Figure	1.	16.	0
	63,218. **Whirl,** Figure, for fitting on the high tension transformer	0.	4.	0
†	63,219. **Copper Stirrup,** Figure, with 1 glow lamp, for the phenomenon of impedance	0.	12.	0
†	63,220. — idem, with 4 glow of 35, 20, 10 and 5 volts pressure	1.	8.	0
	63,221. — idem, after Kann, Figure, with 1 glow lamp and with folding stirrup, for showing that self-induction is the cause of the phenomenon (Ztschr. f. d. phys. u. chem. U., **20,** 1907, p. 247). Without the dischargers No. 63,216 illustrated	0.	16.	0
†	63,222. **2 Brass Plates,** Figure, as conductors for producing a high frequency field	0.	18.	0
	63,223. **Leyden Jar,** 16 cm high, with detachable point, for proving the positive flow in the neighbourhood of the transformer pole	0.	5.	0
	63,224. **Large Brass Conductor,** Figure, for experiments on distance effect, 90 cm long, 26 cm diameter, nickelled, on 1.5 m high glass pillar, with large iron tripod	5.	0.	0

Cl. 2971, 2988, 2973, 6116, 2974, 2990.



63 225. 1 : 18.



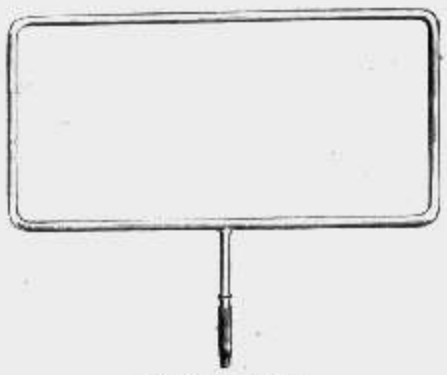
63 226. 1 : 11.



63 228 — 63 231.



63 234. 1 : 9.



63 235. 1 : 9.



63 227. 1 : 7.



63 233. 1 : 5.



63 236. 1 : 6.



63 237. 1 : 6.

	£ s. d
† 63,225. **2 Circular Stout Copper Wires,** Figure, for concentrating the brush discharges	0. 8. 0
† 63,226. **2 Parallel Copper Wires,** Figure, for producing a luminous band	0. 6. 0
† 63,227. **Tesla Lamp** with a fine long Filament and an external Electrode, Figure, with fitting for fixing to high tension transformer	0. 8. 0
63,228. **Electrodeless Tube,** jagged shape, 0.5 m long, Figure	0. 4. 0
63,229. — idem, 1 m long	0. 6. 0
† 63,230. — idem, 1.5 m long	0. 8. 0
63,231. — idem, 2 m long	0.10. 0
† 63,232. **Electrodeless Tube,** straight pattern, 0.4 m long	0. 4. 0
63,233. — idem, with two external electrodes, Figure	0. 5. 0
† 63,234. **Evacuated Bulb** without electrodes, Figure	0. 5. 0
63,235. **Rectangle of Tubes** without electrodes, Figure	0. 6. 0
† 63,236. **Evacuated Bulb** with one electrode, Figure	0. 6. 0
63,237. **Bulb** with an Electrode and phosphorescent cross, Figure	0.12. 0
† 63,238. **Bulb** with an Electrode and phosphorescent mineral, Figure	0.15. 0
† 63,239. **Ebert's Phosphorescent Lamp** with 2 electrodes, Figure (Wied. Annalen, Vol. 53, 1894, p. 159)	0.16. 0
63,240. **Vacuum Tube** after Elster & Geitel, for deflection experiments, Figure	0.12. 0
For further details as to the tubes, kindly refer to directions for use which will be sent on application.	
63,241. **Complete Set of Tesla Apparatus** after Weinhold, for induction coils of 60—150 mm spark-length (W. D., pp. 939—944 [832—837], Figs. 605—607 [550—552])	6.10. 0
The following are fitted on a wood board: 1 large Leyden Jar, 1 spark micrometer, 1 oil-insulated transformer (Fig. 63,242). In addition the following are supplied: 1 copper wire ring for the impedance experiment (Fig. 63,241 A), 1 impedance stirrup, 2 wire spirals, one with glow lamp for	

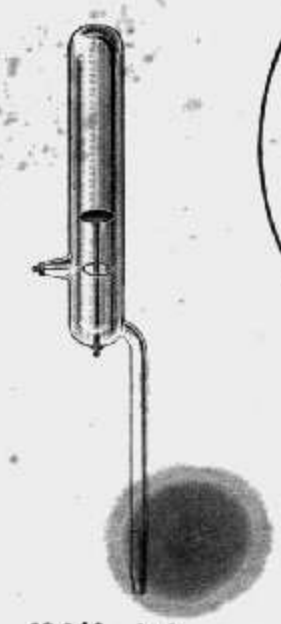
Cf. 2975, 2978, 6113, 2976, 2994, 2995, 2993, 2996, 2997.



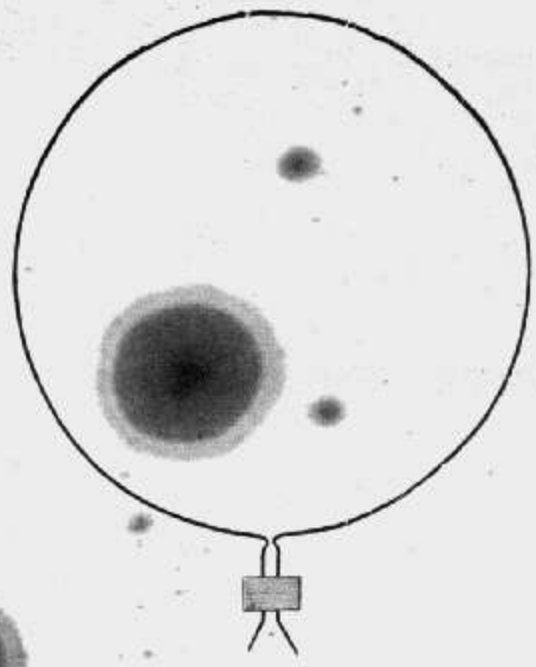
63 238. 1 : 6.



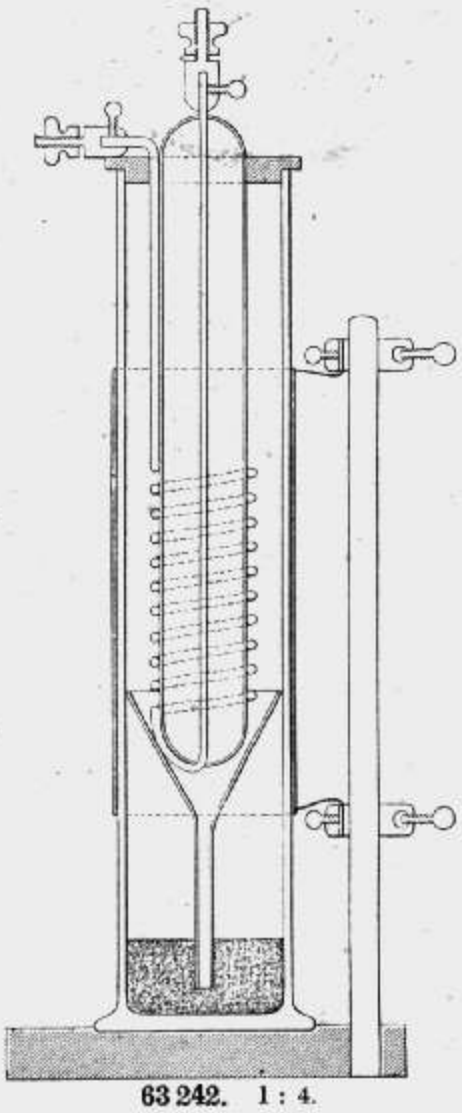
63 239. 1 : 6.



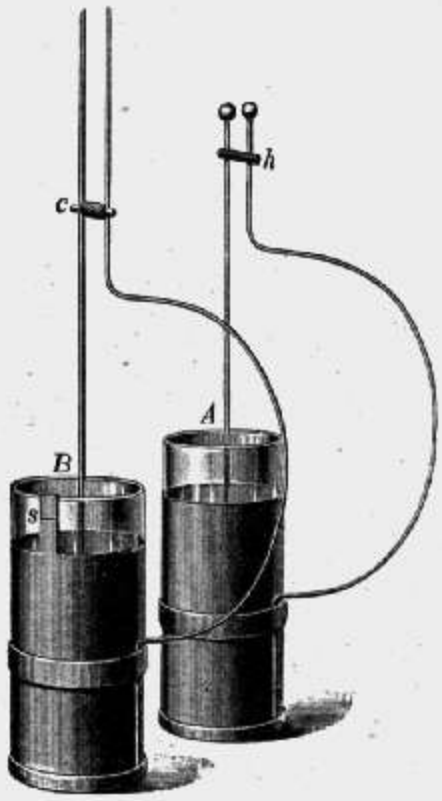
63 240. 1 : 8.



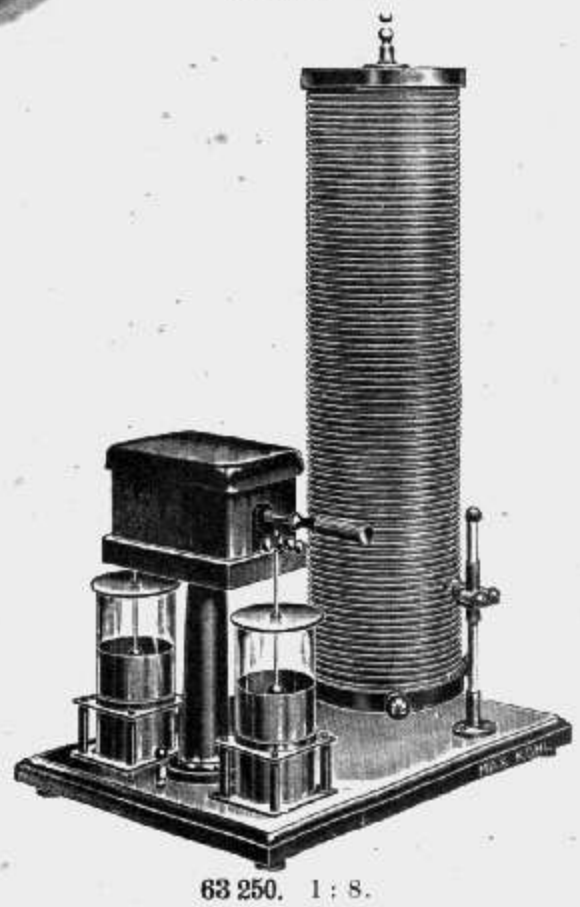
63 241 A. 1 : 4.



63 242. 1 : 4.



63 249. 1 : 8.



63 250. 1 : 8.

transformation; 2 insulating stands, 2 copper rings and 2 copper wires for producing a luminous wall, 2 wire nets for generating a high frequency field, 1 electrodeless tube, 1 glow lamp with one electrode, 1 wood piece with two terminals.

£ s. d.

63,242. **Oil-insulated High Tension Transformer** after Weinhold, separately, Figure (W. D., Fig. 607 [552]), for induction coils of 60—150 mm spark-length 2. 10. 0

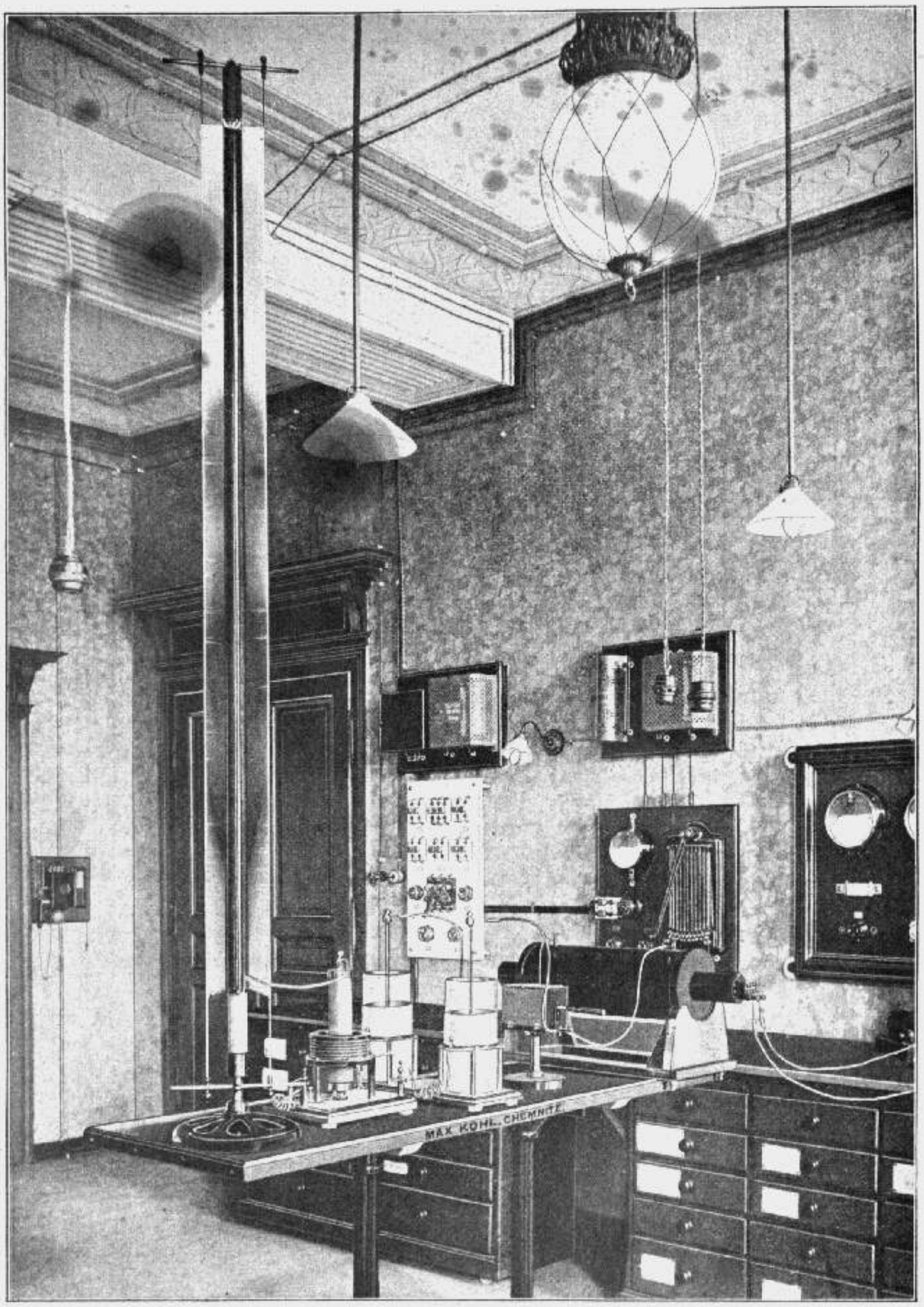
63,243. — idem, larger, for larger spark coils 3. 12. 0

Leyden Jars after Lodge, for demonstrating Electric Resonance: see p. 838, Nos. 60,646—60,648.

63,249. **Leyden Jars for Lodge's Resonance Experiment,** after Weinhold, Figure (W. D., Fig. 608 [553]) 1. 10. 0

63,250. **Apparatus for Generating Currents of High Frequency and Voltage by Resonance,** after Oudin, Figure, consisting of 1 spark micrometer with zinc bulbs and protecting case, with ebonite grip; 2 Leyden jars each 160 mm high and 1 Oudin Resonator, mounted on one polished base together with all necessary connections 7. 10. 0

Cl. 2998, 2999, 3000, 6528, 6527, 6531, 3003.



63 252, 63 210, 63 259, 63 209, 62 513. 1 : 12.

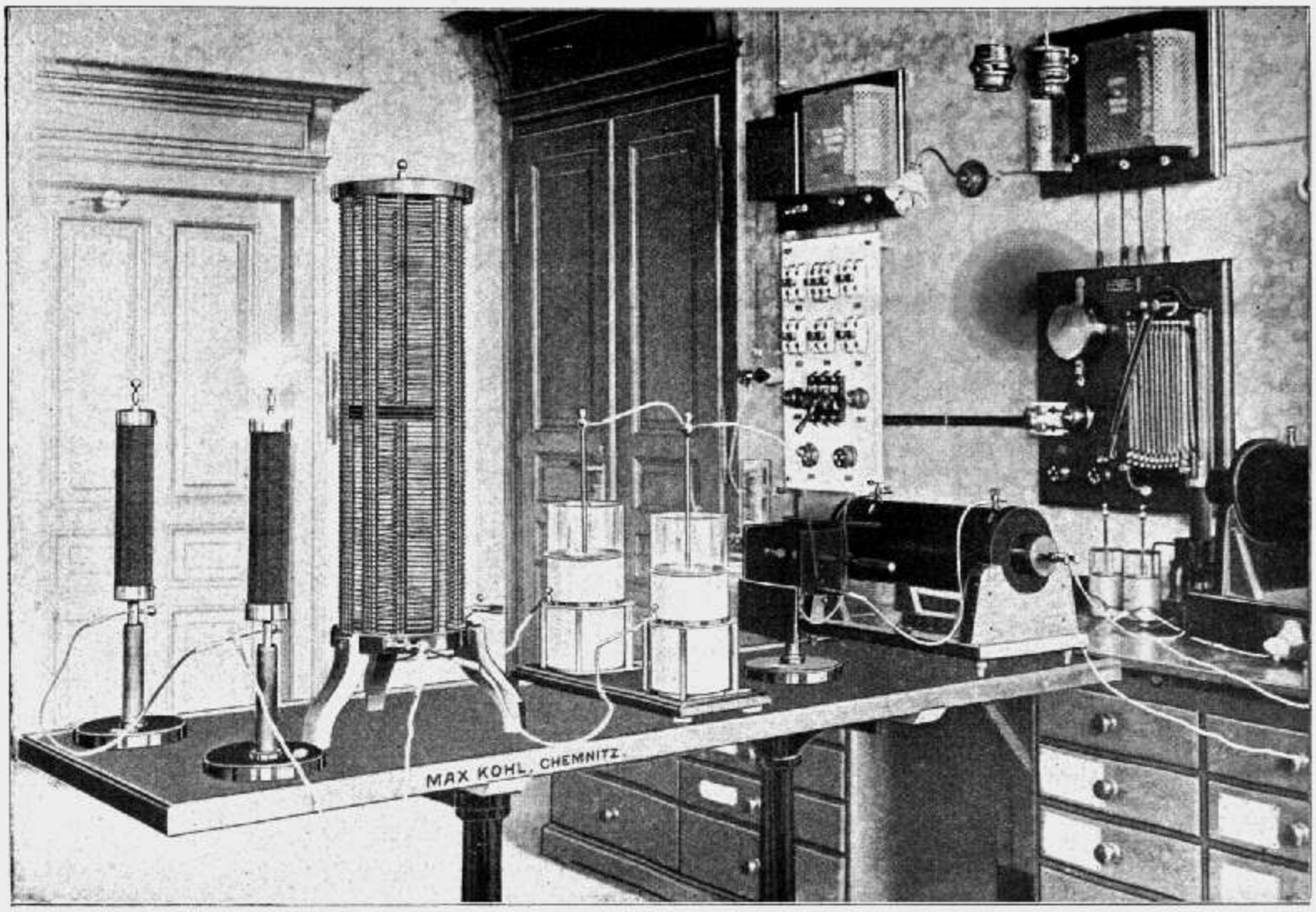
Apparatus after Seibt for demonstrating stationary electric waves.

63,251. **Vacuum Tube for demonstrating the oscillatory character of Leyden Jar Discharges,** after Paalzow (M. P. 9th Edn. III., p. 892) . . . . . £ s. d. 0. 3. 0

The tube, fed from an induction coil, gives a luminous band which is deflected to either side of the tube, according to the direction of the current in the tube, when a strong magnet is brought near it. If a small Leyden jar is inserted in the circuit of the induction coil the band is always deflected in both directions.

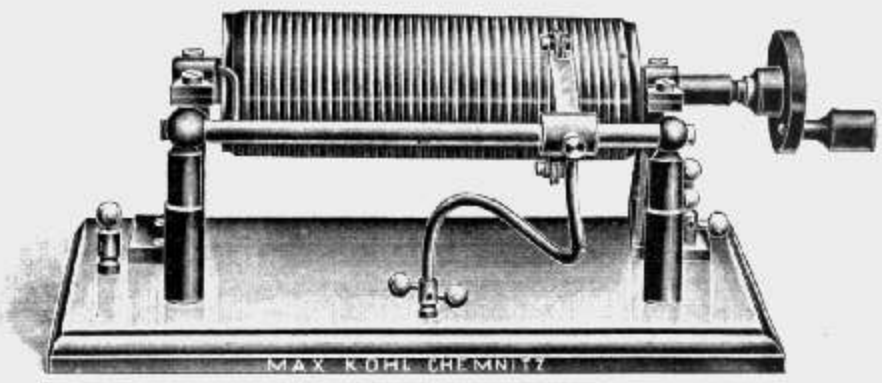
Cl. 5126.

Max Kohl A. G. Chemnitz, Germany.



63 256, 63 254, 63 259, 63 209, 62 513. 1 : 10.

Set for demonstrating the resonance of electric waves by Seibt's Method.



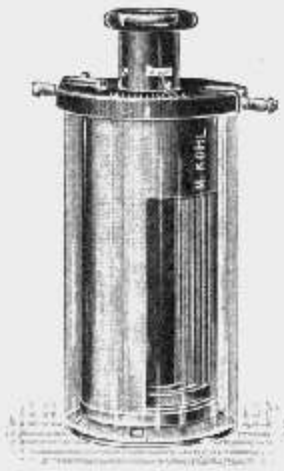
63 255. 1 : 5.

Seibt's Apparatus for demonstrating the Resonance of Electric Waves.

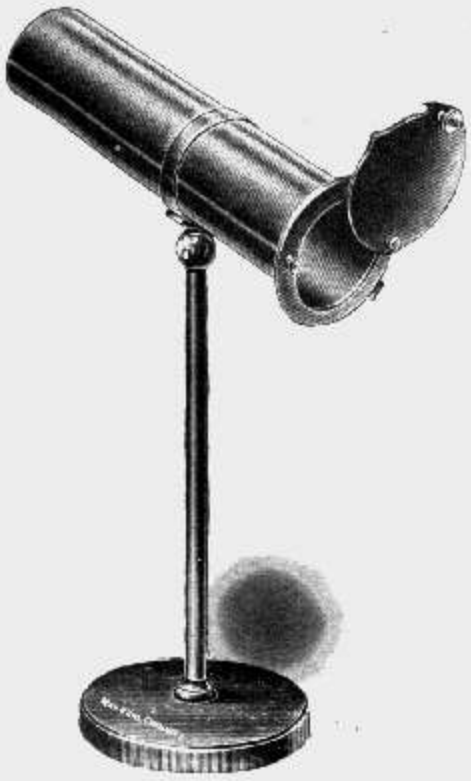
(E. T. Z., 1902, pp. 315 et seq; Phys. Ztschr., 4, 1902, p. 99.)

	£ s. d.
63,252. **Large Resonance Coil** after Seibt, Figure, 2 m long, on base, with two lateral wires	2. 5. 0
63,253. — idem, with evacuated glass tube on one side and wire on the other, 1 m long	3. 0. 0
63,254. **Resonator** after Oudin, **with 2 terminals,** with ebonite grip for tuning accurately, Figure	2. 8. 0
63,255. **Variable Self-induction** (Exciter Solenoid), Figure	3. 6. 0
63,256. **2 Small Resonance Coils** with ebonite pillars on serpentine stone bases, of different winding and colour, Figure . . . . . Each £ **1. 2. 0**	2. 4. 0

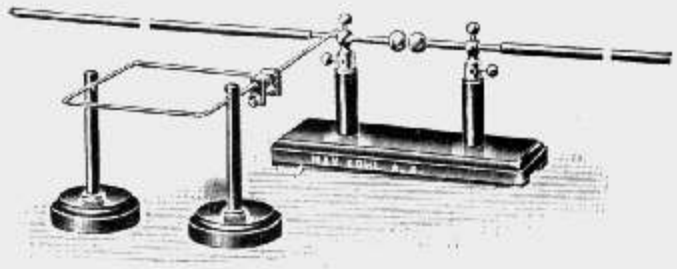
Cl. 5136, 3002.



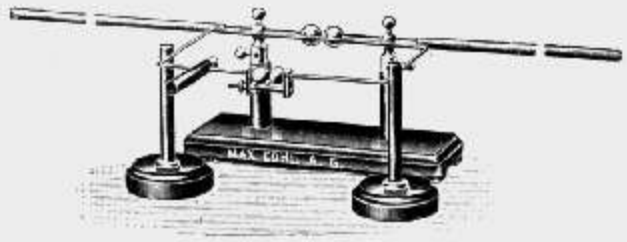
63 262. 1 : 8.



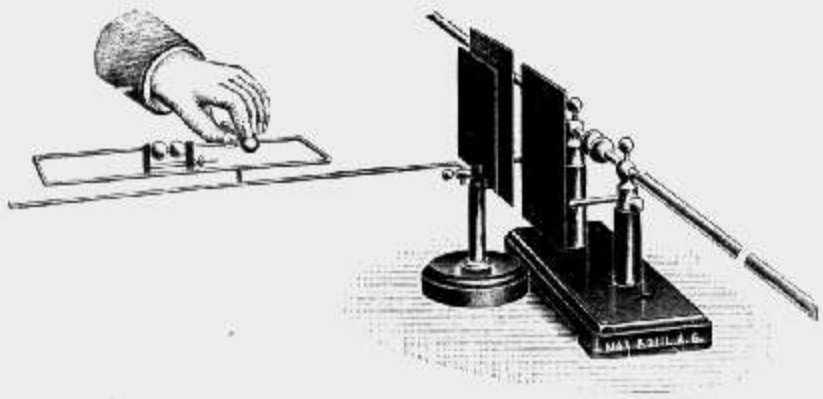
53 508. 1 : 6.



63 267 A.



63 267 B.



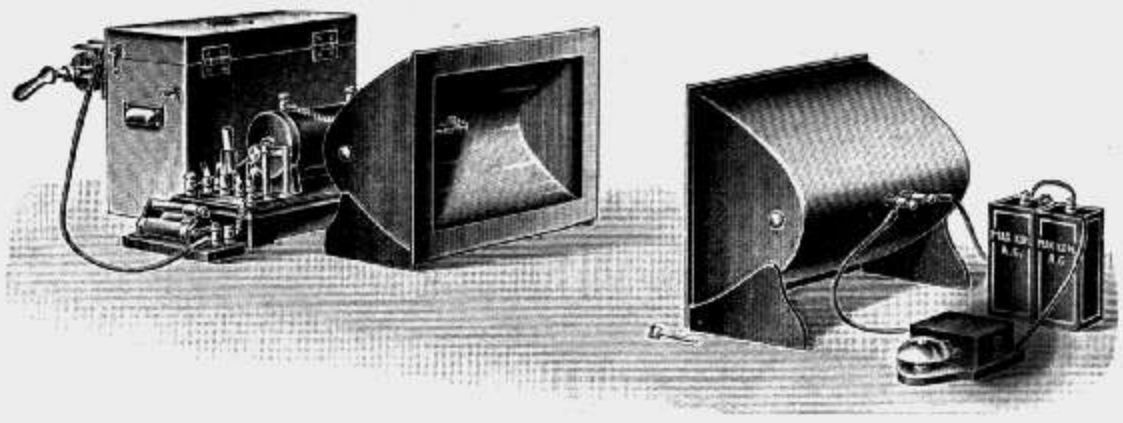
63 267 C.

		£ s. d.
63,257.	**Extra Resonance Coil** on base, with Geissler Tube, for showing the tuning of a receiving station for wireless telegraphy	1. 4. 0
63,258.	**Extra Resonance Coil** on base, for showing the screening effect	1. 2. 0
	For this experiment Coil No. 63,257 must be available in addition to the above.	
63,259.	**2 Leyden Jars** with metal fittings, 26 cm high, medium capacity, cf. Fig. 63,207 .	2. 4. 0
63,260.	**2 Extra Jars** of higher capacity . . . . . Each £ **0. 6. 0**	0. 12. 0
63,261.	**2 Extra Jars** of lower capacity . . . . . Each £ **0. 6. 0**	0. 12. 0
63,262.	**Oil Condenser** with variable capacity, Figure, for use instead of the Leyden Jars	5. 0. 0
63,210.	**High Tension Transformer** after Elster & Geitel, with two secondary coils of different winding, Fig. 63,210, p. 1031	3. 10. 0
	or :	
63,211.	— idem, larger, Fig. 63,211, p. 1031	5. 0. 0
63,208.	**Spark Micrometer** with flat thread, high pitch regulating screw on long ebonite handle, in glass box, on serpentine stone base, Fig. 63,208, p. 1031	1. 6. 0
63,209.	— idem, with protecting silencer box	1. 16. 0

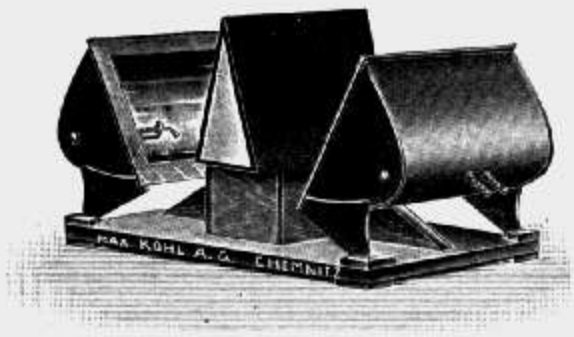
Cl. 5759.
4973, 1105, 5763.
5765.

A complete special list, with description, of Seibt's Apparatus, forwarded on application.

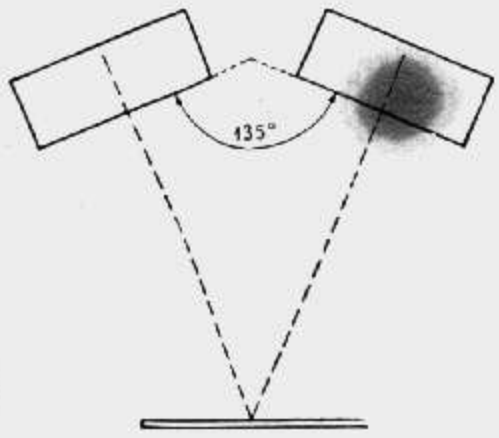
Max Kohl A. G. Chemnitz, Germany.



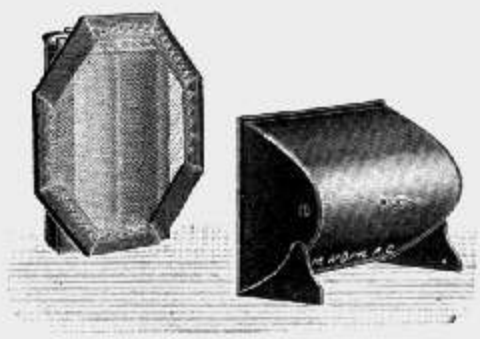
63 268 A.



63 268, 63 269.



63 268 B.



63 268 C.

Max Kohl A. G. Chemnitz, Germany.

53,508. **Resonance Tube** on base, with open ends, but can be closed at one end, Figure . . . . . £ 1. 8.0

53,509. **Tuning Fork** $c_1 = 256$ compound vibrations, with grip 1. 0.0

53,510. — idem, $c_2 = 512$ compound vibrations 0. 18. 0

53,511. — idem, $g_2 = 768$ compound vibrations 0. 18. 0

Apparatus for the Experiments on Electric Power Rays, after Prof. Heinrich Hertz.

(cf. Hertz, Untersuchungen über die Ausbreitung elektrischer Kraft, Leipzig, 1895, Johann Ambrosius Barth.)

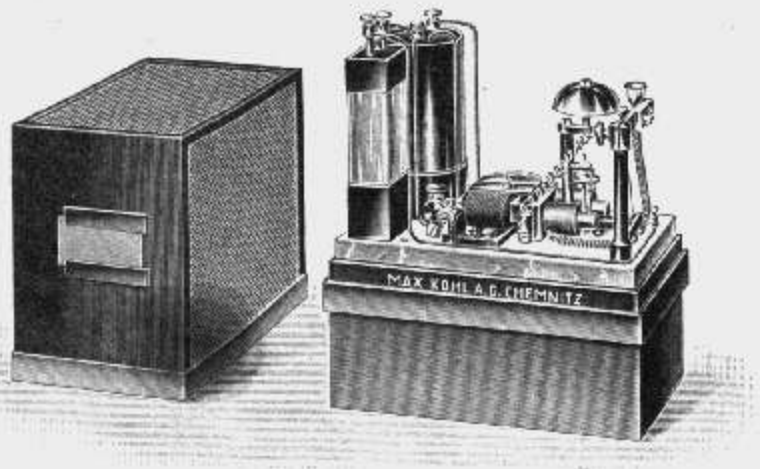
63,267. **Apparatus** after Grimsehl **for repeating Hertz's Fundamental Experiments**, Figs. A—C (Grimsehl, Figs. 1057—1059) 3. 0.0

In these apparatus, as in the original Hertzian Experiments, the secondary spark in the so-called resonator is used as indicator. The induction coil should have a spark about 10 cm long.

63,268. **2 Parabolic Mirrors, one with Hertzian transmitter (oscillator)**, the other with a **coherer (resonator)**, Figures, together with a tuned electric bell for signalling, 2 Dry Cells, 1 Wire Grating, 2 Sheet Iron Screens and 1 small Metal Plate for setting the distance of the oscillator balls (Richarz, Neuere Fortschritte auf dem Gebiete der Elektrizität, 2nd Edn., pp. 66—75), without the induction coil or accumulators illustrated 4. 0.0

In this set, in which a coherer (Branly Tube) is used as indicator, the following experiments can be made: **rectilinear expansion of waves** (Fig. A), **screening effect, reflection** (Fig. B), **polarisation** (Fig. C). The following paraffin prism No. 63,269 is used for **refraction.** The induction coil should have a spark-length of not more than 2—3 cm. Description and precise directions for use are appended.

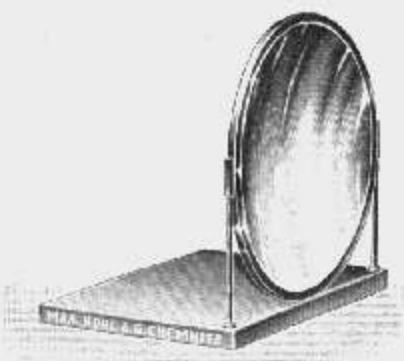
63,269. **Paraffin Prism,** Figure, with board and wood wedges 1. 16. 0



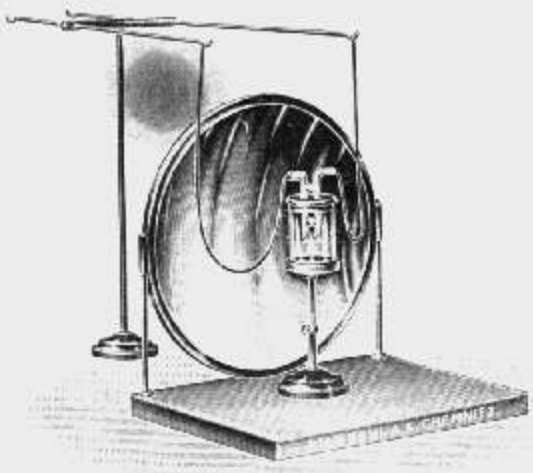
63 270 A. 1 : 8.



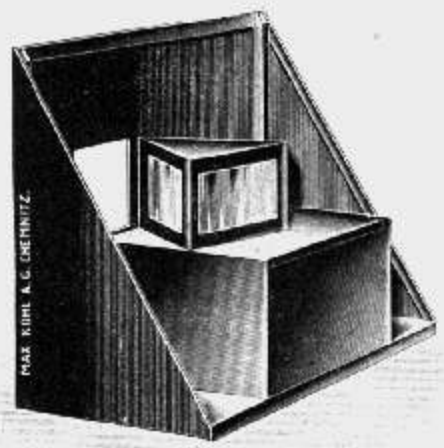
63 270 B. 1 : 2.



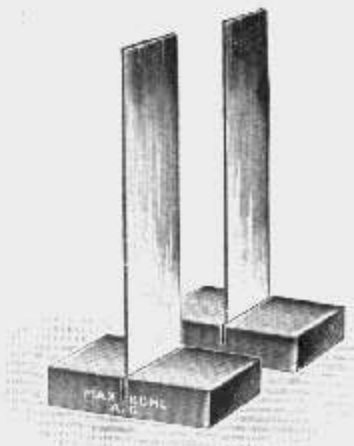
63 270 C. 1 : 12.



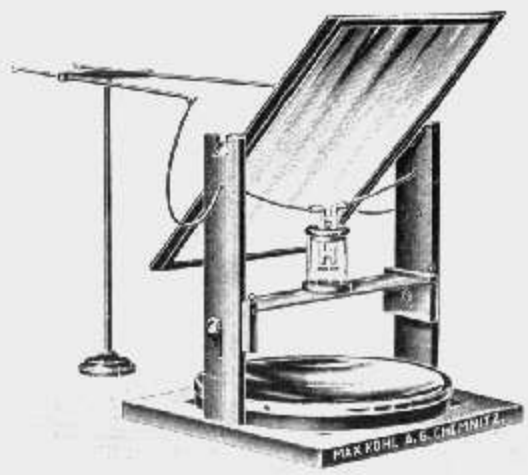
63 270 D. 1 : 12.



63 270 E. 1 : 10.



63 270 F. 1 : 8.



63 270 G. 1 : 12.

63,270. **Complete Set for demonstrating all essential Experiments with Hertzian Waves and Wireless Telegraphy,** after Weinhold, Figs. A—J (W. D., Figs. 611—619 [556—564]) | £ s. d. 16. 10. 0

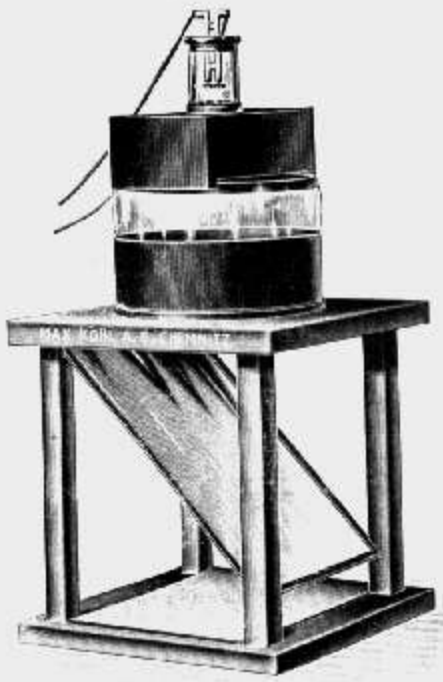
The apparatus comprises:

1 **complete Receiver** on marble with metal protecting case, Branly Tube (Coherer), clapper, variable-sensitivity relay, accumulator and dry cell, Fig. A;
1 Transmitter (Vibrator or Radiator) with horizontal spark gap, Fig. B;
2 concave Mirrors with holders, on board, for reflection, etc.; Figs. C and D.
1 plane Glass Mirror for reflection;
1 Stand for the connecting leads, cf. Figs. D and G;
1 Sheet Iron Slab, 1 Board coated with Tinfoil, 1 Wire Net, 1 Glass Plate and **Wire Grating for reflection;**
1 Paraffin Prism with pasteboard screen, coated with Tinfoil, and holder, for refraction, Fig. E;
2 Glass Mirrors for interference, Fig. F;
1 Mirror in frame for polarisation, Fig. G;
1 Mirror with Glass Cup (as lens) in frame, for polarisation, Fig. H;
2 Supports;
1 Transmitter for wireless telegraphy, Fig. J.

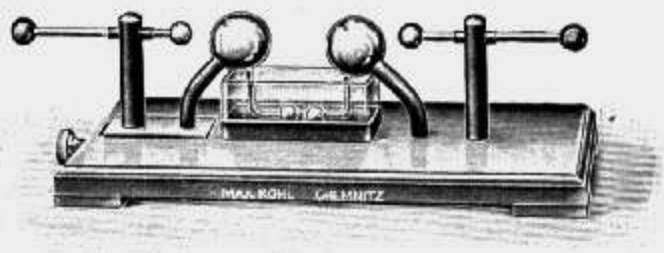
Cl. **6133, 6183, 6135, 6139, 6138, 6134, 6137.**

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A G. Chemnitz, Germany.



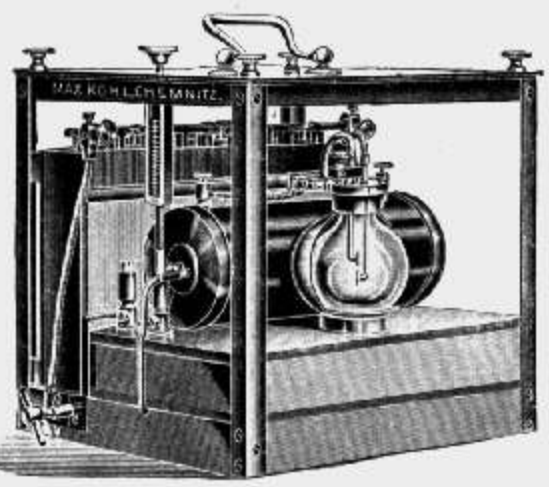
63 270 H. 1 : 10.



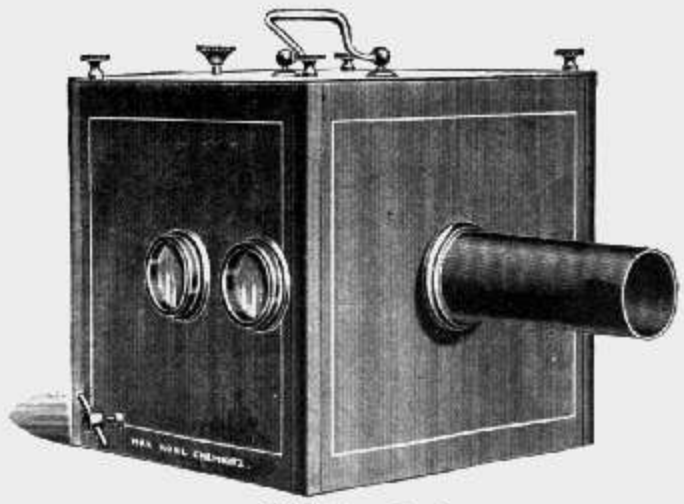
63 270 J. 1 : 8.



63 275. 1 : 5.



63 274 A. 1 : 4.



63 274 B. 1 : 5.

63,271. **Hertzian Wave Transmitter** (Vibrator), after Weinhold, separately, Fig. 63,270 B (W. D., Fig. 613 [558]) . . . . . £ 0. 12. 0

63,272. **Transmitter for Wireless Telegraphy** after Weinhold, alone, Fig. 63,270 J (W. D., Fig. 619 [564]) 1. 16. 0

63,273. **Branly Tube** after Weinhold, separately (W. D., Fig. 611 [556]) 0. 6. 0

63,274. **Complete Exciter for short Waves** after Prof. Jagadis Chunder Bose (Ztschr. f. d. phys. u. chem. U. **10**, p. 149), Figs. A and B 12. 0. 0

The apparatus consists, as shown in Fig. 63,274 A, of a frame with manipulator, 1 Storage Battery, 1 Induction Coil, 1 Interrupter the knob of which projects above the cover of the apparatus, and one small Radiator in oil vessel with concave copper mirror. The entire device can be placed in a protecting box formed of an iron and a copper sheet metal jacket, Fig. B, thus obviating the influence of magnetic and electric waves on the apparatus. The waves emitted by the radiator can be propagated through the tube inserted in the jacket.

The apparatus is ready for use when closed since the interrupter can be operated externally by the push mentioned. The secondary batteries can be cut out by means of the plug visible in Figs. 63,274 A and B.

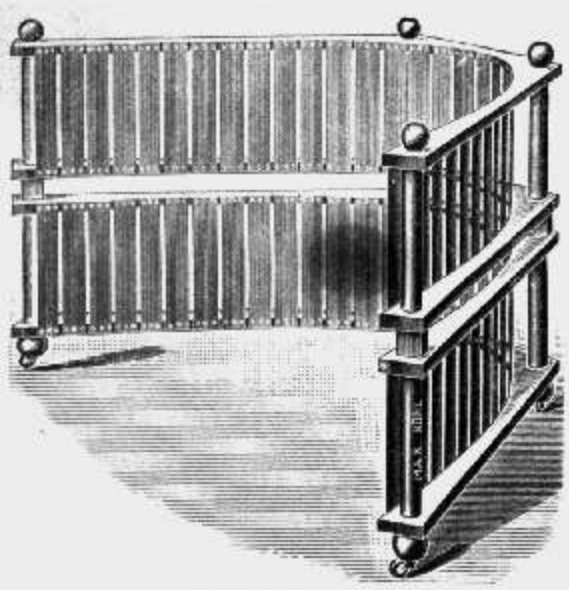
Two double discs can be screwed out of the protecting jacket (Fig. B) in order to be able to observe the two spark gaps.

63,275. **1 Coherer** for above, on stand, Figure 1. 4. 0

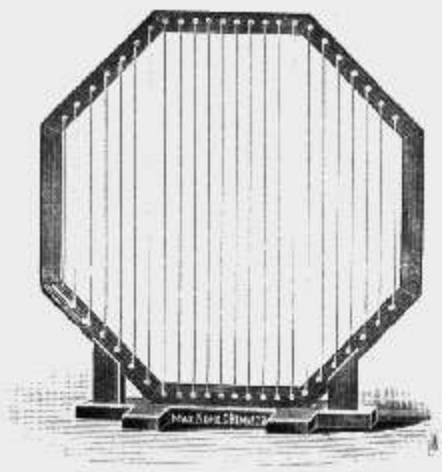
61,280. **1 Pointer Galvanometer** for above 2. 10. 0

63,277. **1 Simple Optical Bench** and a simple **Goniometer** for same, with cylindrical lens, 1 plane mirror, 1 cylindrical mirror, 1 prism, 2 half-cylinders, 2 copper wire gratings for polarisation 9. 0. 0

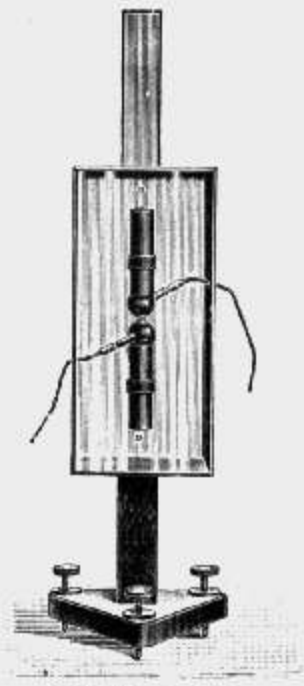
Cl. 4514, 6136, 3016, 3014, 3015. 66



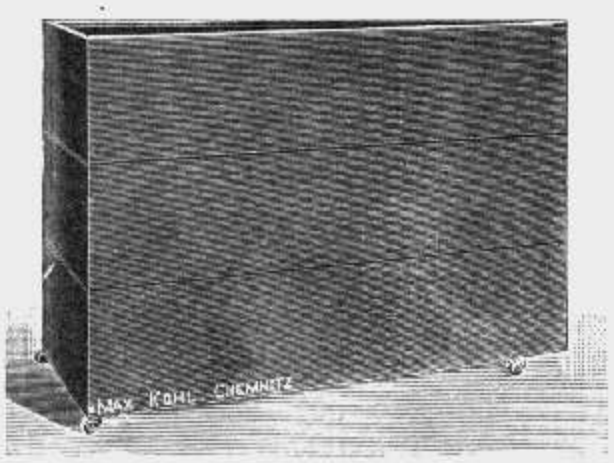
63 278. 1 : 18.



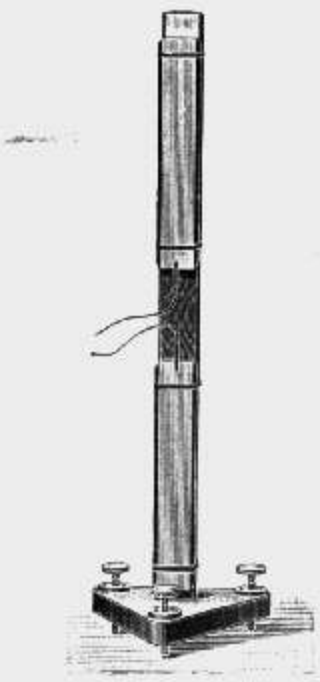
63 280. 1 : 18.



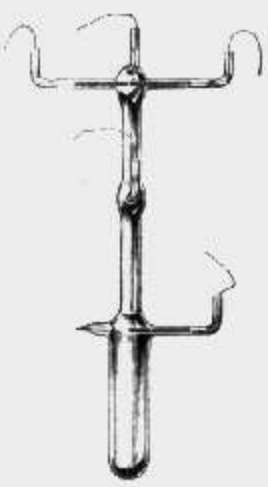
63 283. 1 : 10.



63 281. 1 : 18.



63 284. 1 : 10.



63 285. 1 : 3.

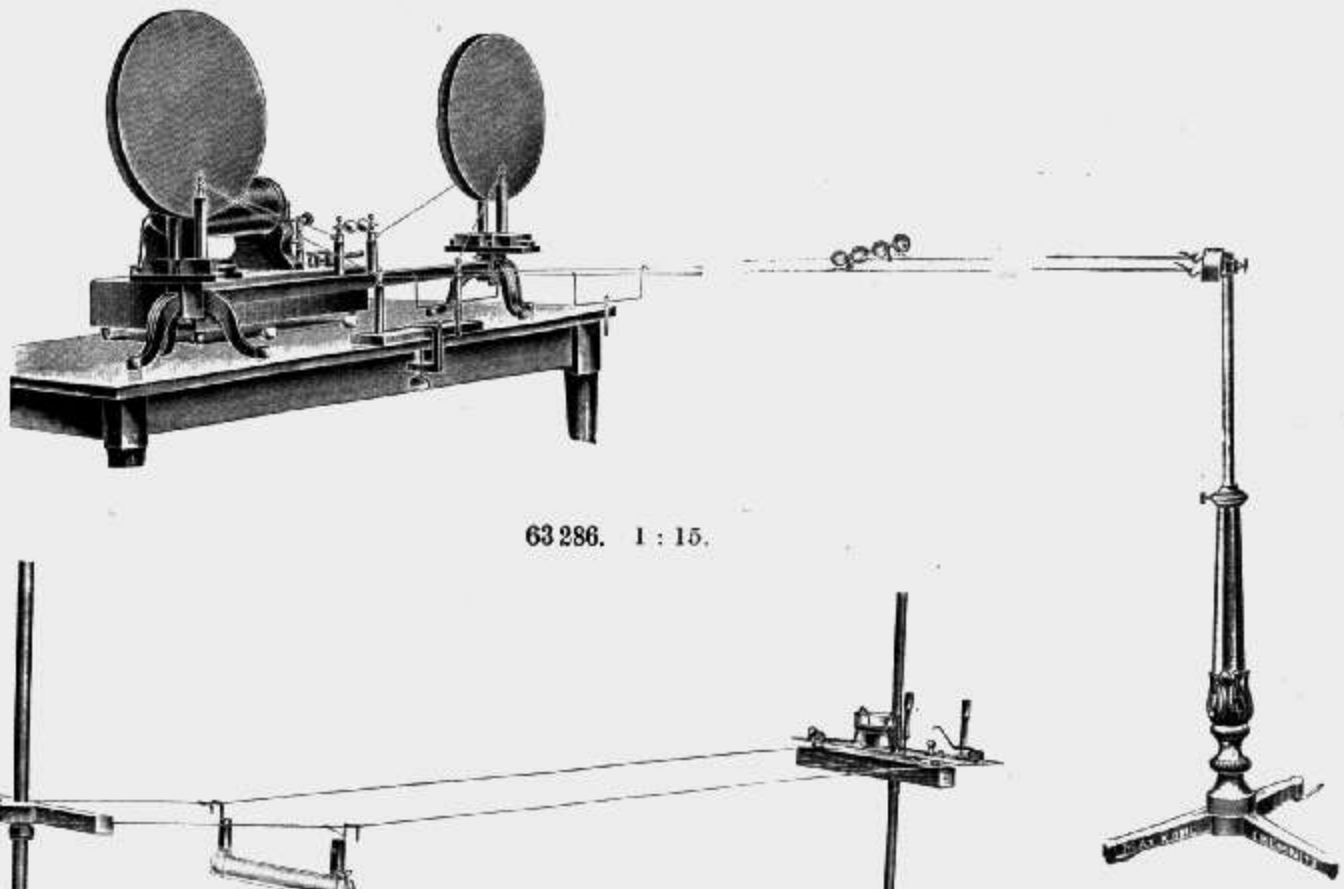
Large Pattern Apparatus for Hertzian Wave Experiments.

	£ s. d.
63,278. **2 Parabolic concave Mirrors** after Garbasso, Figure, 0.7 m high, 1.2 m aperture, 0.12 m focal distance, composed of two wood formers and a number of well-rounded nickelled sheet iron strips 27 cm long and 5 cm width	4. 10. 0
63,279. — idem, same size, after Zehnder, of three wood formers and a number of perpendicular wires, constructed as a wire mirror (Wieden. Ann. d. phys. Vol. 52, 1894, p. 55)	4. 10. 0
63,280. **Octagonal Wire Grating in Wood Frame,** 0.7 × 0.7 m, Figure, can be used vertically and horizontally, stretched with copper wires	1. 4. 0
63,281. **Large Pitch Prism,** Figure, with refracting angle of 30°, 1.2 m side length and 0.7 m high, composed of three single prisms. Each prism consists of a wood box into which hard pitch is run in	6. 12. 0
63,282. **2 Screens of Sheet Zinc on Wood Frames,** 1 m long, 0.7 m high, for reflection experiments . . . . . Each £ **0. 14. 0**	1. 8. 0
63,283. **Primary Conductor** after Zehnder, Figure, on special wood stand with levelling screws (Wied. Ann. d. Physik, Vol. 52, 1894, p. 52)	2. 0. 0

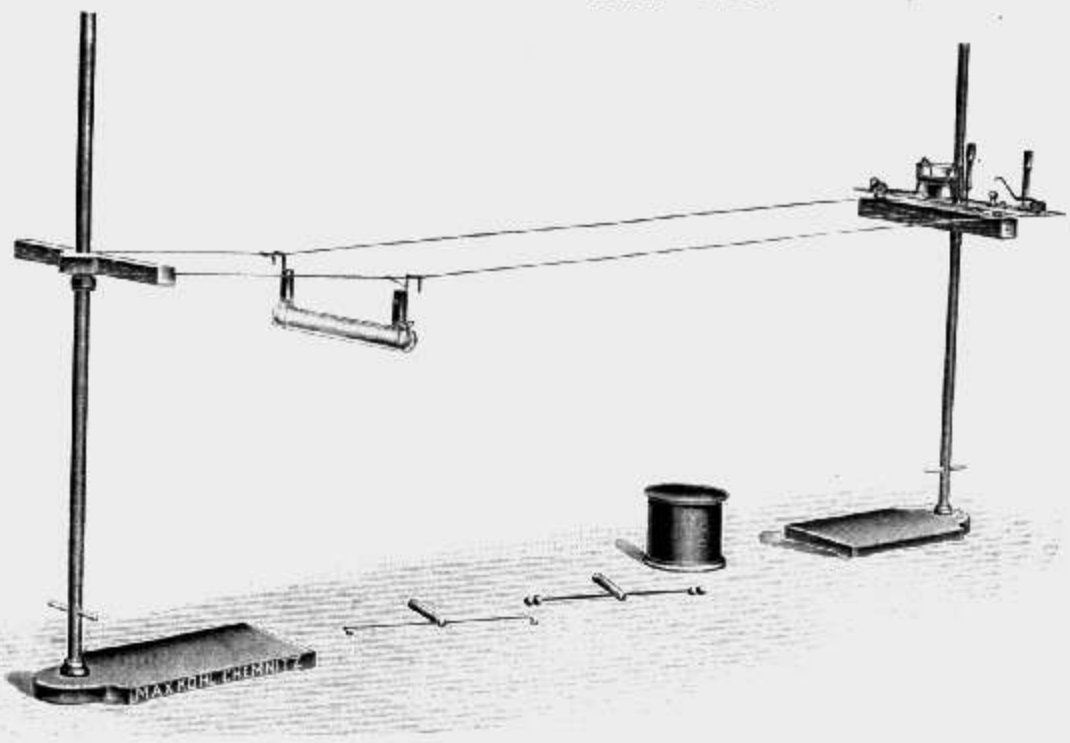
The halves of the primary conductor are cylinders made of brass tubing, brass spheres being soldered on one end and simple arched surfaces on the other. The conductor wires are secured by conical plugs. The primary conductor halves are enclosed in a pasteboard box having a glass front wall.

Cl. 3020, 3021, 3023, 3022, 3024, 3025.

Max Kohl A. G. Chemnitz, Germany.



63 286. 1 : 15.



63 287. 1 : 8.

63,284. **Secondary Conductor** after Zehnder, Figure, on wood stand having leivelling screws (Wied. Ann. Vol. 52, 1894, p. 53) . . . . . £ 1. s. 4. d. 0

63,285. **Discharge Tube** after Zehnder, Figure 0. 18. 0

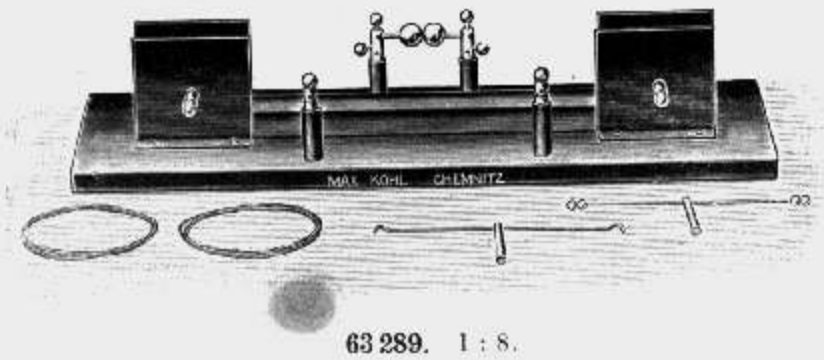
The tube has two leads for connecting with the secondary conductor halves and three leads for connecting with the high-voltage accumulator or the shunt current of the induction coil replacing the current of the accumulator (cf. Zehnder, Wied. Ann., Vol. **47**, 1892, pp. 77 and 90; Vol. **49**, 1893, pp. 549 and 724; Vol. **52**, 1894, p. 34).

High-voltage Storage Batteries: see p. 856.

63,286. **Apparatus for demonstrating and measuring Stationary Electric Waves on Wires**, after Lecher, Figure (Wied. Ann., Vol. **41**, 1890, p. 850), without Lecher tube or induction coil 6. 0. 0

The apparatus consists of two pairs of zinc disc 400 mm diameter, fixed on insulating stand and provided with connecting terminals; two of these discs are capable of motion so as to be able to vary the mutual distance of the discs. At the centre of the baseboard is the spark gap formed of two 30 mm brass spheres, 7.5 mm distance apart, these spheres being nickelled and fixed on ebonite pillars. These discharge spheres are in direct connection with the two fixed zinc discs by wires, and wires 1 mm thick lead from the movable zinc discs to two terminals, on ebonite pillars, at a mutual distance of 300 mm. From here two parallel running wires 9 m long lead to a heavy, adjustable iron pillar stand. Of the two wire clips, provided with ebonite insulating knobs, one is arranged for suspension and for easily sliding along, and the other for fixing by screws.

63,287. — idem, modified by Weinhold (W. D. Fig. 609 and 610 [554 and 555]), without Lecher tube or induction coil, Figure 2. 10. 0



63 289. 1 : 8.



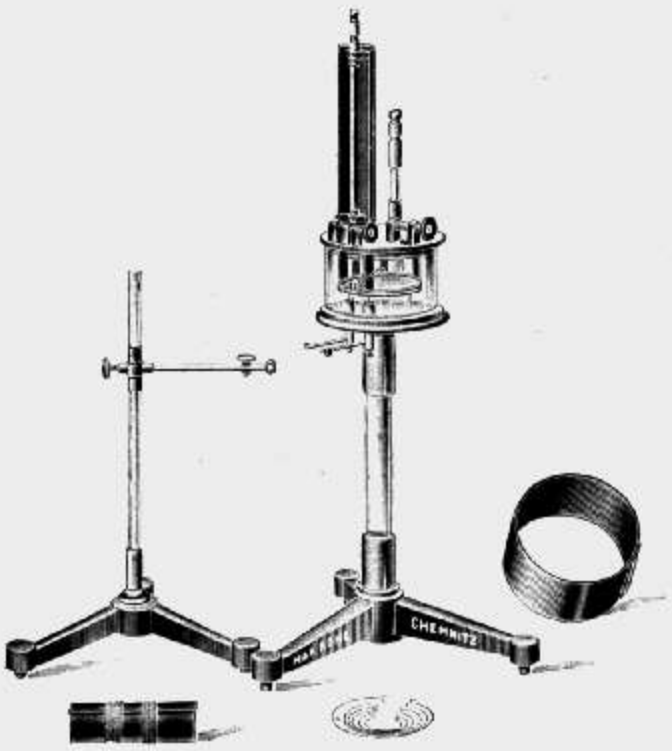
63 288. 1 : 6.



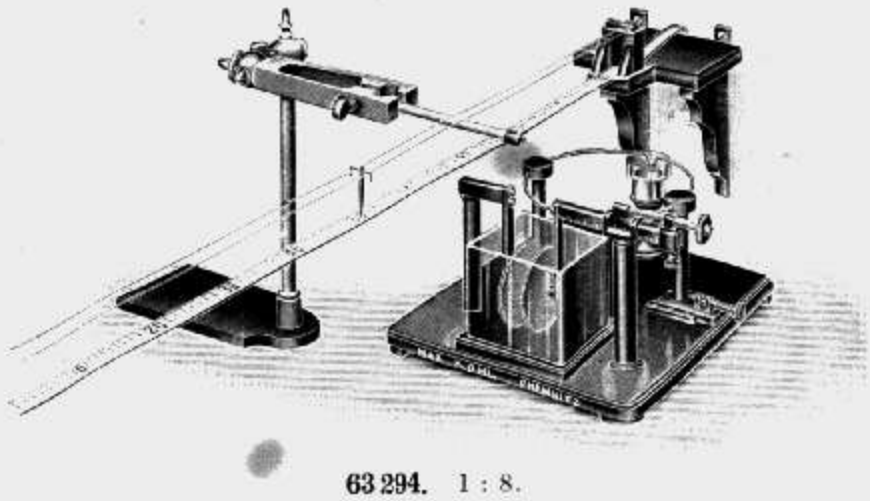
63 291. 1 : 15.

	£ s. d.
63,288. **Lecher Tube** for Apparatus Nos. 63,286—63,287	0. 4. 0
63,289. **Apparatus** after Walter Biegon von Czudnochowsky, **for demonstrating stationary Electric Waves on Wires,** Figure; simple pattern (Ztschr. f. d. phys. u. chem. U. **16,** 1903, p. 345); without tube or spark coil	2. 0. 0
Two foot terminals No. 60,172 (£ 0. 6. 0 each) and a helium tube No. 63,295 are necessary for the experiments with this apparatus.	
63,290. **Exciter for stationary Wire Waves,** after Grimsehl (Ztschr. f. d. phys. u. chem. U. **21,** 1908, p. 9; Physik. Ztschr. **8,** 1907, p. 485)	4. 0. 0
Supplied with the apparatus are: 2 copper wires, wire holder with terminals, 3 bridges and a small helium tube.	
63,291. **Aron's Tube,** Figure, for demonstrating electrical Oscillations (Wied. Ann., **45,** p. 553, 1892,) without exciter or induction coil	1. 16. 0
One of the experimental arrangements similar to Lecher's is used. From the secondary zinc plates opposite the exciter plates, at a mutual distance of 30 mm, two 2 mm thick aluminium wires are conducted parallely 3.5 m through the air and 2.5 m through the 60 mm diameter Aron tube, the wire in the tube being of the same length as that outside. The glass tube is connected by a length of tubing with the water air pump and evacuated to a pressure of 10—20 mm mercury column. With this arrangement the tube is usually seen to light up over its entire length in the darkened room. If, however, the free portion of the leads is bridged over, the light is generally extinguished. By sliding the bridge, however, it is possible to generate stationary electric waves so that the tube shows one more or non-luminous nodal points.	
63,292. **Apparatus** after Coolidge-Blondlot, **for demonstrating electric Waves,** Figure (Wied. Ann. 67, 1899, p. 578), consisting of a modified Blondlot Exciter with ebonite protecting jacket, on stand with glass pillar, a Tension Device on stand, 2 Copper Wires each 0.2 mm thick and 5.5 m long, and 6 Bridges of different size	4. 0. 0
In this apparatus use is made either of a Lecher Tube as bridge or wires lighting up in vacuo are employed, but the waves are visible by the luminescence of the wires in free air.	
In order to obtain as strong oscillations in the secondary circuit of the exciter as is possible, the exciter is of the same size as the primary oscillating circuit and is brought as near to it as possible. With a view to attaining this the two circuits are separated simply by mica plates of a total thickness of 2 mm and are contained in an oil bath, thus preventing any sparking over in the secondary. The primary circuit is constructed in two parts, the distance apart being regulated by insulating screws fitted on the ebonite cover of the apparatus.	
The following are necessary for working the apparatus: 1 Induction Coil of 150—200 mm spark-length; 1 spark Micrometer No. 63,208 or 63,209; 1 High-tension Transformer No. 63,210 and 1 Leyden Jar No. 60,582.	
Directions for use sent on application.	
60,582. **Leyden Jar,** height 26 cm, with terminals	1. 0. 0
63,293. **Wavemeter** after Drude, with air condenser for determining the period of oscillation and, consequently, the wave-length in the oscillation circuits for wireless telegraphy (Drudes Annalen, **9,** 1902, p. 615), Figure. Without vacuum tube	5. 0. 0
The apparatus consists of a small air condenser with two 1 mm thick parallely stretched copper wires connected to it, these wires being fixed to a wood baseplate 2 m long. An electrodeless vacuum tube is used as indicator. Wave-lengths from 12 to 50 m can be determined with ease.	

Max Kohl A. G. Chemnitz, Germany.



63 292. 1 : 7.



63 294. 1 : 8.

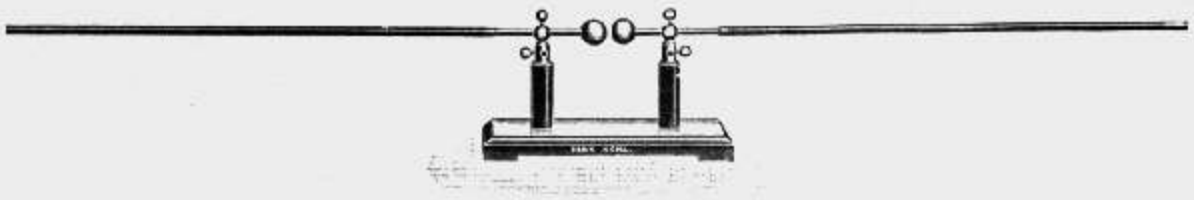


63 293. 1 : 15.

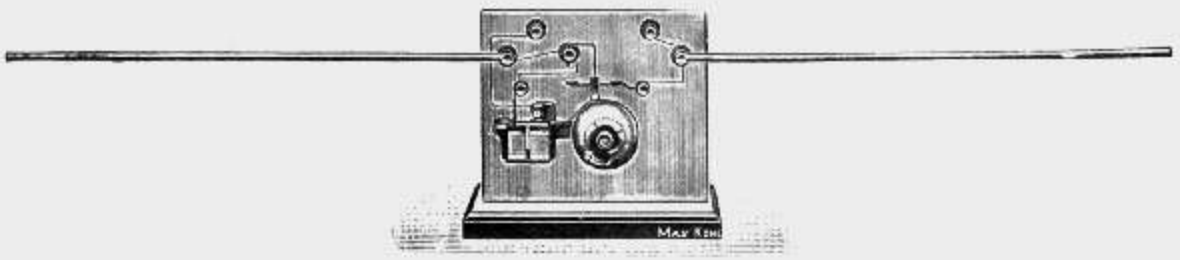
Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
63,294. **Wavemeter** after Drude, with oil condenser, especially for determining the duration of oscillation of wire coils (Drudes Ann., **9**, 1902, p. 293), Figure, without helium tube	8. 0. 0
63,294 a. **Tesla Transformer with Leyden Jar,** after Drude, for above (Drudes Ann., **9**, 1902, p. 293)	2. 8. 0
63,295. **Helium Tube** for use with the Drude Wavemeters, Plücker form with two electrodes	0. 15. 0
63,296. — idem, with one electrode	0. 14. 0
63,297. — idem, without electrode	0. 12. 0
63,298. — idem, cylindrical pattern with one electrode	0. 14. 0
63,299. **Apparatus for Measuring the Dielectric Constant of Liquids,** after Drude (Wied. Ann., **61**, 1897, p. 466)	5. 0. 0
63,300. — idem, after Schmidt, for determining the Dielectric Constant of Crystals (Drudes Ann., **9**, 1902, p. 919)	5. 0. 0
63,301. **Model** after Garbasso, **for Explaining the Hertzian Resonance Phenomena** (Ztschr. f. d. phys. u. chem. U. **15**, 1902, p. 331, Fig. 7; Fr. phys. Techn. I, **2**, Fig. 3284)	13. 0. 0

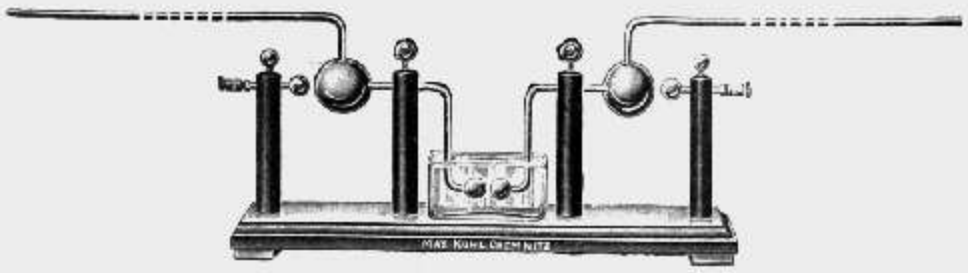
Cl. 3582, 4695.
3035



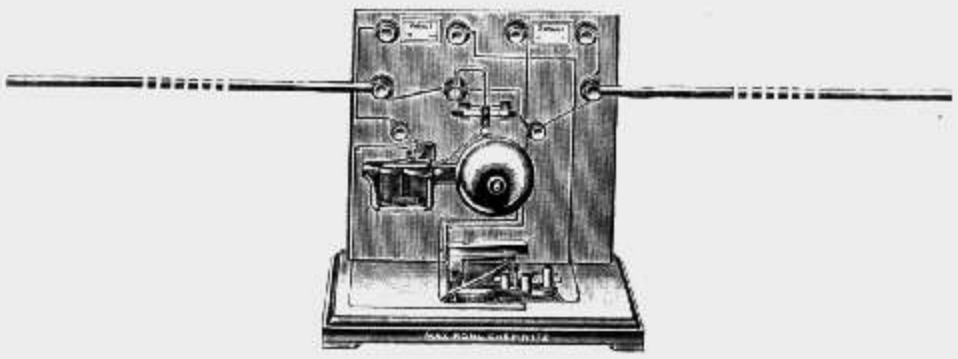
63 302 A. 1 : 5.



63 302 B 1 : 8.



63 305 A. 1 : 7.



63 305 B. 1 : 7.

Wireless Telegraphy (Radio-telegraphy).

(a) Apparatus for small-scale Experiments.

£ s. d.

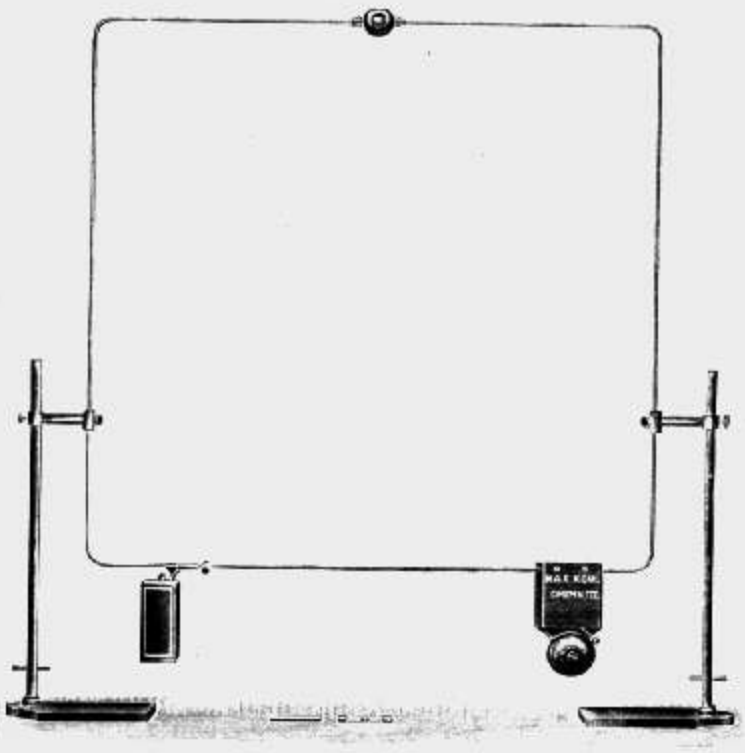
63,302. **Wireless Telegraphy Demonstration Apparatus,** consisting of a **Transmitting Station,** Fig. A, with radiator and 2 resonators; and a **Receiving Station,** Fig. B, with coherer, tapper and 2 resonators 2. 8. 0

The apparatus is very efficient at short distances. The spark is generated either by a small induction coil of 30—50 mm spark length or by an influence machine. One cell is necessary for working the secondary station. An accurate description is appended to each apparatus.

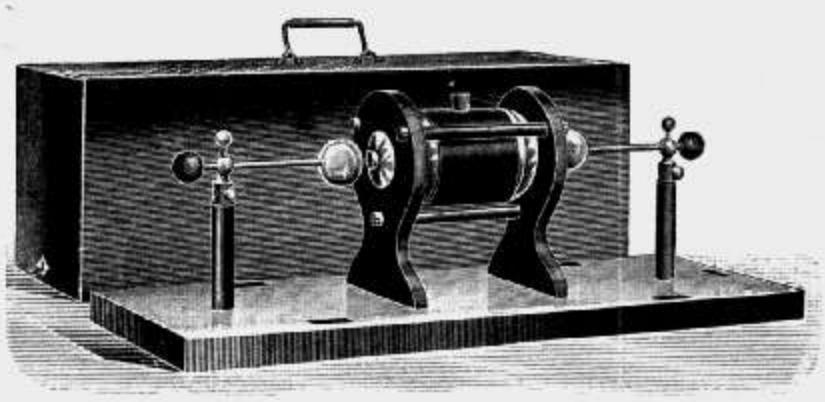
63,305. **Wireless Telegraphy Demonstration Apparatus,** perfected pattern; consisting of a **Transmitting Station,** Fig. A, with an oscillator having three spark gaps and two resonators; and a **Receiving Station,** Fig. B, with coherer, relay, tapper, 2 resonators and terminals for two circuits 6. 0. 0

Cl. 3041, 3042, 3043, 3044.

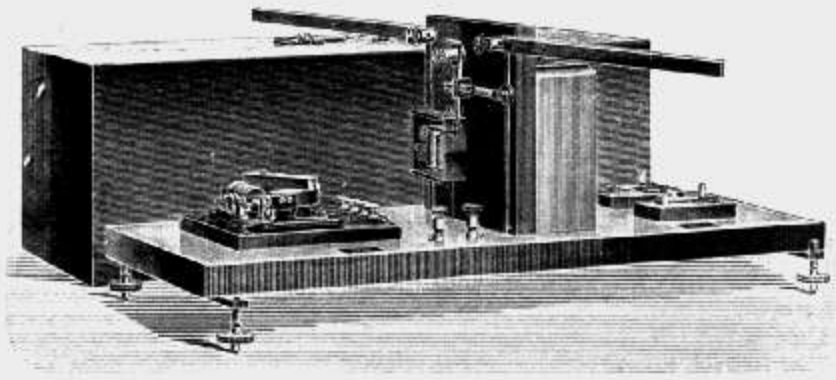
Max Kohl A. G. Chemnitz, Germany.



63 308. 1 : 15.



63 309 A. 1 : 7.



63 309 B. 1 : 7.

	£ s. d.
63,308. **Apparatus for comparative Explanation of Wireless and Ordinary Telegraphy,** Figure	2. 4. 0

For explaining ordinary telegraphy the apparatus is assembled as in the illustration. Instead of the push the simple connecting wire given in with the apparatus can be inserted at the point of interruption so that the bell works continuously. After the push is inserted the modus operandi of the house telegraph should be explained. Between push and bell any length of conductor can be supposed; such a conductor is absolutely necessary in this arrangement for connecting the transmitting and receiving station.

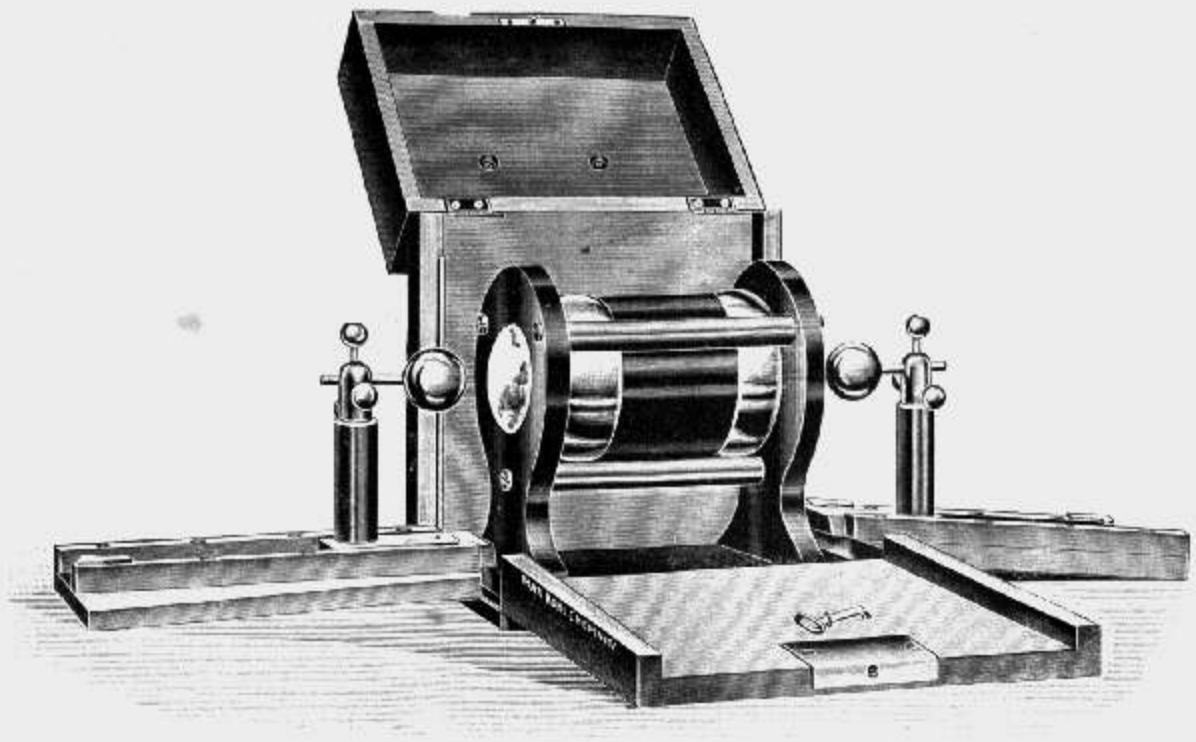
If instead of the push the coherer supplied is inserted, the entire apparatus represents the receiver only in a wireless telegraphy system. The coherer establishes a local circuit if the spark from an induction coil, an influence machine, or the like, is allowed to spring over in the same room. A conductor is not necessary between transmitter and receiver.

63,309. **Wireless Telegraphy Demonstration Apparatus** after Marconi; comprising a **Transmitting Station,** Fig. A, with Righi radiator of 100 and 40 mm size of sphere, in a lock-up polished carrying case fitted with handle; and a **Receiving Station,** Fig. B, with one coherer, 1 polarised relay, 1 electric tapper, 2 resonators, 2 switches and 4 dry cells, in polished lock-up carrying case having four levelling screws and handle	13. 0. 0

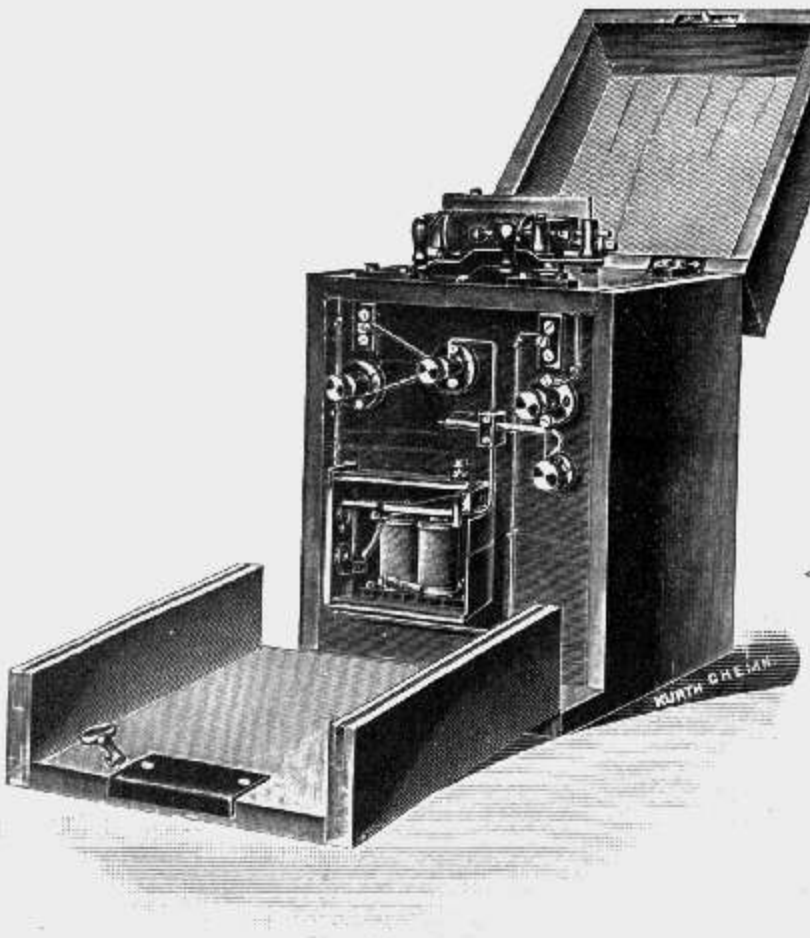
The apparatus is specially suitable for better-class schools and colleges.

63,310. — idem, smaller, with Righi radiator 80 and 30 mm size of spheres, cf. Fig. 63,309 A and B	10. 0. 0

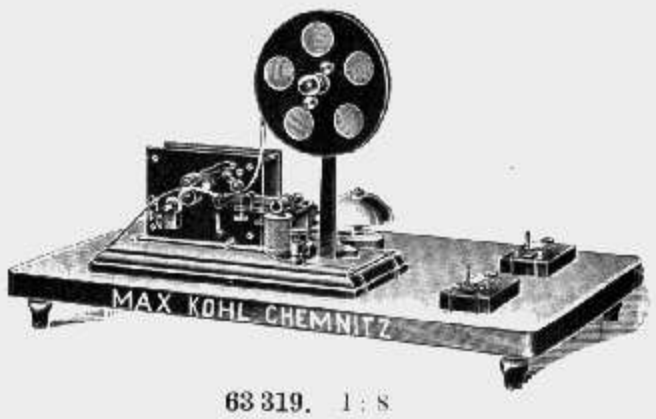
Cl. 4125, 3045, 3046.



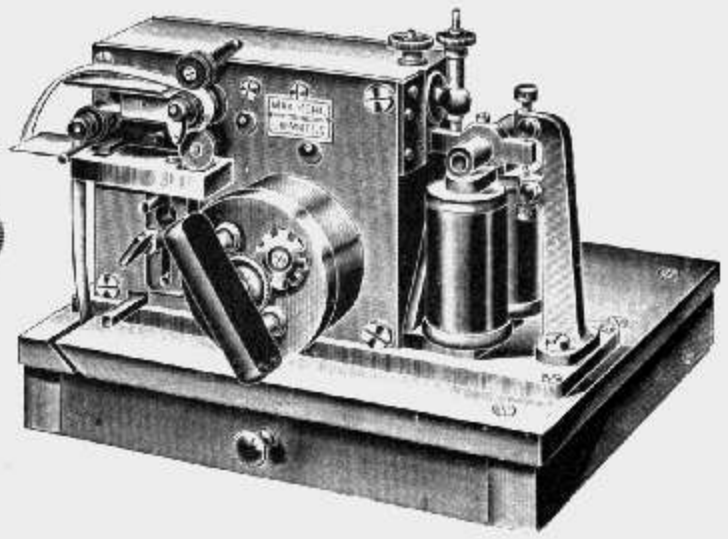
63 312 A. 1 : 4.



63 312 B. 1 : 4.



63 319. 1 : 8



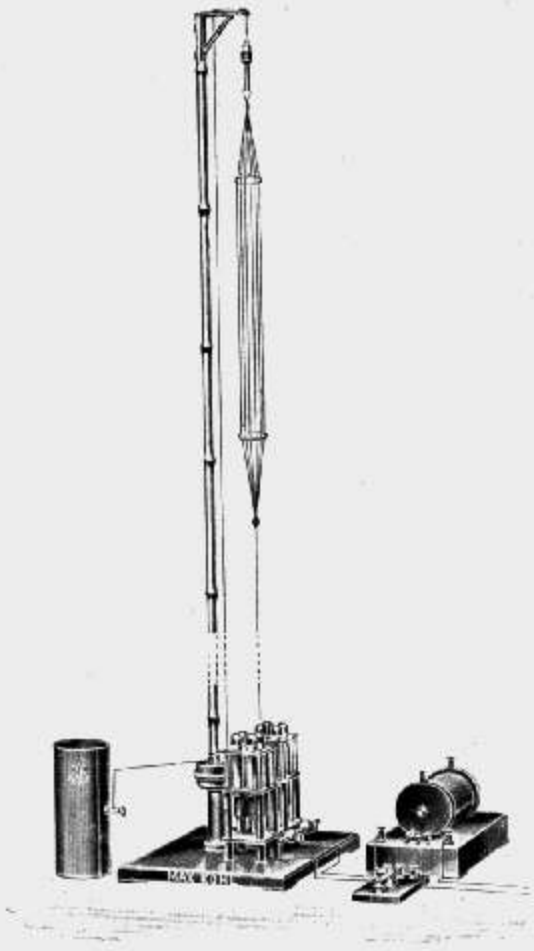
62 329. 1 : 5.

63,312. **Portable Apparatus for demonstrating Wireless Telegraphy**, Figs. A and B: comprising a **Transmitting Station** with Righi radiator in polished lock-up wood box 230 × 195 × 150 mm; and a **Receiving Station** with Marconi coherer, a sensitive, adjustable polarised relay, an electric tapper, 2 switches and 4 dry cells, also in polished lock-up wood box 230 × 195 × 150 mm . . . . . £ s. d. 14. 0. 0.

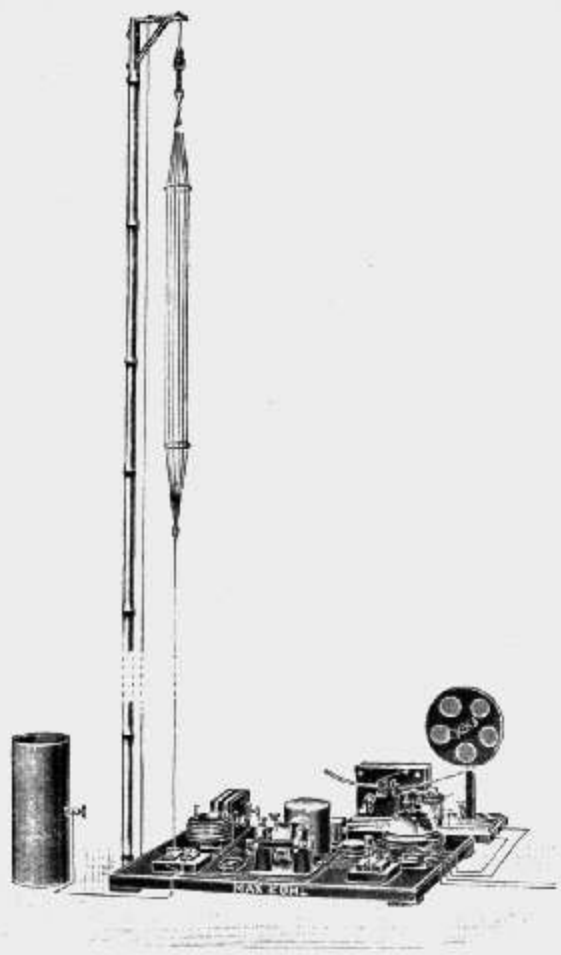
Complete description of the apparatus sent on application.

Cl. 3053, 3047, 3054, 2619.

Max Kohl A. G. Chemnitz, Germany.



63 323 A. 1 : 13.



63 323 B. 1 : 13.

	£ s. d.
63,317. **Electric Bell** for calling	0. 4. 0
62,326. **Morse Ink Writer, small pattern,** cf. Fig. 62,325, p. 959, without cell	2. 0. 0
62,327. **Morse Ink Writer,** with clockwork, on polished mahogany board, Figure on p. 959	4. 0. 0
63,319. — idem, **with one bell and two switches combined on one board,** Figure	5. 0. 0
61,147. **Morse Key,** Fig. on p. 868	0. 10. 0
63,323. **Complete Wireless Telegraphy Demonstration Apparatus** after Prof. Braun, Figs. A and B, **without** induction coil, Morse key, Morse writer, or cells	26. 0. 0

The transmitting station contains a spark gap, a Leyden jar battery, a transformer, and a mass 2.5 m high with transmitting wire and an anti-capacity for same. The mass is constructed of bamboo, being composed of three parts which can be inserted in each other. The jib at the end of the mass carries two pulleys in order to allow of the transmitting wire being drawn up.

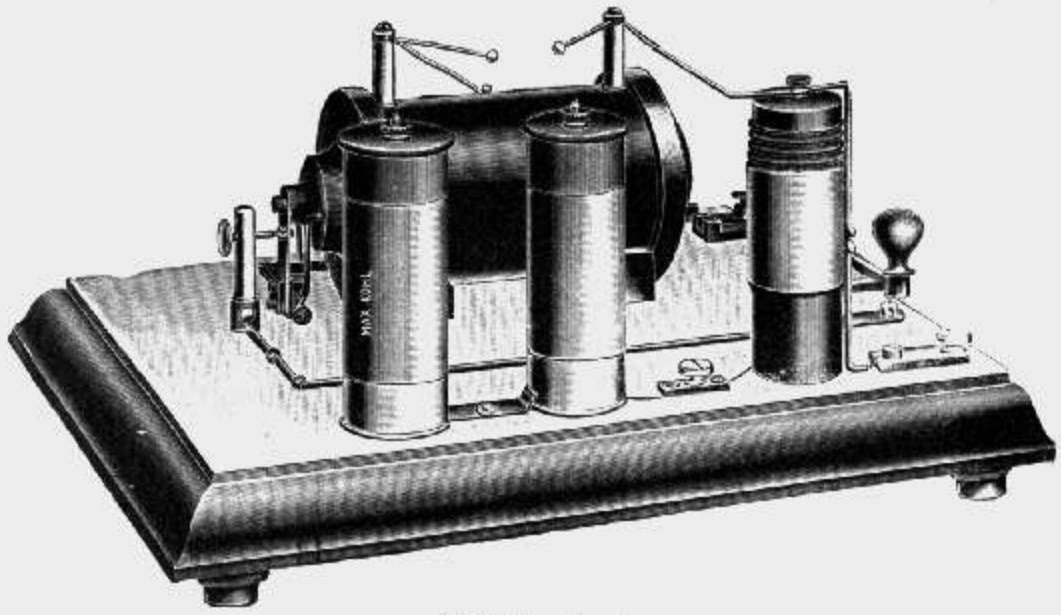
The receiving station, in addition to containing the mass with the receiving wire and anti-capacity, has an oscillation circuit formed of a condenser and self-induction coil, the coherer, the relay, a bell, the tapper and a small auxiliary condenser.

An induction coil having a spark-length of only 30 mm is sufficient to work the apparatus.

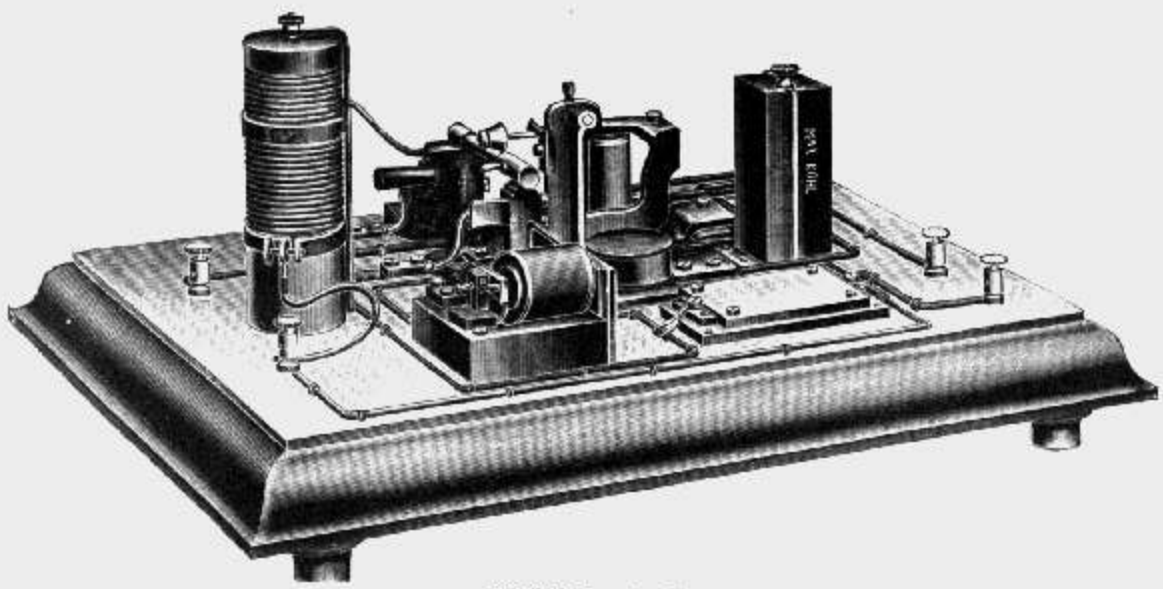
Complete description is appended to each apparatus.

As Morse Writer No. 62,327 can be used or, better still, the following:

62,329. **Standard Ink Writer,** Figure, with detachable spring drum, horizontal paper roll in the base (which can be removed), on polished mahogany socket	12. 10. 0
62,332. **Extra price for Automatic Release,** very practical	1. 10. 0
63,325. **Coherer Tester**	1. 0. 0



63 326 A. 1 : 5.



63 326 B. 1 : 5.

63,326. **Complete Wireless Telegraphy Demonstration Apparatus** after Slaby-Arco, Figs. A—D, with aerials as in No. 63,327 . . . . . £ s. d. 21. 0. 0

The **Transmitting Station** consists of an induction coil with platinum interrupter, adjustable spark gap, 2 Leyden Jars, a variable self-induction coil and a Morse key.

The **Receiving Station** contains a tuning coil, a small condenser, a relay, a coherer, the tapper and a dry cell.

Morse Ink Writers, cf. Nos. 62,327, 62,329 and 62,332.

A complete description of the apparatus forwarded on application.

63,327. **Wireless Telegraphy Demonstration Apparatus, "Telefunken" System;** Fig. A. Transmitter; Fig. B, Receiver; Fig. C, Transmitter and aerial system; without Morse Writer or Alarm 23. 0. 0

The connections of this apparatus are in exact accordance with the modern method of connecting up this system, such as employed in the larger Telefunken plants having high frequency oscillation circuits.

The apparatus comprises a complete Transmitting and Receiving Apparatus (without Writer) also two identical aerial systems for transmitting and receiving. The table included in the illustration is not covered by the above price.

Description and instructions for use on application.

Suitable Morse Ink Writers: see under Nos. 62,327, 62,329 and 62,332.

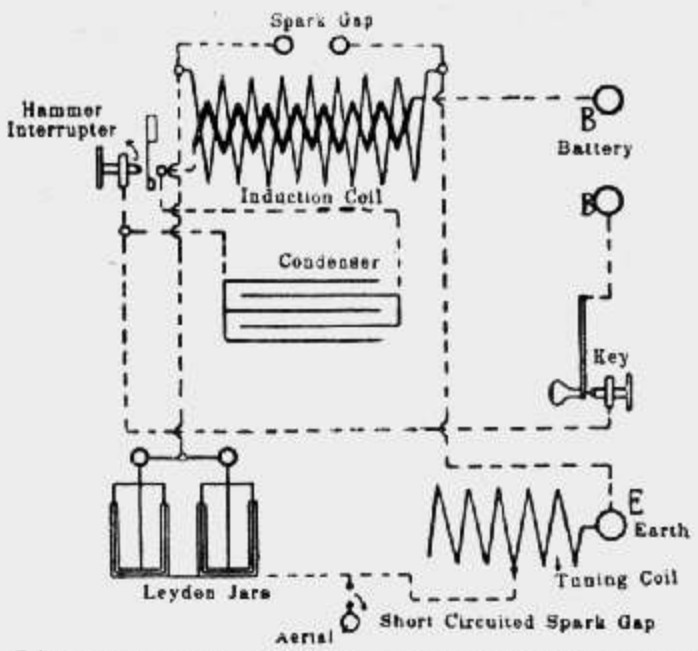


Diagram of Connections of the Transmitting Station of the Slaby-Arco system.

63 326 C.

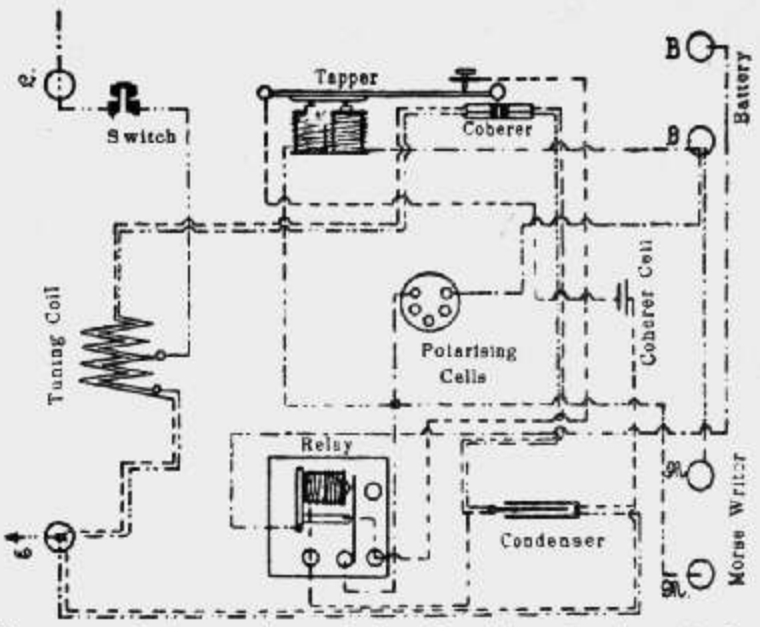
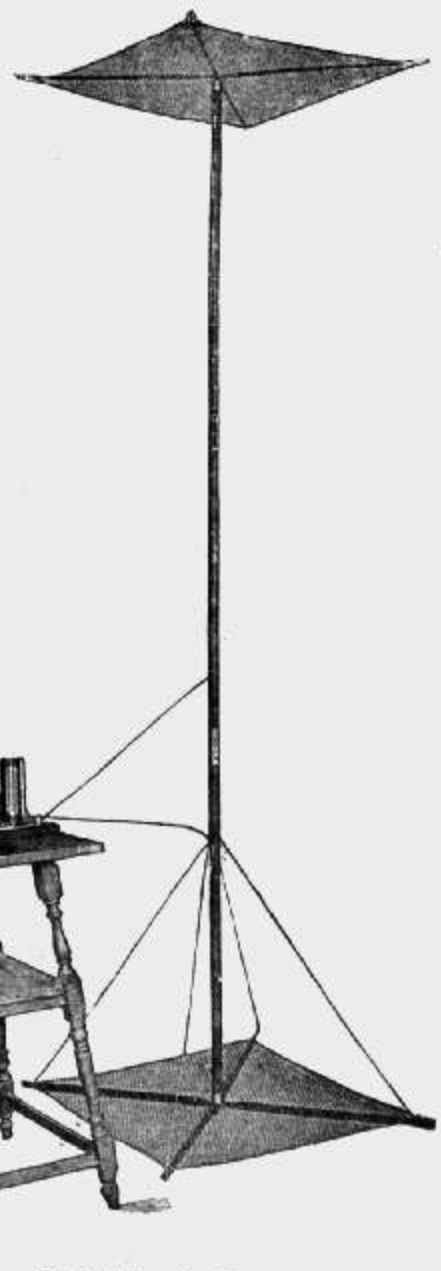
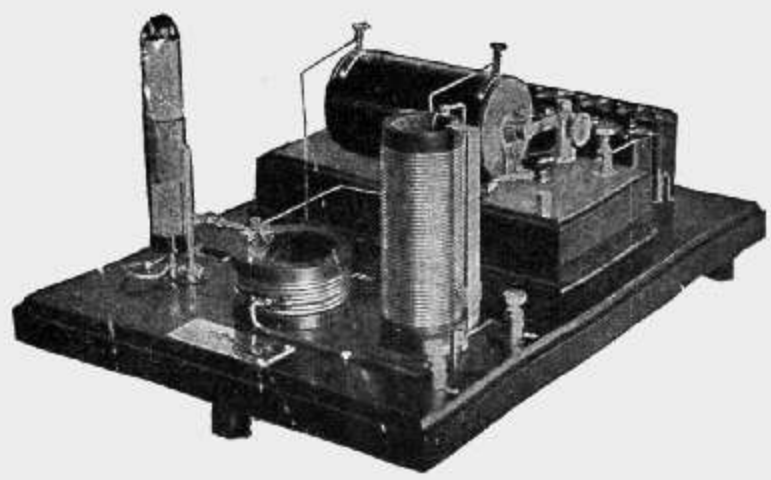


Diagram of Connections of the Receiving Station of the Slaby-Arco system.

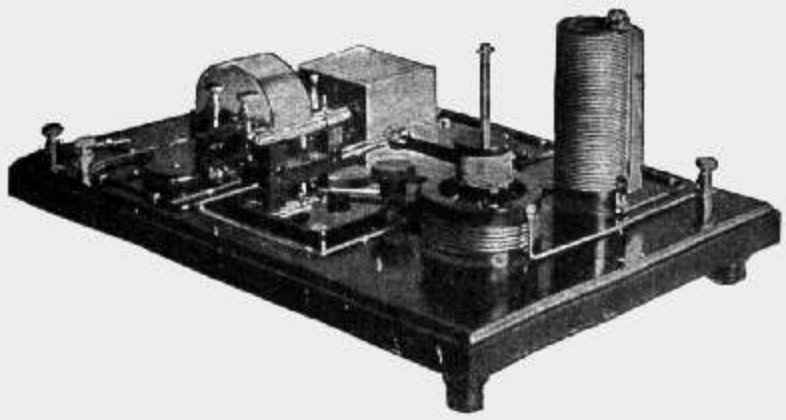
63 326 D.



63 327 C. 1 : 20.



63 327 A. 1 : 5.



63 327 B. 1 : 5.

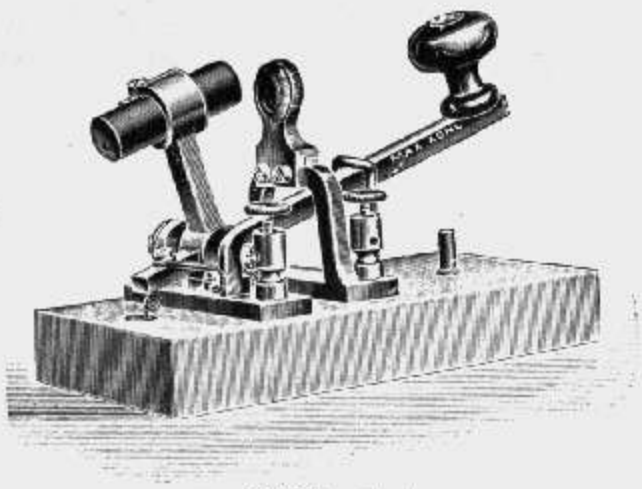


63 328. 1 : 5.

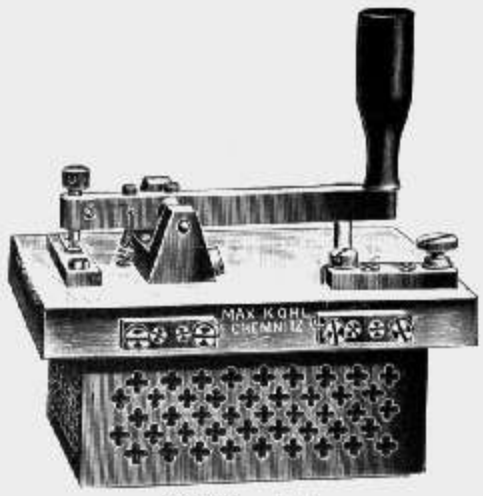
	£ s. d.
63,328. **Branly Tube,** Figure, filled with small iron screws, for demonstration	0. 16. 0
63,329. **Automatic Needle Coherer** after Bleckrode	0. 6. 0
63,330. **Coherer** after Pantenius (Kolbe, Elek.-Lehre, 2nd Edn., Vol. 2, 1905, Fig. 80 A) . . Cl. 6598, 6599, 3583, 3584, 3585, 3870.	1. 4. 0



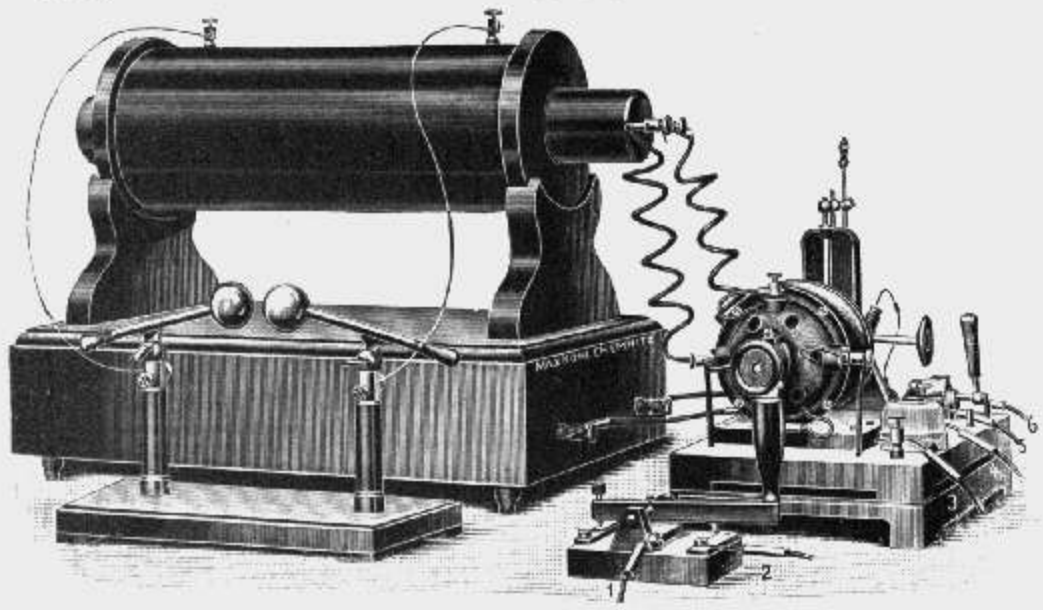
63 331. 1 : 6.



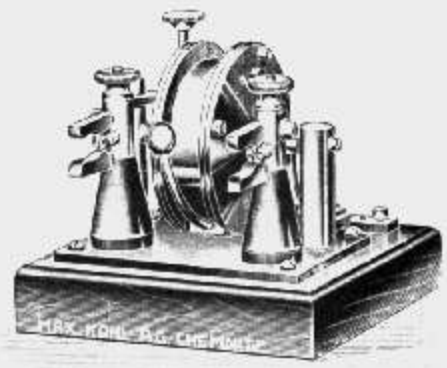
63 334. 1 : 4.



63 335. 1 : 4.



63 332, 63 333. 1 : 7.



63 337. 1 : 3.

Max Kohl A. G. Chemnitz, Germany.

£ s. d.

63,331. **Thermocouple,** Figure, after Rubens, can be used as **a Wave Detector** 1. 0. 0

As galvanometer for above use can be made of an astatic or a moving-coil mirror galvanometer of low resistance and high sensitivity.

Valve Tube as Audion (Wave Detector): see under No. 63,136, p. 1024.

(b) Small-cale Apparatus for Wireless Telegraphy.

63,332. **Righi Radiator,** Figure, consisting of baseboard and two ebonite pillars on the free ends of each of which a brass rod with brass sphere rotates in hinges, together with terminals, but without the accessories illustrated 2. 0. 0

63,333. **Key,** Figure, with extra-thick platinum contacts and long ebonite push . . . 2. 2. 0

63,334. **Key,** Figure, for heavy currents 1.12. 0

The key is arranged in such manner that the arc formed on interrupting, and forced upwards by its own heat, is not deleterious to the apparatus. One of the contacts is interchangeable, being made of carbon; it must always be connected with the positive pole of the current lead.

The key, which is specially adapted for working induction coils having Wehnelt Interrupter, is of extraordinary resisting powers as constructed.

63,335. **Morse Key** for currents to 50 amperes, Figure, with thick platinum contacts and electromagnetic spark extinguisher 8. 0. 0

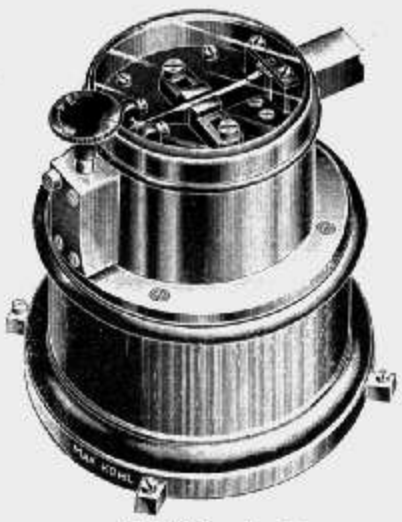
The key is intended for heavy currents as produced when working the induction coil with the Wehnelt break.

63,336. **Adjustable Steel Coherer,** with filling material 1. 6. 0

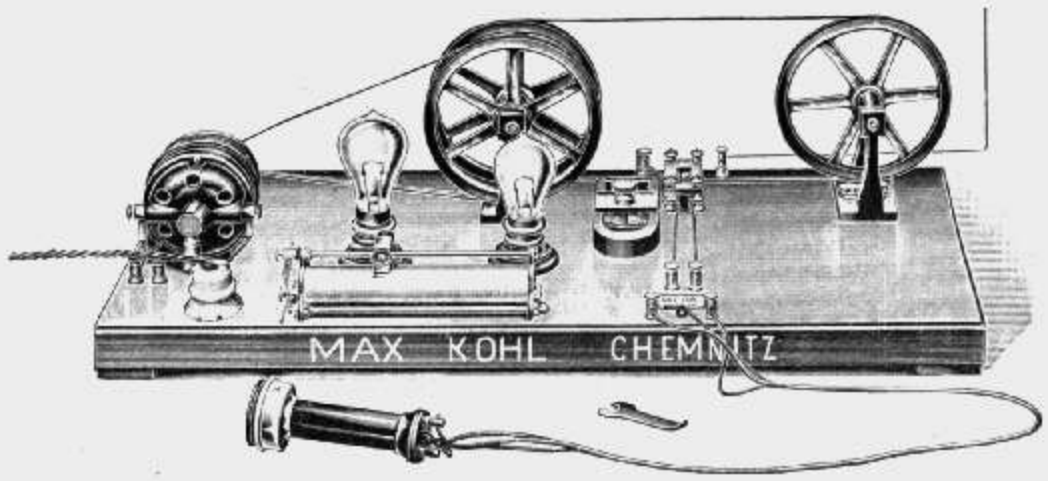
63,337. **Device for Clipping and Shaking the Coherer,** Figure, suitable for Coherer No. 63,336. Price without Coherer 3.10. 0

63,338. **Round pattern polarised Relay,** Figure, having resistance of approx. 7,000 ohms, with four polarising cells for preventing sparking 9. 0. 0

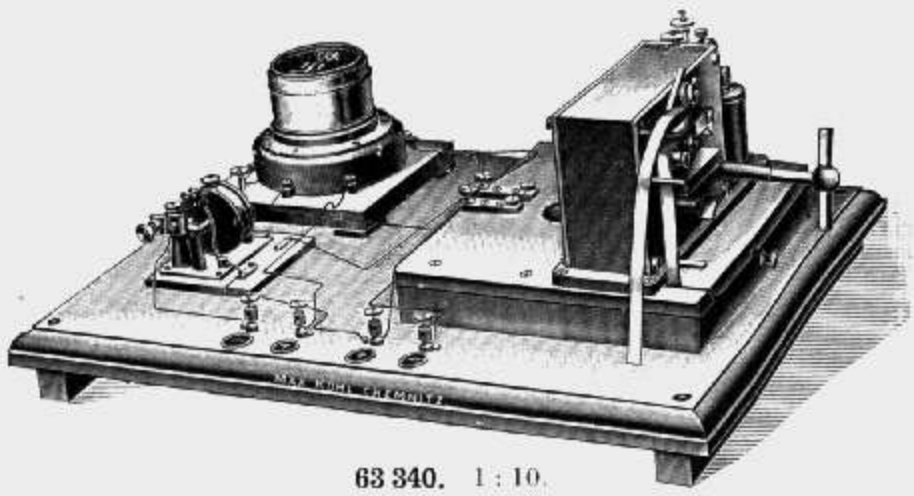
Cl. 4675, 3058, 3059, 3055, 6171.



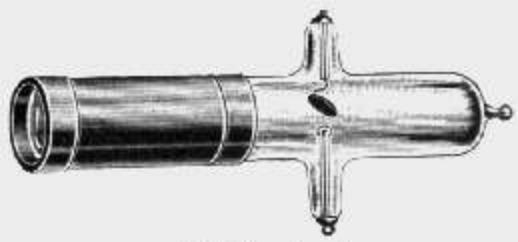
63 338. 1 : 5.



63 341. 1 : 10.



63 340. 1 : 10.



63 345. 1 : 4.

63,339. **Round Relay** No. 63,338, **Coherer** No. 63,336, and **Shaking Device** No. 63,337, mounted together on one polished mahogany slab, with all leads and the necessary terminals — £ 15. s. 0. d. 0

Standard Ink Writers: see Nos. 62,329/32, p. 1049.

63,340. **Assembled Receiving Station.** Figure, comprising 1 adjustable steel Coherer No. 63,336, 1 clip and shaking device No. 63,337 for same, 1 round pattern polarised relay No. 63,338, and 1 standard ink writer No. 62,329 with automatic release No. 62,332, mounted together on one polished mahogany board 29. 10. 0

63,341. **Magnetic Detector** after Marconi, Figure, complete with telephone and 110 Volt D. C. motor 11. 0. 0

This apparatus is splendidly adapted for demonstrations.

If a motor for different voltage or current is desired, this should be stated when ordering.

63,345. **Zickler Tube for opto-electric Telegraphy,** Figure, with quartz plate and adjustable quartz lens (Ztschr. f. d. phys. u. chem. U. **12**, 1899, p. 43; E. T. Z., 1898, pp. 474 and 487) 3. 0. 0

Opto-electric Telegraphy by Zickler's method is based on the phenomenon of a spark gap allowing the sparks to pass when submitted to radiation from ultra-violet light, the sparking ceasing, however, when radiation is stopped. The spark gap is enclosed in an evacuated glass tube having a quartz window at one end; in front of this window is fitted a sliding, convex, quartz lens which condenses the ultra-violet rays on the cathode. The ultra-violet rays are shut off by inserting a thick glass plate in the luminous pencil of the arc lamp.

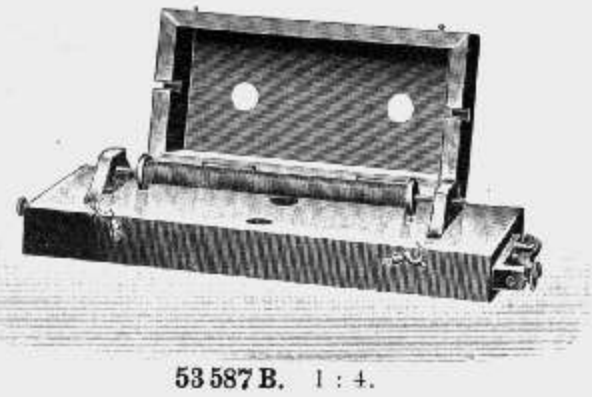
As to the source of light to use, an electric arc lamp (say, that of a projection lantern), the condenser of which has been removed, is sufficient for demonstration purposes. For condensing the light on the tube it is advisable to use the following quartz lens when the distance in question is somewhat large.

63,346. **Quartz Lens** 38 mm diameter 0. 12. 0

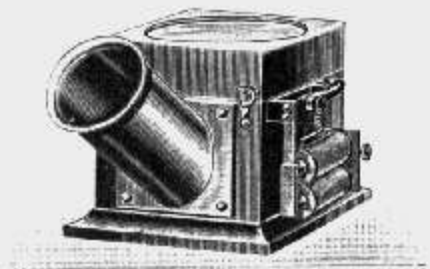
63,347. **Glass Plate,** 200 × 150 × 8 mm 0. 3. 0

63,348. **Geissler Tube** for Zickler's opto-electric Telegraphy 0. 3. 0

The Geissler tube is put in series with the induction coil and spark gap. While the Geissler Tube only gives a dull glow when there is no sparking over in the Zickler tube, it lights up much brighter with the passage of sparks.

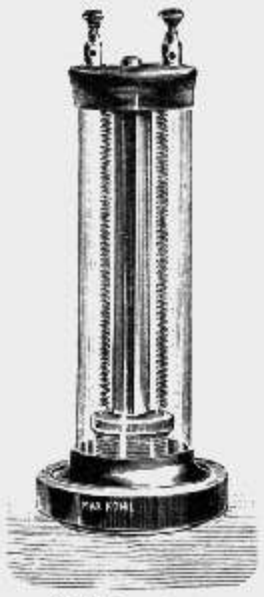


53 587 B. 1 : 4.



53 587 A. 1 : 4.

63 360. 1 : 7.



63 361. 1 : 3.



63 367. 1 : 4.



63 362. 1 : 4.



63 369. 1 : 4.

Section 11: Telephony and Microphony.

53,587. **Telephone** after Ph. Reis, consisting of transmitter, Fig. 53,587 A, and Receiver, Fig. 53,587 B . . . . . £ 4. s. 0. d. 0

Between transmitter and receiver — called by Reis himself the reproducing apparatus — a battery is so connected up that the two are traversed in series by the current. The latter should be of such strength that the armature of the small magnet on the transmitter is attracted; for this purpose 3—4 Bunsen cells or storage cells should suffice, according to the distance between both stations.

63,360. **Apparatus for Explaining the Working of the Telephone,** Figure (Ztschr. f. d. phys. u. chem. U. 2, p. 133; Kolbe, Einf. i. d. Elektrizitätslehre, Vol. 2, Fig. 78 A) 2. 2. 0

The apparatus consists of two powerful bar magnets on to which two wire coils are slipped; the coils are connected with each other. In front of one of the magnets a small iron piece is suspended so as to be capable of oscillation. If the thick iron plate given in with the apparatus is brought up to the other magnet at regular intervals (say, to the beat of the pendulum oscillation) until it makes contact, and is then removed, the small iron piece in front of the first magnet is set into oscillatory motion, which can be increased until the iron piece is finally attracted by the magnet.

63,361. **Telephone in Glass Case,** Figure, with ebonite mountings; all internal parts quite visible 0. 16. 0

63,362. **Telephone** after Bell, Figure, in ebonite sheath with double flexible 0. 12. 0

63,367. **Round Pattern Telephone,** Figure, double-pole, with nickelled cap, ebonite mouthpiece and twin flexible 0. 8. 0

63,369. **Receiver with lateral ear-piece,** Figure, with horse-shoe magnet, nickelled diaphragm case, ebonite piece and twin flexible 0. 16. 0

63,370. **Precision Telephone,** Figure, thoroughly well constructed 1. 0. 0

63,373. **20 metres Twin Flexible,** with wire ends for connecting up two telephones 0. 6. 0

63,374. **Microphone** after Weinhold, simple, Figure (W. D. Fig. 600 [549]) 0. 6. 0

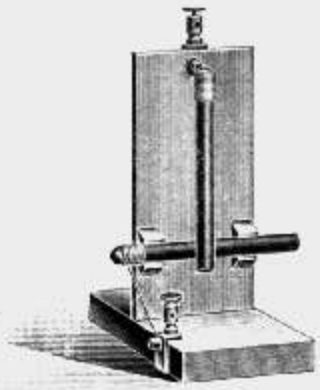
63,375. **Microphone** after Hughes, Figure (M. P., 9th Edn., III, Fig. 800) 0. 8. 0

Cl. 1178, 3066, 3068, 1177, 3500, 3067, 3069.

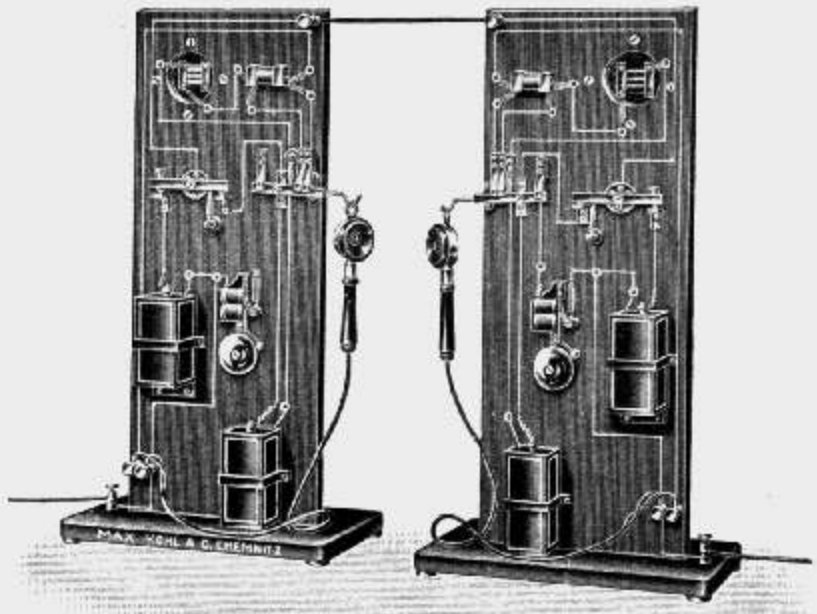
Max Kohl A. G. Chemnitz, Germany.



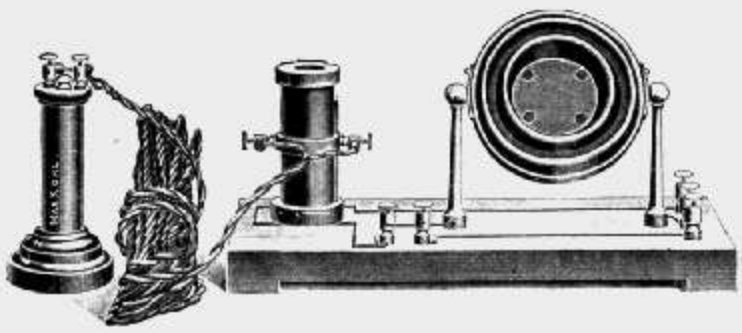
63 370. 3 : 10.



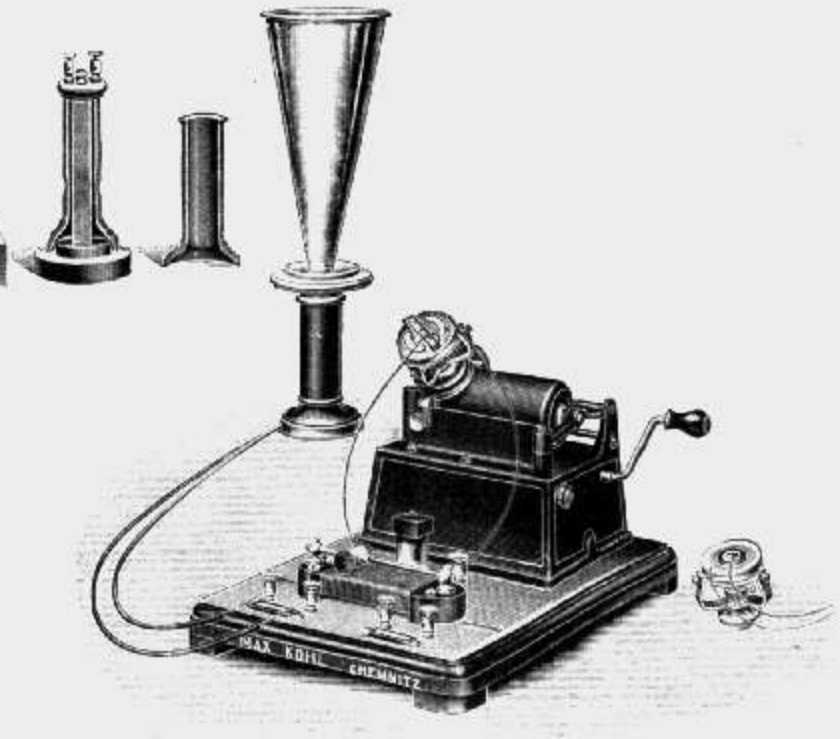
63 374. 1 : 5.



63 378. 1 : 10.



63 377. 1 : 5.



63 379. 1 : 8.



63 375. 1 : 5.

63,377. **Model of a Micro-telephone Station,** Figure, excellently adapted for demonstration purposes . . . . . £ 2.10.0

The model can be worked and gives good results. A microphone is built open upon a polished baseplate, being fitted to two pillars and rotating about a horizontal axis. In addition the board is fitted with all the necessary leads and terminals, an induction coil, the secondary winding of which can be moved along a perpendicular slide so as to be able to vary the inductive action.

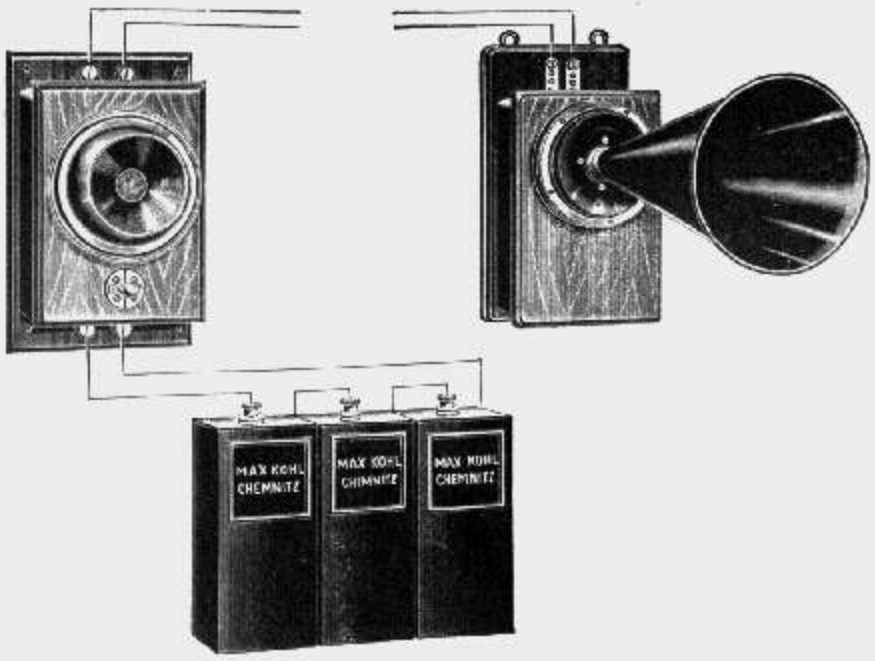
In addition, two telephones pertain to the apparatus. One of these telephones is built in section and can be taken to pieces to show the internal construction. Supplied with the apparatus is twelve metres twin telephone flexible with pin ends.

63,378. **Model of a complete Telephone Installation, consisting of two stations,** Figure, very comprehensive and quite workable. The connections are in accordance with those usually adopted in practice for domestic and factory installations 7.10.0

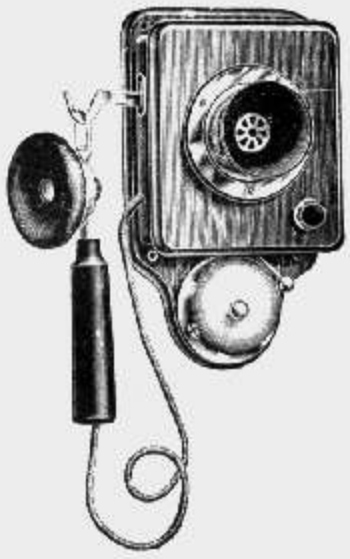
63,379. **Apparatus for Telephonic Lecture Experiments,** after Dr. Heilbrun, Figure (E. T. Z., 1908, p. 341), with two different microphones, precision telephone, and a phonograph cylinder 9. 0. 0

The apparatus consists of a phonograph, the sound pin of this being connected with a microphone. It is thus possible to transmit to some distance the musical selection, etc., contained on the record. The apparatus is very well adapted also for demonstrating the difference in action of different microphones and telephones. It is practicable to insert a galvanometer (preferably No. 61,528) in the circuit.

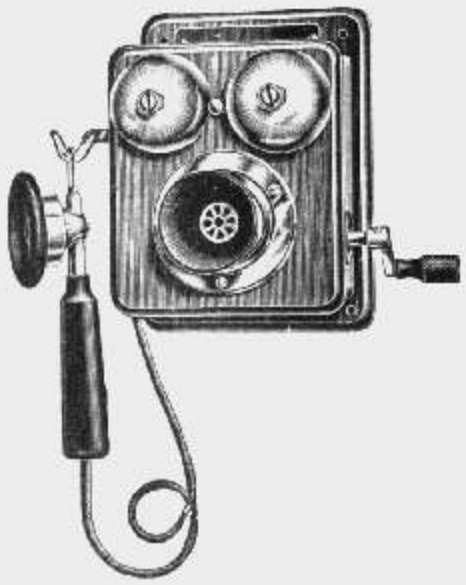
Cl. 3070, 3074, 6127, 3079, 3075, 5200.



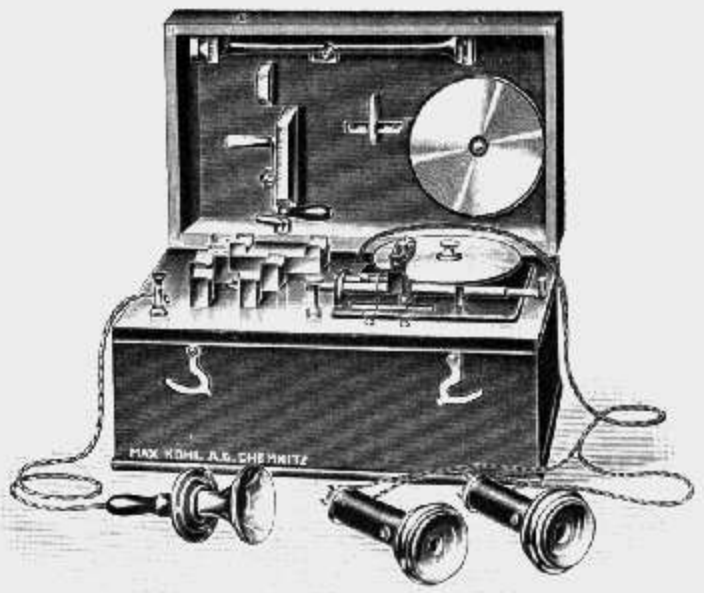
63 380. 1 : 6.



63 381. 1 : 4.



63 382. 1 : 4.



63 383. 1 : 6.

63,380. **Loud-speaking Telephone,** Figure, consisting of an extra-sensitive **Microphone** with large induction coil, a **Precision Telephone** with sound horn, three large Dry Cells and 20 m insulated Twin Flexible . . . . . £ s. d. 4. 0. 0

The loud effect of the Telephone is excellent; speech, song, and whistling are reproduced very loud.

63,381. **Micro-telephone Station for short-distance work** (in same house, etc.), for battery call, Figure, with granular carbon microphone, stem telephone, bell with steel dome, automatic hook switch, induction coil, key and terminals, in polished walnut case. Each 1. 0. 0

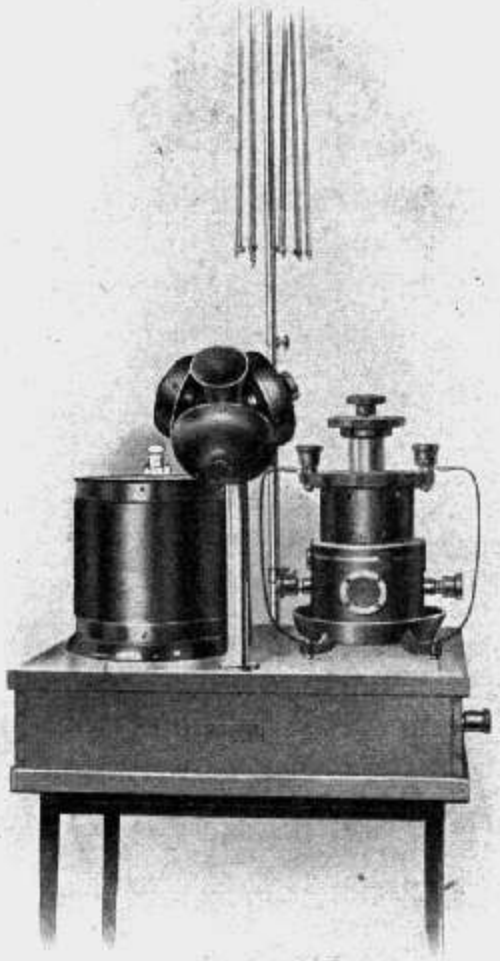
For the microphone and call together two cells No. 60,787 per station are necessary.

63,382. — idem, **for magneto-call,** Figure . . . . . Each 2. 8. 0

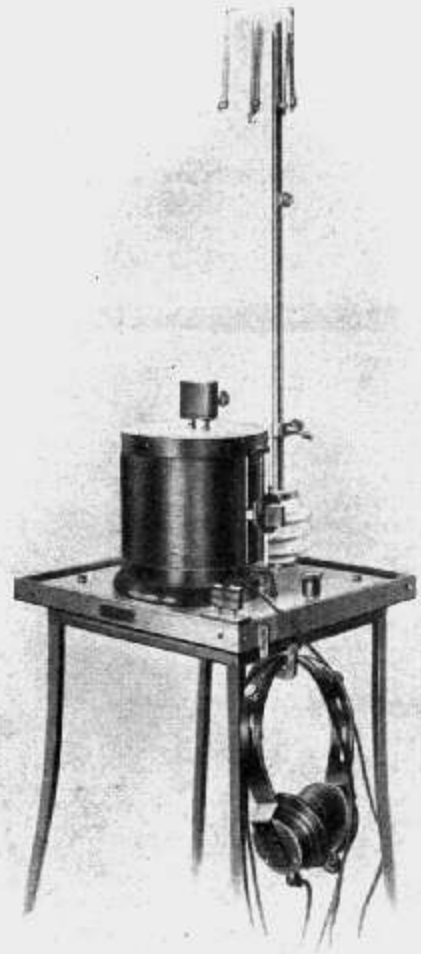
One cell (No. 60,787) per station is necessary for the microphone.

Stations Nos. 63,381 and 63,382 are very practical for connecting separate rooms (Director's room and porter's dwelling). Except for the wire material (No. 62,356, p. 961) and the cells, nothing further is necessary. The erecting can be done without special preliminary knowledge.

Cl. 3080, 79 F. 80 F, 9011.



63 384 A.



63 384 B.

63,383. **Telephonograph** after Poulsen, for permanently fixing and conveniently repeating a telephonic conversation, Figure (cf. E. T. Z., 1901, p. 57, 181; Drudes Annalen d. Physik, **3**, 1900, p. 754), with microphone for transmitting, two telephones for receiving, and the necessary cells, also two steel discs and demagnetizing device . . . . . £ s. d. 11. 0. 0

The fluctuations in a current produced by a microphone are carried through a magnetizing coil, which is guided over a hardened steel plate in a spiral line, in a similar manner as employed in gramophones. The fluctuations in magnetization of the steel plate which are permanently recorded, suffice to induce currents in the coil of the magnet when the latter is again guided over the steel plate, these currents giving in the telephone an accurate and surprisingly plain reproduction — which can be repeated at will — of the sounds originally conducted into the microphone.

63,384. **Demonstration Apparatus for Wireless Telegraphy with electric Waves,** consisting of a **Transmitting Station,** Fig. A, and a **Receiving Station,** Fig. B, for single direction working 27. 10. 0

Direct Current at 220 volts is necessary for working. Complete description sent on application.

63,385. — idem, consisting of two stations which can both transmit and receive, for reciprocal working 37. 10. 0

Complete Apparatus for Experiments with the Speaking Arc Lamp, Figure on p. 1058, consisting of:

50,892. **Arc Light Hand Regulator** (D. C. of at least 80 volts and 10 amps is necessary) . 2. 2. 0

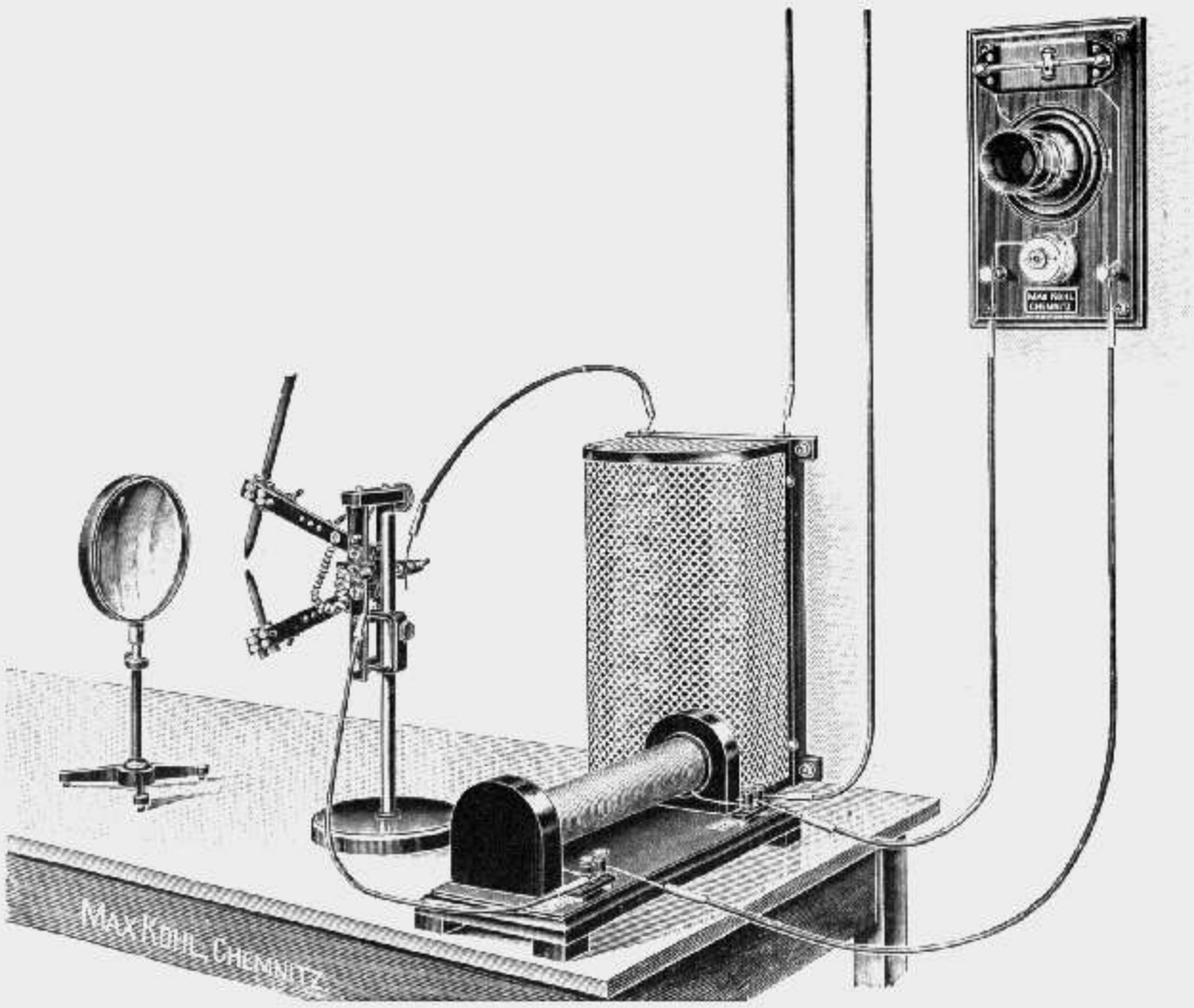
63,386. **Series Resistance** for the Arc Lamp, for connecting to 110—120 Volts 0. 18. 0

Or:

63,387. **Series Resistance** for the Arc Lamp for connecting to 220 volts 2. 0. 0

63,388. **Self-induction Coil** 2. 10. 0

63,389. **Microphone** with Switch and Regulating Resistance 2. 0. 0

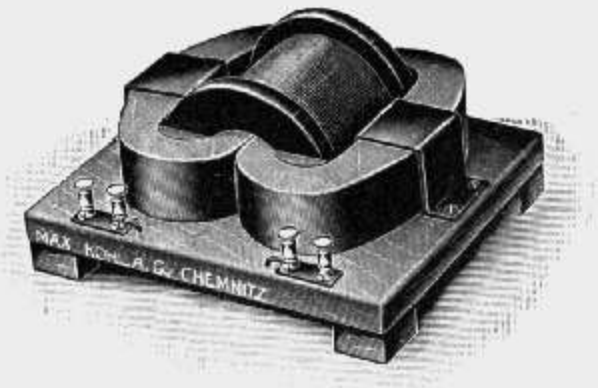


63 395, 50 892, 63 386, 63 388, 63 389. 1 : 8.

		£ s. d.
Complete Apparatus for Experiments with the Speaking Arc Lamp after Weinhold (W. D., Fig. 601), consisting of:		
Arc Light Hand Regulator and Resistance: see Nos. 50,892, 63,386 and 63,387, p. 1057.		
63,390. **Induction Coil,** Figure		3. 4. 0
63,391. **Microphone with Switch and Regulating Resistance, and 1 Fuse with simple current indicator for same**		3. 0. 0
Additional Apparatus for above so as to be able to demonstrate the automatically singing (whistling) arc lamp also, consisting of:		
63,392. **Small Induction Coil** (W. D., Fig. 604), with aluminium ring for Thomson's Experiment		0. 16. 0
61,122. **Switch**		0. 3. 6
63,393. **Paper Condenser** in simple wood box, approx. 8 mfd.		2. 0. 0
63,394. **Staged Paper Condenser,** with four steps, for use instead of No. 63,393; this permits of obtaining a simple melody with the arc (electric piano) since the pitch varies with the capacity cut in		6. 0. 0
Apparatus for Demonstrating Photophony, Figures, consisting of:		
50,892. **Arc Light Hand Regulator** (D. C. of at least 80 volts and 10 amps. is necessary)		2. 2. 0
63,386. **Series Resistance** for Arc Lamp, for 110 volts, Figure		0. 18. 0
63,387. **Series Resistance** for Arc Lamp, for 220 volts		2. 0. 0
63,388. **Self-induction Coil,** Figure		2. 10. 0

Cl. 3087.

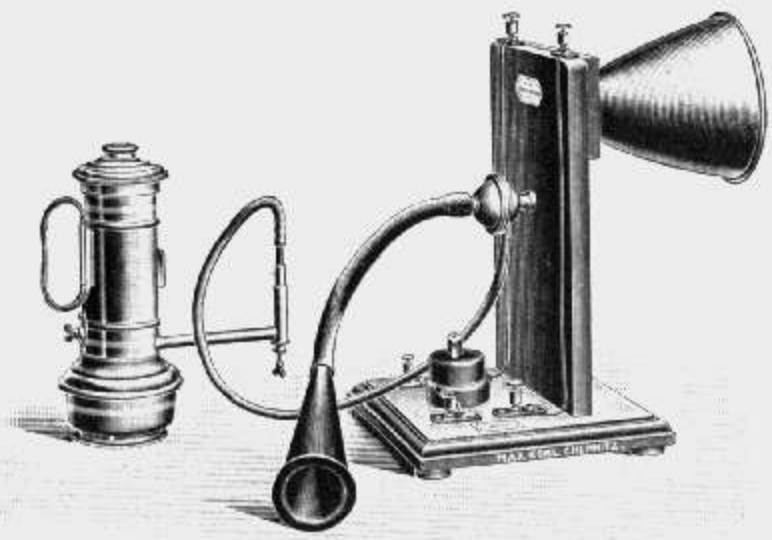
Max Kohl A. G. Chemnitz, Germany.



63 390. 1 : 4.



63 397, 63 370. 1 : 8.



63 398. 1 : 6

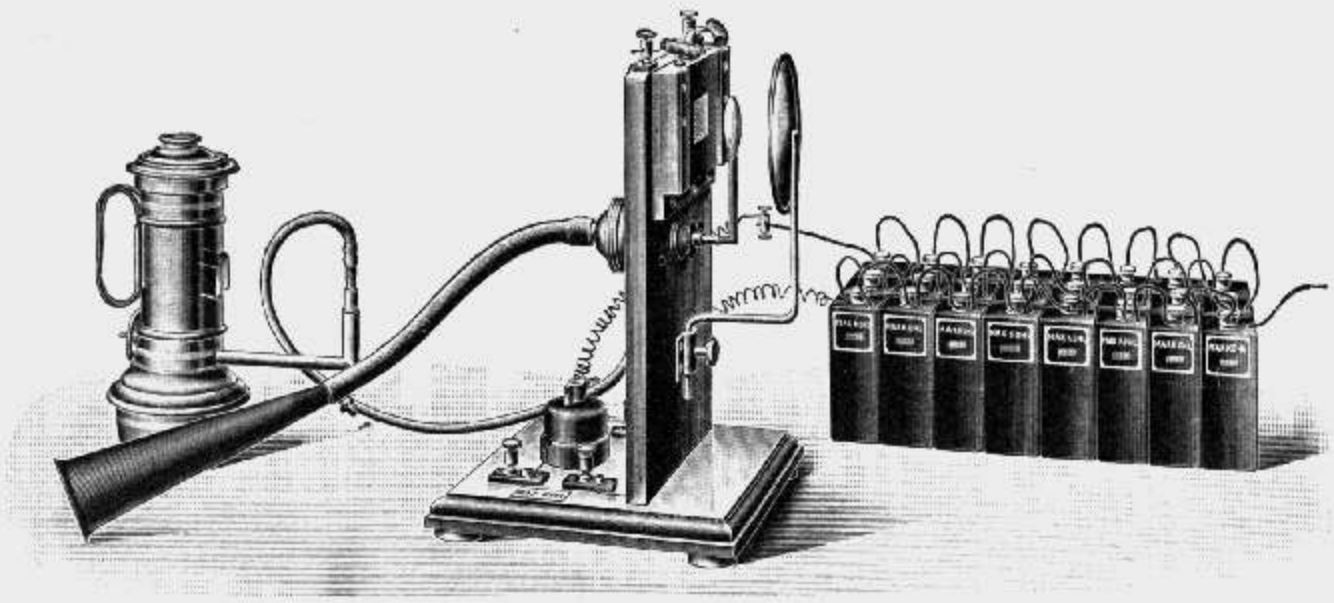
	£ s. d.
63,389. **Microphone** with Switch and Regulating Resistance	2. 0. 0
63,395. **Condenser Lens on Stand**	2. 0. 0
63,396. **Water Box** for protecting the Selenium Cell from too great a heat	1. 0. 0
63,397. **Concave Mirror with Selenium Cell,** Figure. Price exclusive of battery illustrated and of telephone	5.10. 0
63,370. **Precision Telephone**	1. 0. 0

Nos. 50,892—63,395 form the **Transmitting Station,** and Nos. 63,396, 63,397 and 63,370 the **Receiving Station.** The source of current can be provided from 15 to 20 accumulators or 20 to 26 dry cells, or other suitable cells in series.

63,398. **Photophonic Transmitting Station for Acetylene Light,** Figure, with manometric capsule with sound horn, with pointed burner and interchangeable parabolic reflector; including also Acetylene Generator and short length of rubber tubing	4. 4. 0

A small acetylene flame at the focus of the concave mirror is influenced by the sound waves striking on the manometer capsule, the variations in intensity of the flame being propagated as a parallel bundle of light and being transformed again into sound waves by the secondary station No. 63,397.

As Receiving Station for above use is made of Nos. 63,397 and 63,370.



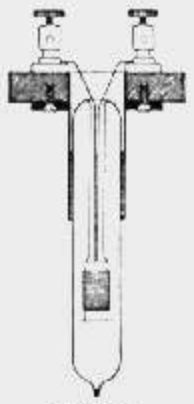
63 400. 1 : 7.



63 402. 2 : 5.



63 403. 1 : 2.



63 407.

63,400. **Photophonic Apparatus for Acetylene Light,** for showing the sensitivity of Selenium to Light, Figure, mounted on board, with manometric capsule, sound horn, pointed burner, highly sensitive Selenium cell and reflector, switch and terminals; **including Acetylene Generator** but **not** battery or telephone . . . . . £ s. d. 6. 0. 0

The apparatus is constructed in a like manner to No. 63,398, the only difference being that a Selenium cell and a spherical reflector take the place of the parabolic reflector. To complete the apparatus there should be a source of current (see remark to No. 63,397) and a telephone No. 63,370. Battery and Telephone are put in series with the Selenium Cell. It can be shewn that the transmission of the sound waves only results from the fluctuations in light by the fact that transmission ceases when an opaque body is held between acetylene flame and Selenium Cell.

63,401. — idem, **with a Parabolic Reflector,** which can be fitted instead of the Selenium Cell so as to be able to use the apparatus as a photophonic transmitting station also, in accordance with Fig. 63,398 . . . . . 6.10.0

Selenium Cells.

63,402. **Selenium Cell, flat rectangular shape,** in wood box, Figure, from 20,000 to 80,000 ohms resistance. The ratio of resistances in brightly lighted and darkened state is at least 1 : 10 . . . . . 1.16.0

Selenium Cells, round pattern, with metal slide, Figure:

List No.	63,403	63,404	63,405
Diameter of Aperture mm	25	30	35
	£ 1.16.0	2.14.0	3.12.0

63,406. **Stand with joint,** for Nos. 63,402—63,405 . . . . . 0.16.0

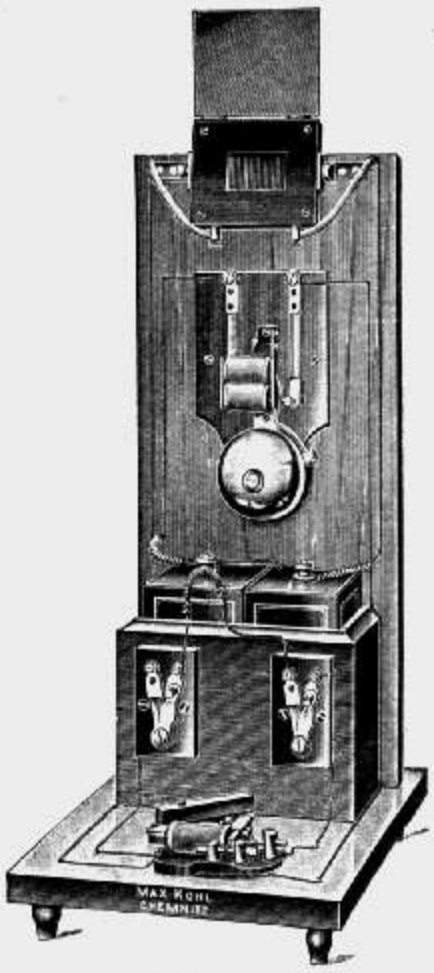
Cl. 1963, 1954, 1957, 5156.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



63 408, 63 409. 1 : 5.



63 410. 1 : 7.



63 411. 1 : 4.



63 412. 1 : 4.



63 414. 1 : 4.

63,407. **Selenium Cell, cylindrical,** in evacuated glass tube with ebonite mount and terminals, Figure . . . . . £ 3.15. 0

63,408. **Flat Selenium Cell,** maximum sensitivity, in metal casing with slide, Figure, without stand; resistance, unilluminated, say, 100,000 ohms 4. 0. 0

63,409. **Stand** for above, Figure 0. 5. 0

63,410. **Apparatus for Shewing the Sensitivity of Selenium to Light,** Figure, consisting of: 1 Selenium Cell, 1 polarised Relay of variable sensitivity, 2 Dry Cells, 1 electric Bell, 2 Switches: all mounted together on one polished mahogany stand 6. 0. 0

In addition to the two dry cells supplied with the apparatus, which are used for working the bell, a 15—20 volt battery is necessary for the Selenium Cell. When the box of the Selenium Cell is opened in bright light, the bell rings, and ceases when the box is closed.

Section 12: Thermo-electricity. Miscellanea.

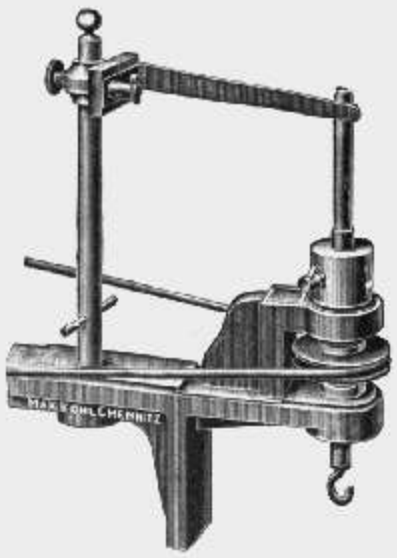
63,411. **Thermo-electric Apparatus** after Seebeck, Figure, consisting of a copper stirrup soldered on a bismuth rod, on stand, with a magnetic needle (M. P., 9th Edn., III, Fig. 812; W. u. E. phys. Prakt., 4th Edn., Fig. 326) . . . . . £ 0.16. 0

63,412. **Thermo-electric Rectangle,** Figure, of antimony and bismuth, on stand, with one magnetic needle 0.16. 0

63,413. **Rod-shaped Thermocouple,** of antimony and bismuth, with terminals soldered on 0. 8. 0

63,414. **Thermocouple** after Pouillet, Figure, on adjustable stand (M. P., 9th Edn., III, Fig. 816) 1. 0. 0

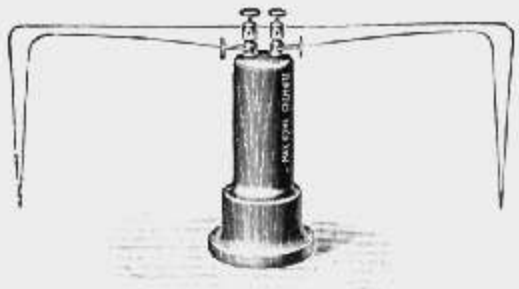
To the ends of a bismuth rod, provided with rectangular arms, copper wires are soldered, which lead to two insulated terminals fastened on the apparatus. The form of the thermocouple permits of the two junctions being immersed in liquids of different temperatures.



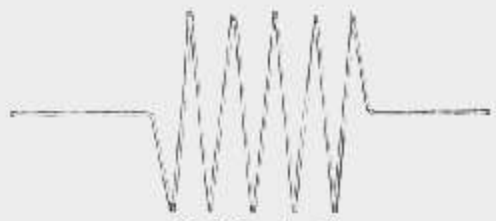
52069. 1 : 5.



63416. 1 : 2.



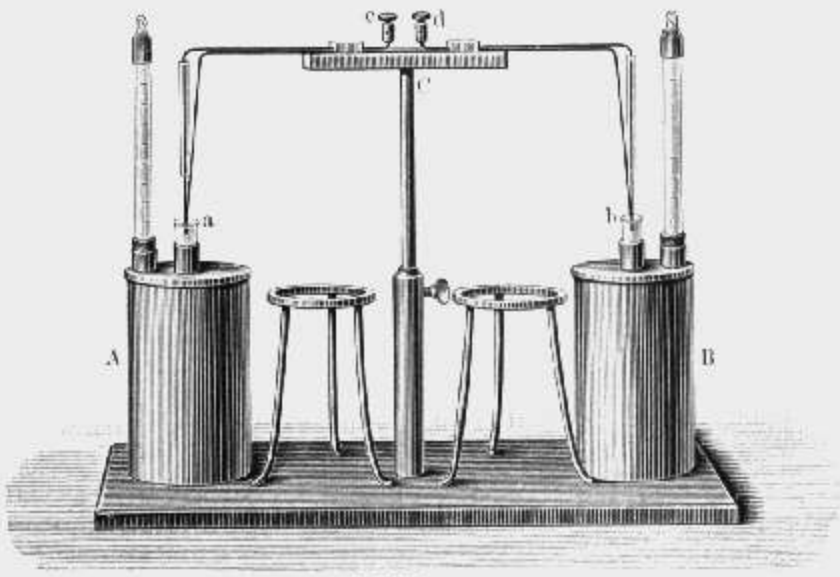
63417. 1 : 5.



63418. 1 : 2.



63419. 1 : 3.



63420. 1 : 8.

52,069. **Rotating Thermocouple** for the Whirling Table, Figure, cylindrical pattern, of iron and German silver, with spring contacts sliding on the cylinder . . . . . £ s. d. 0. 15. 0

On rotating, heating in the cylinder takes place by the friction of the spring, the friction causing a current, which flows from iron to German silver or vice-versa according to the position of the spring.

63,416. **Needle-shaped Thermocouple,** Figure (M. P., 9th Edn., III, Fig. 825), for introducing into plant and animal tissues 0. 10. 0

63,417. **Thermocouple,** Figure, after Friedr. C. G. Müller (M. T., Fig. 234), of iron and constantan 0. 8. 0

63,418. **Thermo-cell,** Figure, after Friedr. C. G. Müller (M. T., Fig. 233) 0. 1. 8

63,419. **Thermo-pile** after Melloni, Figure, Demonstration Model, with three bismuth-antimony cells, on stand, with two terminals 0. 18. 0

63,420. **Apparatus for Determining Temperature with Thermocouple,** Figure (W. u. E. phys. Prakt., 4th Edn., Fig. 327), with adjustable stand, 2 baths and 2 thermometers 2. 10. 0

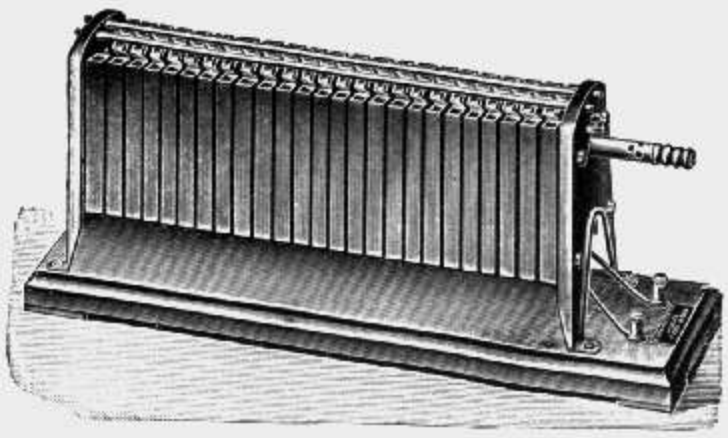
The thermocouples consist of an approx. 3 mm thick German silver wire which at a and b respectively is soldered to a copper wire of same thickness: glass tubes are slipped over the vertical ends of these copper wires at a and b and reach to the junctions. The junctions themselves are immersed in reagent glasses filled with paraffin oil or petroleum. The sheet iron vessels are filled with water and are provided with thermometers.

Thermo-piles for Charging Accumulators: see p. 859.
Thermo-piles for Shewing Thermal Differences: see Section "Heat".

Cl. 3883, 680, 3096, 4522, 3098, 3097.

Max Kohl A. G. Chemnitz, Germany.

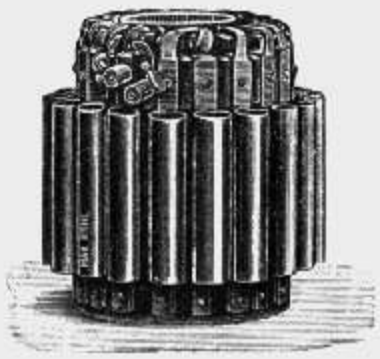
Max Kohl A. G. Chemnitz, Germany.



63 428. 1 : 5.



63 425. 1 : 11.



63 422. 1 : 5.



63 441. 1 : 7.

Noë's Thermopiles, Figure (M. P., 9th Edn., III, Fig. 835), the e. m. f. of a cell is approx. 0.06 volt, that of a pile of 25 cells, for example, equalling 1.5 volt: £ s. d.

List No.	63,421	63,422	63,423
Number of Cells	12	20	25
£	0. 15. 0	1. 4. 0	1. 10. 0

63,424. — idem, larger model, with 25 cells 2. 5. 0

These thermo-piles have the cells arranged star-shaped and are supplied without heating device. They can be heated with any Bunsen Burner or spirit lamp.

63,425. **2 Thermopiles** after Noë, consisting of 20 cells each, with 2 spirit Bunsen burners, on one baseplate, Figure 5. 10. 0

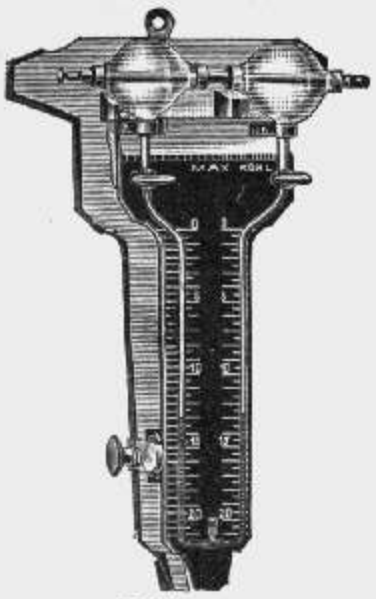
Thermopiles for Demonstration Purposes, Figure:

Number of Cells	26	38	50	50
Tension, approx. volts	1.8—2.2	2.8—3.2	3.8—4.2	4.0—4.5
On Short Circuit, approx. amps.	3—4	3—4	3—4	4—5
List No.	63,426	63,427	63,428	63,429
With Gas Burner £	1. 2. 0	1. 13. 0	2. 5. 0	3. 0. 0
List No.	63,430	63,431	63,432	63,433
With Spirit Burner £	1. 8. 0	1. 19. 0	2. 13. 0	3. 10. 0

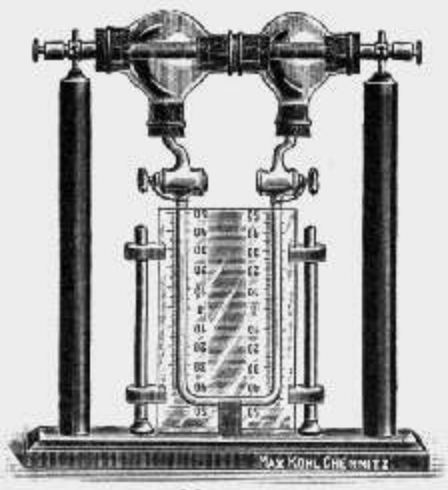
Thermopiles Nos. 63,421 — 63,434 are used for demonstrating the practical arrangement of thermo-piles; they are not intended for the permanent charging of accumulators. They are capable of giving for a short time quite appreciable outputs.

63,440. **Thermo-electric Cross** after Peltier (M. P., 9th Edn., III, Fig. 839), for showing the generation of cold by the electric current 1. 0. 0

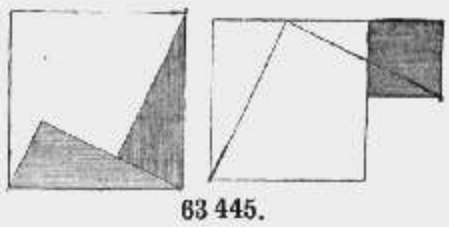
63,441. **Apparatus for Peltier's Experiment** after Weinhold, Figure (W. D., Fig. 620 [565]) 0. 16. 0



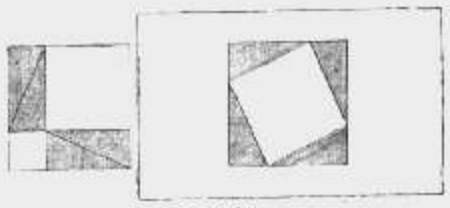
63 442. 1 : 6.



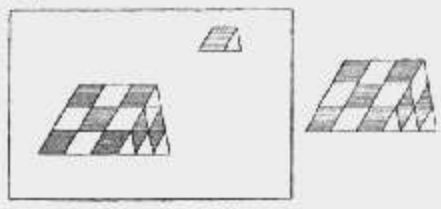
63 443. 1 : 4.



63 445.



63 446.



63 447.

63,442. **Electrothermic Apparatus** after Schumann, Figure (M. P., 9th Edn., III, Fig. 842) . . . . . £ 2. 0.0

Bismuth rods are soldered on to both sides of an antimony rod. The junctions are enclosed in the bulbs of two air thermometers, so that the Joule effect is produced in both bulbs in the same manner, but the Peltier effect in the opposite manner. The liquid pointer gives opposite deflections when opposite currents are conducted through.

63,443. — idem, smaller, Figure, for objective projection 1.12.0

The tubes with the liquid indicators are fitted in front of a transparent scale in order to render the phenomenon simultaneously visible to all the audience.

The Peltier Effect can also be shewn with the Kolbe Differential and Double Thermoscope (see "Heat" Section).

63,444. **Thermocouple** after Wunder (Ztschr. f. d. phys. u. chem. U., **24**, 1911), Figure on p. 1065. The current density produced by heating the thermocouple is sufficient to allow the magnet to carry an armature 1. 0.0

Mathematical Instruction Models.

63,445. **Model** after Meffert, **for Explaining the Pythagorean Theorem,** Figure 0.18.0

63,446. — idem, different pattern, Figure 0.15.0

63,447. — idem, for proving the theorem that the areas of like polygons are as the squares of homlogous sides, Figure 0. 8.0

Mineralogy.

100 Minerals, selected pieces, carefully chosen and arranged in compartments:

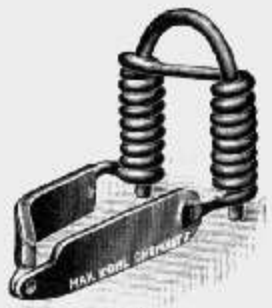
List No.	**63,452**	**63,453**
Average Size of the Minerals, cm	5×6	7×9
	£ 2.10.0	**4.5.0**

The collection comprises: **I. Elements:** Graphite, Sulphur, Bismuth, Copper. **II. Sulphides:** Realgar, Antimonite, Native molybdenum-sulphide, Galena, Cinnabar, Zinc blende, Magnetic Pyrites, Red Nickel Pyrites, Pyrite, Marcasite, Grey cobalt-ore, Arsenical Pyrites, Copper Pyrites, Fahlerz. **III. Oxides:** Rock Crystal, Smoky Quartz, Amethyst, Quartz, Agate, Flint, Zirconium, Rutil, Tin Stone, Pyrolusite, Psilomelane, Corundum, Emery, Iron-glance, Red Iron-stone Titanic Iron, Opal, Brown Iron-stone. **IV. Haloid Salts:** Rock Salt, Fluorspar, Cryolite, Carnallite. **V. Aluminates, Ferrites, Borates:** Spinel, Magnetic Iron Ore, Boracite. **VI. Nitrates, Carbonates:** Sodium Nitrate, Calc-spar (crystallised), Calc-spar (cleavage piece), Dolomite Spar, Magnesite, Zinc-spar, Iron-spar, Aragonite, Strontianite, Cerussite, Amalachite. **VII. Sulphates, Tugstates:** Anhydrite, Heavy Spar, Coelestin, Lead Sulphite, Gypsum, Alabaster, Alunite, Scheelite, Wolframite. **VIII. Phosphates:** Apatite, Phosphorite, Pyromorphite. **IX. Silicates:** Cyanite, Topaz, Staurolite, Tourmaline, Epidote, Vesuvian, Garnet, Olivin, Bronzite, Augite, Actinolite, Hornblende, Nepheline, Nosean, Leucite, Orthoclase, Sanidin, Microglin, Albite, Oligoclase, Labradorite, Natrolite, Desmine, Chabasite, Biotite, Muscovite, Chlorite, Serpentine, Talc, Kaolinite. **X. Organic Compounds:** Ozokerite, Asphalt, Anthracite, Coal.

This collection may be subject to slight variation according to our stock of good pieces.

Cl. 5154, 408, 5152, 3109, 5153.

Max Kohl A. G. Chemnitz, Germany.



63 444.



63 462 — 63 463.

100 Minerals in lacquered wood box, with compartments:

		£ s. d.
List No.	**63,455**	**63,456**
Average Size of Minerals, cm	5×6	7×9
£	**3. 5. 0**	**5. 10. 0**

100 Minerals in finely polished wood box, with compartments:

List No.	**63,458**	**63,459**
Average Size of Minerals, cm	5×6	7×9
£	**4. 0. 0**	**6. 0. 0**

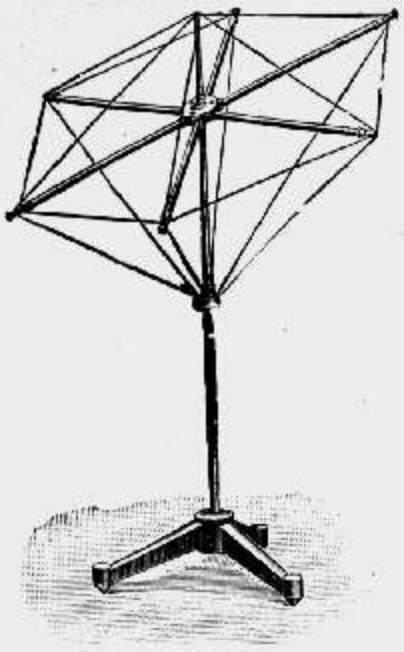
250 Minerals, collection for teaching purposes, Figure, the most important samples being good and instructive specimens. Of the crystallised minerals stages or crystals are selected which show plainly the characteristic crystallic shapes.

Without Box	Average Size	5×7	7×9 cm
	List No. . .	**63,460**	**63,461**
	£	**15. 0. 0**	**24. 0. 0**
In nice stained oak cabinet, with 5 drawers and small cardboard boxes, Figure	List No.	**63,462**	**63,463**
	£	**18. 10. 0**	**28. 0. 0**

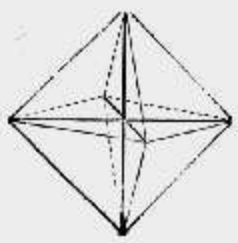
I. Elements: Diamond, Graphite, Crystallised and heavy; Arsenic, Bismuth, Gold, Silver (wire and sheet form), Copper. **II. Sulphides:** Realgar, Orpiment, Antimonite, Molybdenum-glance, Galena, Crystallised, hexahedral and massive, Silver-glance, Copper-glance, Cinnabar, Zinc-blende, crystallised and compact, Fibrous-blende, Magnetic Pyrites, Millerite, Red-Nickel Pyrites, Pyrite, hexahedral and pyrito-hedral crystallised, Cobalt-glance, Grey cobalt ore, Marcasite, Arsenical Pyrites, Copper Pyrites, crystallised and compact; Variegated Copper ore, Antimony-silver-blende, Fahlerz. **III. Oxides:** Rock Crystal, Smoky Quartz, Amethyst, Common Quartz, Cat's Eye, Tiger's Eye, Ferruginous Quartz, Rose-quartz, Chalcedony, Agate, Jasper, Silicious Schist, Flint, Tridymite, Zircon, Rutile, Anatase, Tin Stone, Pyrolusite, Psilomelane, Wad, Braunite, Hausmannite, Red copper ore, Red tin-ore, Corundum, cryst. and Emery, Iron-glance, Red iron-stone, Red Hematite and Titanic Iron, Hyalite, Opal, Silica, Bauxite, Goethite, Lepidokrokite, Brown iron-ore, Kidney ore, Manganite. **IV. Haloid Salts:** Sylvine, Rock-salt, cleavage-piece and compact, Fluorspar, hexahed. cryst., octohed. cryst., and cleavage-piece; Cryolite, Carnallite, Kainite, Atacamite. **V. Aluminates, Ferrites, Borates:** Spinell, rare, blue and black, Franklinite, Magnetic iron-ore, octahed. cryst., duodecahed. cryst. and compact (attractor); Chrysoberyll, Boracite, Tinkal. **VI. Nitrates, Carbonates:** Sodium nitrate, Calc-spar, rhombohed., scalenohed. prismat. cryst., cleavage-piece and double spar, Marble, Compact Lime, Calc-tuff, Chalk, Dolomite-spar, Magnesite, Zink-spar, Iron-spar, Sphaerosiderite, Carbonaceous Iron-stone, Manganese-spar, Aragonite, chisel-shaped, acute pyramidal and triplet, Witherite, Strontionite, Cerussite, Malachite, Vitreous Copper. **VII. Sulphates, Chromates, Molybdates, Tungstates, Uranates:** Glauberite, Anhydrite, Heavy spar, col. cryst., white cryst. and compact; Coelestine, Lead Sulphate, Gypsum, cryst. and cleavage-piece; Fibreous Gypsum, Alabaster, Alunite, Copper Sulphate (blue Copperas), Red lead-ore, Scheelite, Wulfenite, Wolframite, Uranium-pitch ore. **VIII. Phosphates, Arseniates:** Monazite, Apatite, brown cryst., transp. cryst. and compact, Phosphorite, Staffelite, Pyromorphite, brown and green; Pharmakolite, Cobalt-bloom (earthy), Wavellite, Kallaite. **IX. Silicates, Titanates:** Andalusite, Chiastolite, Disthene, Rhaetizite, Topaz, Staurolite, Datolite, Tourmaline, black and red; Axinite, Zoisite, Epidote, Vesuvian, Hessonite, common Granite, Melanite, Syrope, Almandine, Cordierite, Beryl, Olivine, Silicious Zinc-ore, Dioptose, Chondrodite, Bronzite, Hypersthene, Wollastonite, Diopside, Diallag, Augite (common cryst. and basaltic), Omphacite, Rhodonite, Anthophyllite, Tremolite, Actinolite, Asbestos, Hornblende, comm. cryst. and basaltic, Glaukophane, Scapolite, Melilite, Nepheline, Sodalite, Noseane, Hauyne, Lapis-lazuli, Leucite, Adular, Orthoclase, Karlsbad twins, Baveno Twin, cleavage-piece and iridescent, Sonadin, Mikroline, Albite, Perikline, Oligoclase, Labradorite, Anorthite, Apophyllite, Analcim, Natrolite, Prehnite, Stilbite, Desmine, Phillipsite, Chabasite, Biotite, Phlogopite, Zinnwaldite, Lepidolite, Muscovite, Paragonite, Ottrelite, Chorite, Serpentine, rare and common, Meerschaum, Talc, Kaolinite, Pyrophyllite, Bolus, Sphene, green cryst. and brown (Titanite). **X. Organic Compounds:** Mellite, Petroleum, Ozokerite, Amber, Asphalt, Anthracite, Coal, Brown-coal, Lignite, Peat.

In addition we supply any other desired collection of minerals: Prices on application.

Max Kohl A. G. Chemnitz, Germany.

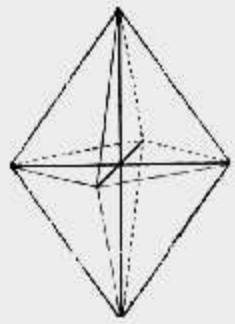


63 472 A. 1 : 8.



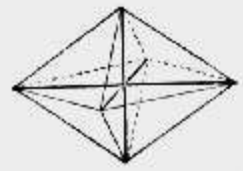
a_1, b_1, c_1 = Octohedron. **Tesseral** System.

63 472 B.



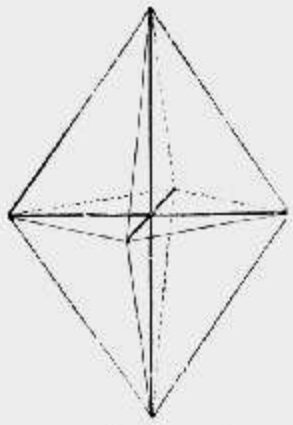
a_2, b_1, c_1 = Pointed **quadrate** Pyramid (2 P).

63 472 C.



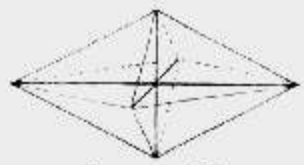
a_0, b_1, c_1 = Obtuse **quadrate** Pyramid (P).

63 472 D.



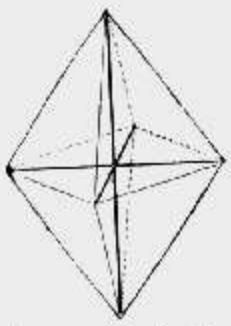
a_2, b_1, c_2 = Acute **Rhombic** Pyramid.

63 472 E.



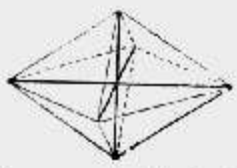
a_0, b_1, c_2 = Obtuse **Rhombic** Pyramid.

63 472 F.



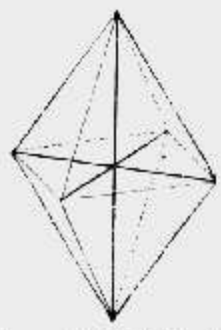
a_2, b_1, c_1 (inclined forward) = Acute **monoclinic** Pyramid.

63 472 G.



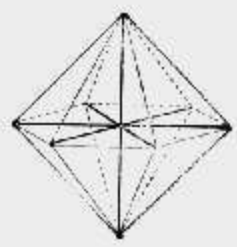
a_0, b_1, c_1 (inclined forward) = Obtuse **monoclinic** Pyramid.

63 472 H.



a_2, b_1, c_2 (**all axes** inclined towards each other) = Acute **triclinic** Pyramid.

63 472 J.



a_1, b_1, c_1, d = **hexagonal** Pyramid.

63 472 K.

63,472. **Axial Cross** after Nestler, Figs. A—K, for demonstrating the fundamental forms of all six crystal systems (octohedra and pyramids) . . . . . £. s. d. 1. 6. 0

All the axial halves consist of two tubes which telescope in each other and which can be firmly clamped in different positions by a spring on the outer tube engaging in notches in the inner tube. Elastics are drawn through the ends of the axes representing the edges of the pyramids.

Some examples are shewn in Figs. 63,472 B—63,472 K. In these the vertical axis is designated by a, the others by b, c and d; and the individual rest-points of the vertical axis — reckoned from the central point — are designated by 0, 1, 2, 3, and those of the other axes by 1, 2, 3.

Collection of Copies of Precious Stones, Figure, ideal crystallization forms, imitated in shape and colour, approx. 25 mm in size.

Number of Stones . . .		12	24	36	50	60	88
In Cardboard Box . . .	List No.	**63,473**	**63,474**	**63,475**	**63 476**	**63,477**	**63,478**
	£	**0. 14. 0**	**1. 4. 0**	**1. 12. 0**	**2. 6. 0**	**2. 12. 0**	**3. 15. 0**
In Case . . .	List No.	**63,479**	**63,480**	**63,481**	**63,482**	**63,483**	**63,484**
	£	**1. 0. 0**	**1. 16. 0**	**2. 10. 0**	**3. 8. 0**	**4. 0. 0**	**6. 0. 0**

63,485. **4 Diamond Copies,** in case, containing, Koh-i-Noor as re-cut, Regent, Florentine, Orloff, cf. Fig. 63,486 . . . . . 0. 12. 0

63,486. **9 Diamond Copies** in case, Figure, as follows: Sancy, Hope, Koh-i-Noor as re-cut, Great Mogul, Florentine, Regent, Southern Star, Koh-i-Noor as originally cut, Orloff | 1. 6. 0

Cl. 3140, 3141, 3142, 3139, 3143, 3144, 3147, 3146, 3145, 3148.

Max Kohl A. G. Chemnitz, Germany.



63 480. 1 : 3.



63 486. 1 : 3.



63 489. 1 : 5.



63 499. 1 : 7.

63,487 **12 Diamond Copies,** the same as No. 63,486, together with Nassack, Pigott and Pascha of Egypt . . . . . £ 1. 10. 0

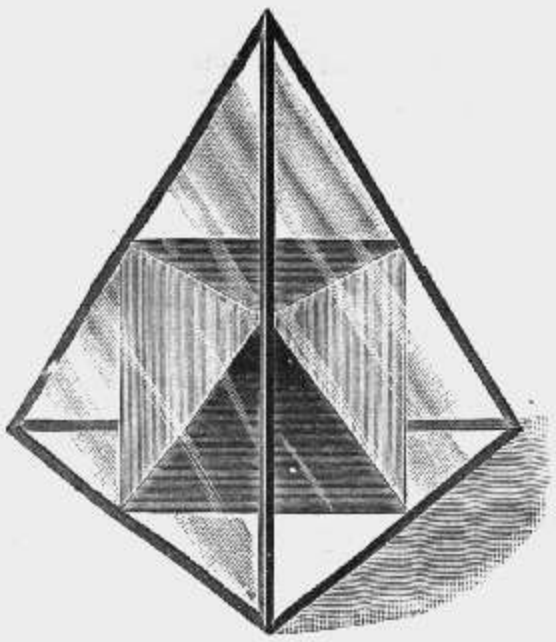
63,488. **15 Diamond Copies,** the same as under Nos. 63,486—63,487, together with Shah, Kaiserin Eugenie, Polar Star 1. 12. 0

63,489. **22 Diamond Copies,** the same as under Nos. 63,486—63,488, Figure together with Green Diamond of Dresden, Tiffany, Stewart, Diamant des Herrn (Dresden), Este, Star of South Africa, Jubilee 2. 8. 0

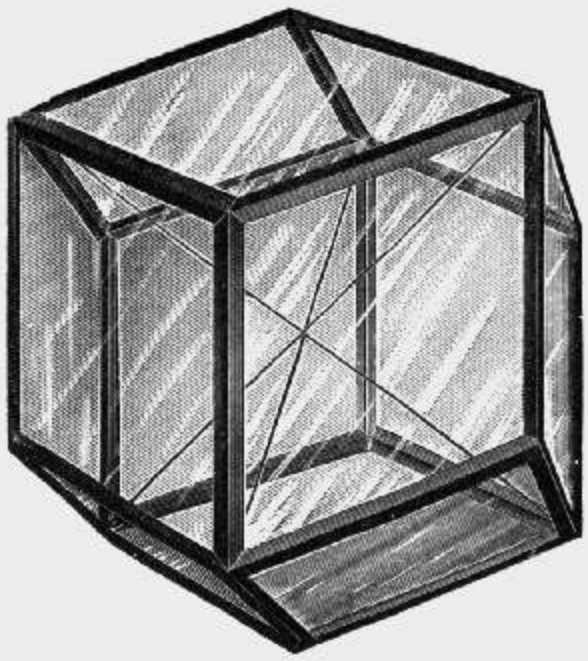
Crystal Models of cut crystal glass, 30—70 mm in size, Figure:

No. of Specimens		6	12	20	30	40	60	72	90
In Cardboard Box	List No.	**63,490**	**63,491**	**63,492**	**63,493**	**63,494**	**63,495**	**63,496**	**63,497**
	£	**0. 10. 0**	**0. 18. 0**	**1. 10. 0**	**2. 0. 0**	**2. 12. 0**	**3. 15. 0**	**4. 10. 0**	**5. 10. 0**
In Case	List No.	**63,498**	**63,499**	**63,500**	**63,501**	**63,502**	**63,503**	**63,504**	**63,505**
	£	**0. 18. 0**	**1. 14. 0**	**2. 8. 0**	**3. 4. 0**	**4. 2. 0**	**6. 10. 0**	**7. 10. 0**	**9. 0. 0**

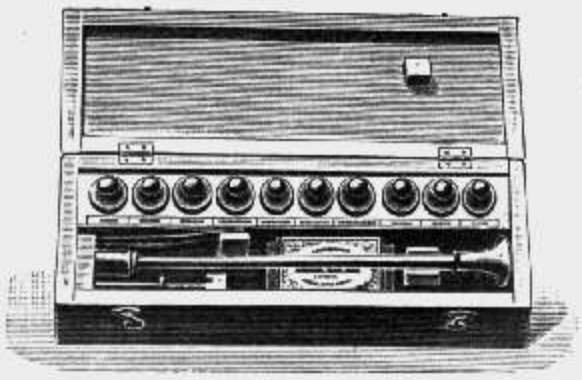
Cl. 3593, 3595, 3596, 3597.



63 507 A. 1 : 3.



63 507 B. 1 : 3.



63 531. 1 : 5.

63,507. **15 Models of Crystals,** composed of glass discs, with enclosed base of cardboard, Fig. 63,507 A or with axes of coloured threads, Fig. 63,507 B, well mounted and cemented; size of the single crystals 15—25 cm . . . . . £ 2. 10. 0

The collection contains the most important fundamental shapes.

63,508. **16 Models of Crystals,** of glass, for demonstrating simple combinations of holohedric and hemihedric forms, the combinations of pasteboard, enclosed 4. 15. 0

63,509. **30 Models of Crystals,** of glass, with coloured axes drawn in, representing the simple fundamental forms, cf. Fig. 63 507 B, 15—25 cm in size 6. 0. 0

63,515. **10 Models of Crystals shewing the most important Intersecting Doublets;** the various single crystal individuals fitted by glass of different tint for demonstration, 15—25 cm in size 4. 0. 0

Prices on application for other collections.

63,516. **30 Models of Crystals, of Wood,** representing the simple main forms, 5 cm average size 1. 10. 0

63,517. — i d e m, average size 10 cm 3. 15. 0

63,518. **30 Wood Crystal Models,** large, light construction, **for demonstration purposes,** the simple main forms, of pear-tree wood, hollow, size 20—25 cm 5. 0. 0

63,520. **50 Wood Crystal Models,** specially collected for High Schools and Colleges, including in addition to the chief types, different combinations and doublets, average size 5 cm 2. 10. 0

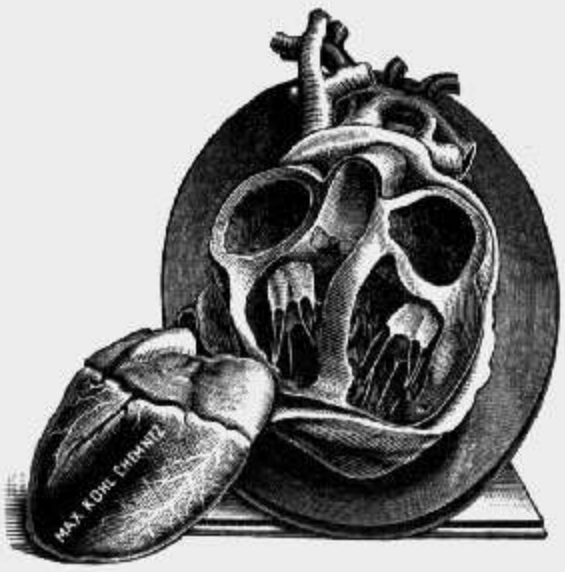
63,521. — i d e m, average size 10 cm 6. 15. 0

63,522. **80 Wood Crystal Models,** 5 cm in size, after Prof. C. Hintze 5. 0. 0

63,523. — i d e m, size 10 cm 14. 5. 0

Cl. 3150, 3151, 3153.

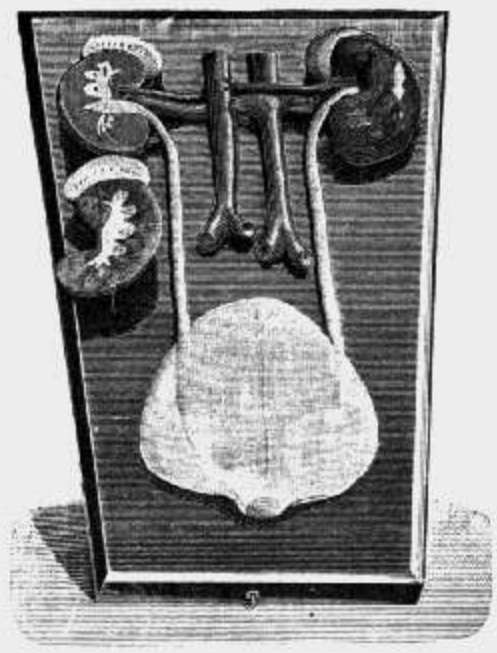
Max Kohl A. G. Chemnitz, Germany.



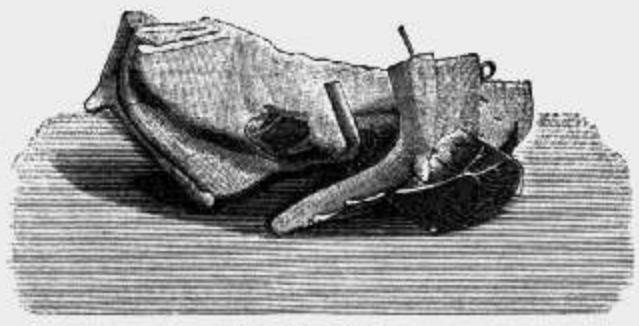
63 532. 1 : 5.



63 534. 1 : 10.



63 536. 1 : 3.



63 535. 1 : 1.

Max Kohl A. G. Chemnitz, Germany.

	£ s. d.
63,524. **150 Wood Crystal Models,** size 5 cm, after Prof. C. Hintze	9. 15. 0
63,525. — i d e m, size 10 cm	28. 15. 0
52,227. **Hardness Scale** after Mohs, Fig. 52,227, p. 312, with large stone specimens, porcelain slab, diamond style, and bar magnet, in wood box	0. 18. 0
63,531. **Blow-pipe Set,** F i g u r e, with blow-pipe having pierced platinum point, forceps platinum sheet, 6 platinum wires and 10 reagents	1. 4. 0

Microscopes for Observing Liquid Crystals after Lehmann: see pp. 183 and 536 of this list.

Anatomical Models, of Clay Paste and Painted true to Nature.

We supply all Anatomical Models, and shall be glad to quote to requirements. The following are a few examples.

I. Large-scale Sectional Models.

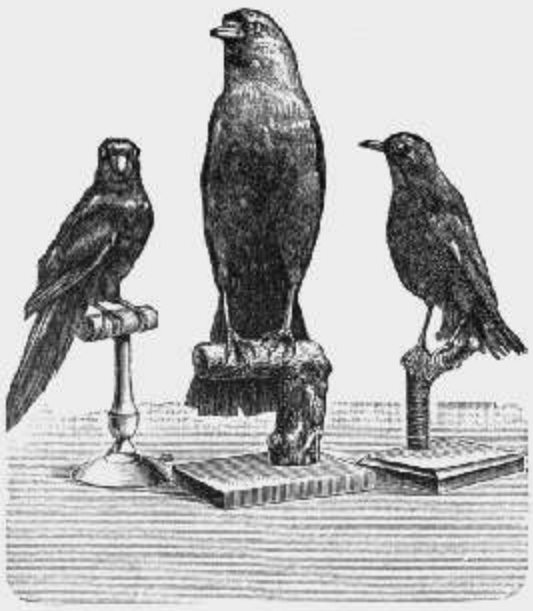
63,532. **Heart,** the front wall of which should be lifted off so as to render the four cavities with their openings and valves visible simultaneously, F i g u r e	0. 15. 0
63,533. — i d e m, smaller pattern	0. 10. 0

II. Actual size Specimens.

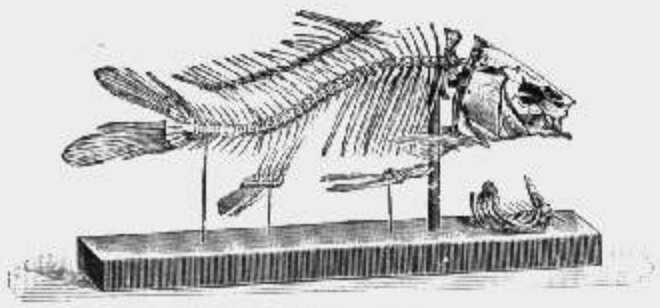
63,534. **Torso,** F i g u r e, with the thoracic and abdominal viscera	3. 10. 0
63,535. **Tongue,** F i g u r e, can be taken to pieces	0. 7. 0
63,536. **Urinary Organs,** F i g u r e, can be taken apart	0. 13. 0

Ear, Larynx, and Eye Models: see "Acoustics" and "Optics" Sections.

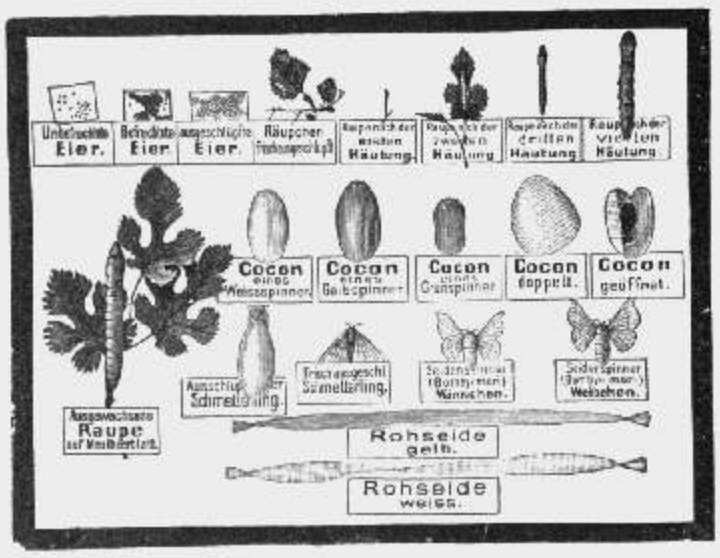
Cl. 3164, 3167, 3172, 3171.



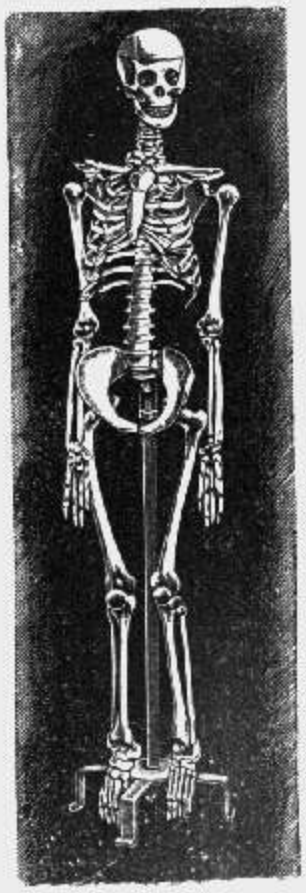
63 550. 1 : 6.



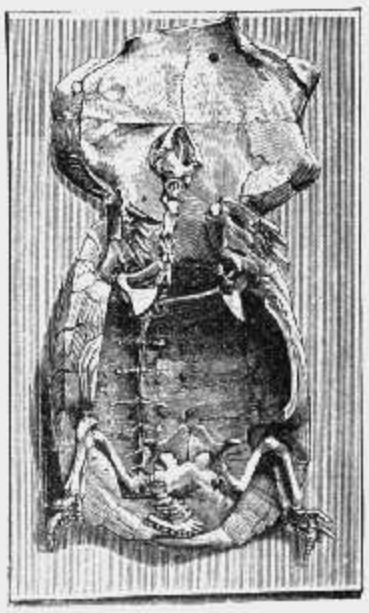
63 554. 1 : 7.



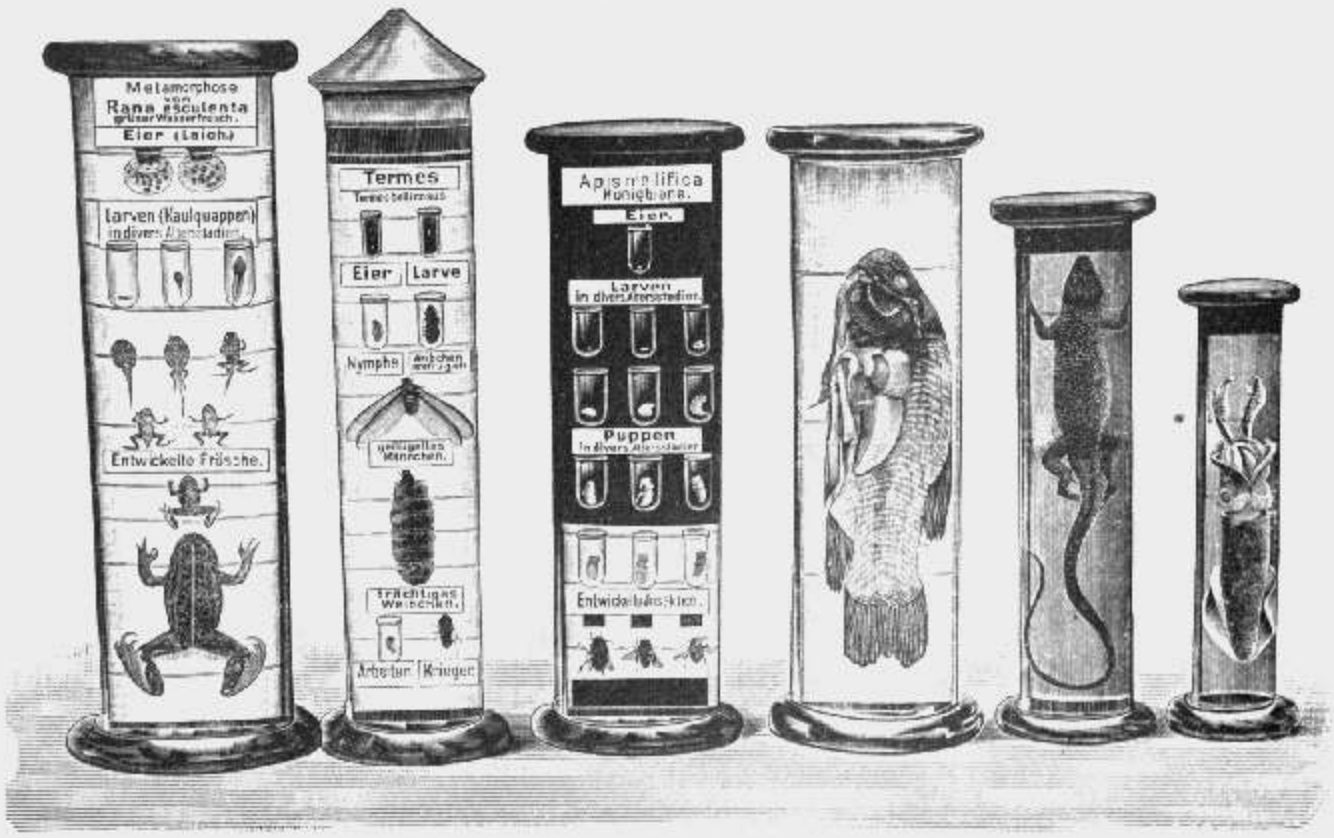
63 551. 1 : 4.



63 553. 1 : 20.



63 555. 1 : 4.



63 552. 1 : 4.

Cl. 3158, 3162, 3159, 3161, 3163, 3160.

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.



63 556. 1 : 14.

We supply

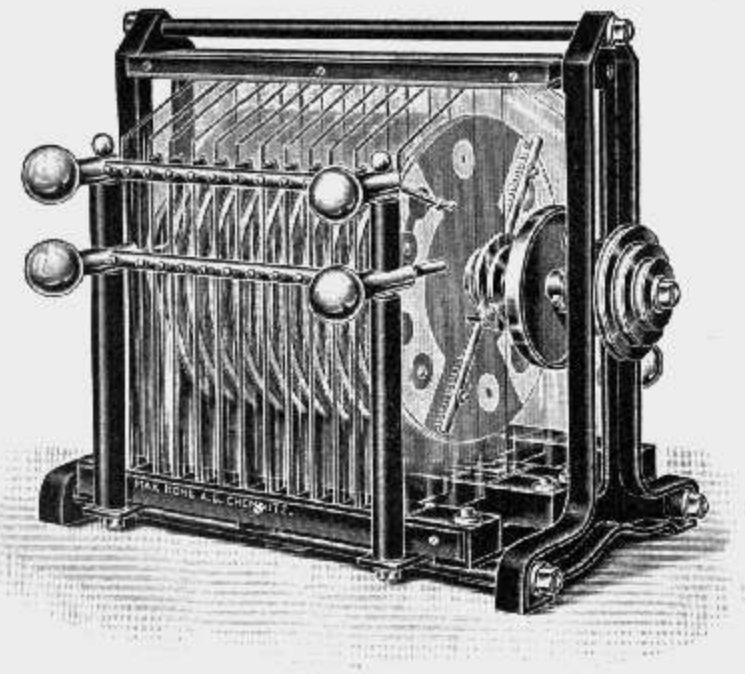
Philosophical Preparations and Human and Animal Skeletons

of the best quality and shall be glad to send separate lists of these if desired.

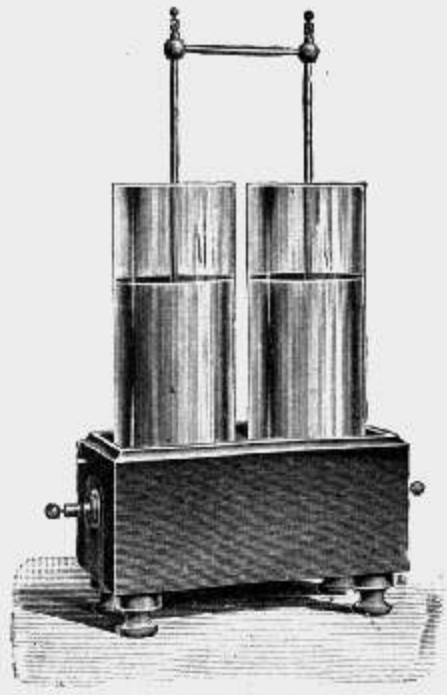
Figs. 63 550 — 63 555 shew a few examples.

Iron Museum Cupboard (Fig. 63 556) supplied as speciality.

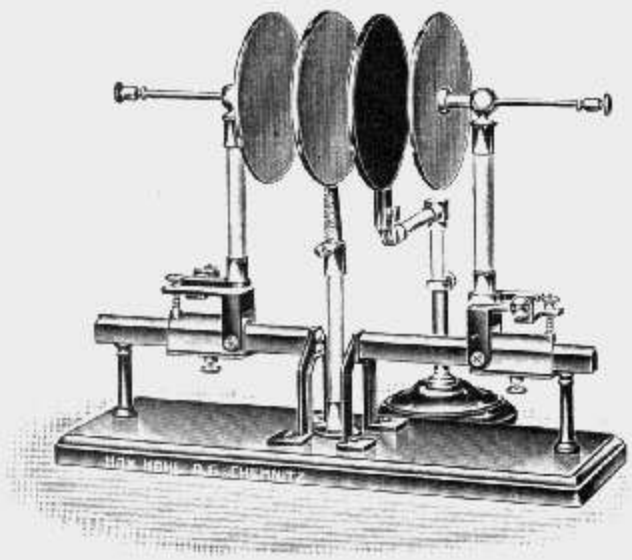
APPENDIX.



63 561. 1 : 7.



63 566. 1 : 8.



63 569. 1 : 7.

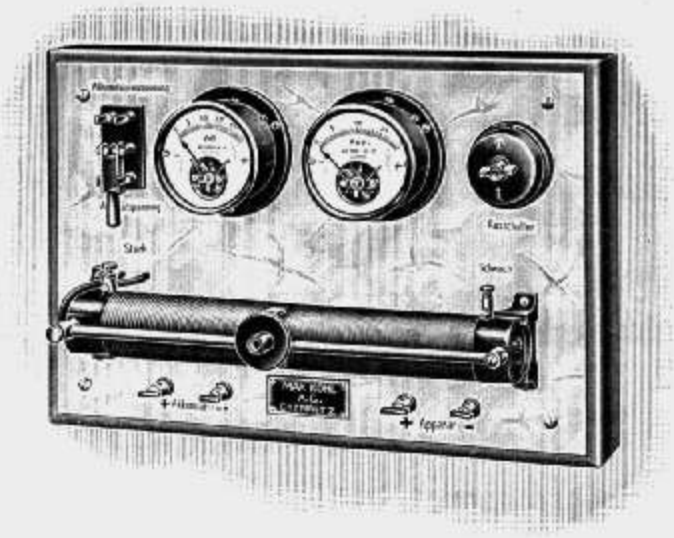


63 570 G.

	£ s. d.
63,560. **Pendulum Dynmeter** after Friedr. C. G. Müller, improved type (Ztschr. f. d. phys. u. chem. U., **23**, 1910, p. 17), with two bar magnets 100×12×8 mm with agate cap .	4. 10. 0
63,561. **Influence Machine** after Töpler with 20 rotating discs 300 mm diameter, Figure, for motor drive (M. P., 9th Edn., III, Fig. 161)	32. 0. 0
63,562. **Self-exciting Influence Machine** after Wimshurst, with double rotation, with two glass discs 90 cm diameter, cf. Fig. 60,442, p. 820, with glass case, without table or the other accessories illustrated	24. 10. 0
63,563. — idem, with **4** glass discs 90 cm diameter	41. 0. 0
63,564. **Machine** as No. 63,562, but without glass case	18. 10. 0
63,565. **Machine** as No. 63,563, but without glass case	35. 0. 0
63,566. **Leyden Jar Battery** with two jars 40 cm high in parallel, Figure	2. 0. 0
63,567. — idem, with two jars 60 cm high	3. 0. 0
63,568. — idem, with two jars 80 cm high	4. 0. 0
63,569. **Condenser** after Cavendish, Figure, with three brass plates and a plate each of ebonite, glass, resin, and paraffin wax	10. 0. 0

Cl. 5936, 2980, 6174, 5897.

Max Kohl A. G. Chemnitz, Germany.



63 585. 1 : 9.

Sliding Resistances, patterns A—F, p. 869, are if specially ordered, supplied also arranged vertically in accordance with Fig. 63,570 G, and with one or two contact brushes. The latter arrangement permits of numerous adaptations as shunt resistance.

£ s. d.

Extra Price for vertical arrangement, cf. Fig. 63 560 G, with **one** contact brush:

Pattern	A	B	C	D	E	F
List No.	**63,570**	**63,571**	**63,572**	**63,573**	**63,574**	**63,575**
£	**0. 3. 0**	**0. 3. 8**	**0. 4. 8**	**0. 4. 8**	**0. 5. 0**	**0. 5. 0**

— i d e m, with **two** contact brushes:

List No.	**63,576**	**63,577**	**63,578**	**63,579**	**63,580**	**63,581**
£	**0. 8. 0**	**0. 8. 8**	**0. 9. 8**	**0. 10. 8**	**0. 11. 0**	**0. 12. 8**

63,582. **Cathode Ray Tube** after F. Braun, cf. F i g u r e 61,499, p. 898, with osmose regeneration 1. 8. 0

Since the tubes, in a similar manner to the Röntgen tubes, become harder in use, it is advisable to fit the regenerating device, which permits of introducing gas into the interior.

63,583. — i d e m, larger, 1 m long, with screen 130 mm diameter, cf. F i g. 61,500, p. 898, with osmose regeneration 3. 8. 0

63,584. — i d e m, after Braun-Wehnelt, cf. F i g. 61,501, p. 898, with osmose regeneration 2. 3. 0

63,585. **Switchboard for Accumulators,** F i g u r e, specially adapted for electro-chemical purposes, for connecting to pressures up to 16 volts and currents to 20 amps. . . . 9. 0. 0

The switchboard, of marble with wood frame, contains: 1 precision voltmeter 25 volts, 1 voltmeter switch, 1 precision ammeter 20 amps., 1 main switch, 1 stepped sliding resistance permitting regulation in fine steps and over a wide range, also 4 terminals.

Apparatus for School Experiments with Röntgen Rays.

(Cf. in this connection our complete Introduction, sent on request.)

Induction Coils with Accessories, X-ray Tubes, Fluorescent Screens: see pp. 978—986.

62,730. **Carton with Strips** of various Metals, also Glass 0. 10. 0

63,586. **Carton** with a **Glass Strip** 6 mm thick and an Aluminium Sheet Strip 0.5 mm thick 0. 4. 0

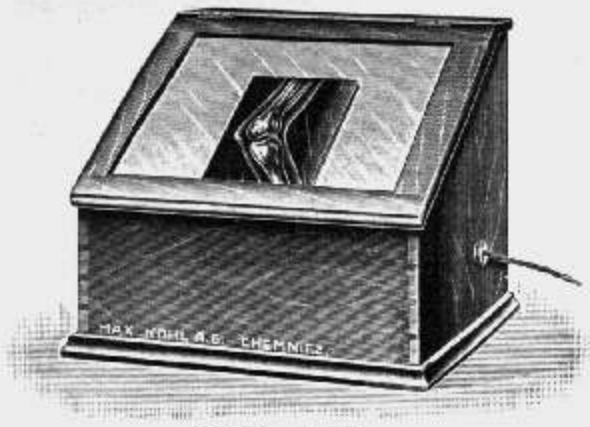
63,587. **Fluorescent Screen,** size 8 × 16 cm 0. 4. 0

63,588. **Phalanges in Glass Tube** after Weinhold, for shewing that X-rays do not undergo any appreciable refraction or reflection (W. D., p. 875) 0. 6. 0

63,589. **Metal Disc with Insulating Grip,** for shewing ionisation of the air (cf. Fig. 4 of the Introduction) 0. 6. 0

Cf. in this connection also Nos. 62,731/2, p. 986.

Max Kohl A G. Chemnitz, Germany.



63 602. 1 : 7.



63 604. 1 : 6.

Dry Plates, specially manufactured for X-ray purposes, each plate packed twice in light tight paper:

List No.	**63,590**	**63,591**	**63,592**	**63,593**
Size, cm	9×12	13×18	18×24	24×30
Per dozen, £	**0. 2. 8**	**0. 4. 5**	**0. 8. 5**	**0. 14. 5**

"Rapidfolien", extremely active, grainless, intensifying screens for radiographic work:

List No.	**63,594**	**63,595**	**63,596**	**63,597**
Size, cm	9×12	13×18	18×24	24×30
Each, £	**0. 10. 0**	**0. 18. 0**	**1. 10. 0**	**2. 6. 0**

The "Rapidfolien" reduce the time of exposure to from $^1/_{30}$th to $^1/_{20}$th the time ordinarily necessary. They are specially recommended for use with influence machines and small spark coils.

X-ray Negatives, original photos of the Human Body:

List No.	Plate Size cm	Object	£ s. d.
63,598	13×18	Hand	0. 8. 0
63,599	18×24	Knee, Foot or Shoulder	0. 10. 0
63,600	24×30	Skull	0. 12. 0
63,601	30×40	Thorax	0. 18. 0

63,602. **Röntgen Show Case,** desk form, for observing Negatives, Figure, with glow lamp, for plates 24×30 cm 1. 10. 0

63,603. — idem, for plates to 30×40 cm, with two glow lamps 2. 0. 0

Voltage of lamps should be given, or otherwise the Show Cases are supplied for 110 volts.

63,604. **Thermopile** after Indrikson, Figure (Kolbe-Skellon, Introduction to Electricity, Part II, Fig. 141 C) 2. 0. 0

Estimates of Cost for Physical Apparatus.

For estimates as to equipments for Physical and Chemical Lecture Rooms, Preparation Room, Museums, Students' Workrooms, compiled with due consideration to the means available, and which generally include a lecture table: see **pp. 99—106** (Vol. I).

For estimates as to **Projection Lanterns** and Accessories: see **pp. 189 and 190.** Estimates as to **Kohl's Megadiascope** (Universal Projection Apparatus) and special fittings: see **p. 1230** (sewn in after p. 192, Vol. I).

Table of prices of **Physical Apparatus for projection purposes:** see pp. 1094—1096, which supersede pp. 190—192 in Vol. I.

It is assumed in the following collection of estimates that the requisite fittings are at hand, and especially the necessary museum cupboards for the apparatus, a connection to a gas lead and an electric lead supplied with D. C., including for the latter a suitable experimental switchboard, also a projection apparatus together with projection screen and a window obscuring device.

Attention should be paid to the fact that in the case of **platinum** objects or apparatus in which the use of platinum essentially influences the price, the prices will undergo variation with any change in the price of platinum.

Estimates Nos. I—4. Collections of Apparatus in accordance with Standard Requirements.

The Standard List (Normalverzeichnis) was presented and accepted at the Fifth General Meeting of the Society for Promoting Instruction in Mathematics and the Natural Sciences, Elberfeld, Autumn 1896 (see also Unterrichtsblätter für Mathematik und Naturwissenschaften, 2, 1896, page 24).

The Collections of Apparatus included in the following pages each form an entire whole; they can, however, should the full amount not at once be available, be installed little by little in such manner that the apparatus of Collection 1 included in the column "1st Acquirement" should be ordered first, while, in a similar manner, the apparatus given under "2nd Acquirement" should be ordered additionally in the following or in a number of successive school years.

If, however, the apparatus for each branch of Physics are desired complete at the outset, the apparatus for the various branches can be ordered successively.

The numbers given in special columns refer to the "Standard List" mentioned above. The order is, however, kept in accordance with the present Price List.

In perusing the estimates it should be noted that only such apparatus pertain to a collection in which the price is inserted in the corresponding price column. Price Lists containing only these apparatus can be obtained from us.

Collection 1 in addition to containing all apparatus mentioned as generally necessary for Higher Institutions in the "Normalverzeichnis für die physikalischen Sammlungen der höheren Lehranstalten", include, as well, all apparatus indicated as being desirable. Moreover, a series of apparatus has been considered which are now generally ordered at the same time.

Collection 2 contains, under the objects designated by "1st Acquirement", all apparatus designated as necessary for "Higher Educational Institutions" and, in addition, an ample number of apparatus generally considered as desirable, and of new apparatus. The apparatus designated "2nd Acquirement" are in part designated as desirable and have, in part, been introduced during the last year or two. This Collection includes, like the previous one, an induction coil sufficient for producing Röntgen Rays, for Tesla high frequency experiments, etc.

Collection 3 comprises under the apparatus designated as "1st Acquirement" only those articles which are indicated as generally necessary for Higher Educational Institutions. For the "2nd Acquirement", which reaches nearly as high a sum as the "1st Acquirement", a number of the apparatus considered as desirable and a few more recent apparatus have been included.

Collection 4 is intended for the minor institutions (such as the "Progymnasien" in Germany). It comprises for the "1st Acquirement" all apparatus designated as generally necessary for these institutions; and for the "2nd Acquirement" all those generally designated as desirable. By restricting the selection of the latter, the total sum can be diminished. This Collection is also well adapted for Continuation Schools, etc.

Max Kohl A. G. Chemnitz, Germany.

Object	No. in German Standard Collection	Collection 1		Collection 2		Collection 3		Collection 4	
		1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d	£ s. d.	£ s. d.	£ s. d.
Apparatus, Supplies and Materials for General Use.									
51,104. 2 Universal stands (Bunsen's) with single parts .	10	2. 4. 0	—	2. 4. 0	—	2. 4. 0		2. 4. 0	—
51,124. Gauss Stand, heavy construction	9	2. 0. 0	—	2. 0. 0	—	2. 0. 0		2. 0. 0	—
51,132—51,134. 3 Tables for setting up apparatus . .	9	1. 1. 0	—	1. 1. 0		1. 1. 0	—	1. 1. 0	—
51,144. Levelling board . . .	11	0. 10. 0	—	0. 10. 0		0. 10. 0	—		—
51,147. Wood supports . . .	11	0. 4. 0		0. 4. 0	—	0. 4. 0	—		
51,149. 1 Set of thin wood wedges	11	0. 0. 8	—	0. 0. 8	—	0. 0. 8		0. 0. 8	—
51,158. 1 Set flexible leads . .	101	—	0. 17. 0	0. 17. 0	—		0. 17. 0	—	0. 17. 0
51,160. Copper wire, double silk covered, 10 metres . . .	101	0. 0. 8	—	0. 0. 8	—	0. 0. 8		0. 0. 8	—
51,162. 0,5 kg of various copper wire, bare and insulated .	101	0. 4. 0			—	—	—		0. 4. 0
51,163. Rubber tubing of black rubber, No. 2/0, 1/0, 2, 3, 4, 6, 8; 2 metres each .	8	0. 16. 10	—	0. 16. 10	—	0. 16. 10	—	0. 16. 10	—
51,165. Rubber tubing, grey, for connecting up gas burners, 5 metres	8	0. 5. 0		0. 5. 0		0. 5. 0		0. 5. 0	—
51,184. 2 Bunsen burners, without tap . . each £ 0. 1. 3	12	0. 2. 6	—	0. 2. 6	—	0. 2. 6	—	0. 2. 6	—
51,208—51,211. 4 Spirit lamps	13	0. 3. 5	—	0. 3. 5		0. 3. 5	—	0. 3. 5	
51,226. 3 Wire nets of iron .	8	0. 1. 0	—	0. 1. 0		0. 1. 0	—	0. 1. 0	
51,292. 3 kg Mercury	18	1. 4. 0	—	1. 4. 0		1. 4. 0	—	1. 4. 0	—
51,320. Mortar, cast iron, with pestle	8	0. 15. 0	—	0. 15. 0	—	0. 15. 0	—	0. 15. 0	—
51,322. 3 Pulverising dishes .	8	0. 3. 5	—	0. 3. 5	—	0. 3. 5	—	0. 3. 5	—
51,336. 16 Rubber stoppers of different sizes	8	0. 8. 7	—	0. 8. 7	—	0. 8. 7	—	0. 8. 7	—
51,337. 100 Corks of various sizes	8	0. 2. 6	—	0. 2. 6	—	0. 2. 6		0. 2. 6	
— Glass vessel	146	—	0. 6. 0	—	0 6. 0	—	0. 6. 0	0. 6. 0	—
51,341. Measuring cylinders, 25, 50, 200, 500 and 1000 ccm capacity	17	0. 9. 7	—	0. 9. 7	—	0. 9. 7	—	0. 9. 7	—
51,345. Beakers, 10 in set . .	7	0. 2. 7	—	0. 2. 7		0. 2. 7	—	0. 2. 7	—
51,346. Test glasses, set of 30 in 3 sizes	7	0. 1. 7	—	0. 1. 7		0. 1. 7	—	0. 1. 7	—
51,352. 3 Porcelain dishes with tap, 60, 85 and 125 mm .	7	0. 0. 11	—	0. 0. 11	—	0. 0. 11	—	0. 0. 11	—
— Platinum wire, 30 cm of 0,35 mm	8	1. 0. 0	—	1. 0. 0		1. 0. 0	—	1. 0. 0	—
— Platinum Wire, 30 cm of 0,25 mm									
— Platinum sheet, 40 × 40 mm, 0,03 mm thick . . .									
51,376. Boiling flasks, set of 7	7	0. 1. 8		0. 1. 8	—	0. 1. 8	—	0. 1. 8	—
51,389. Funnels, set of 4 . .	7	0. 1. 0		0. 1. 0	—	0. 1. 0	—	0. 1. 0	—
51,406. Bent tubing, 1 kg . .	7	0. 2. 0		0. 2. 0	—	0. 2. 0	—	—	—
51,410. 4 Stirring rods	7	0. 1. 0	—	0. 1. 0		0. 1. 0	—	—	—
51,414. Burettes, with glass stopcock, 25 and 75 ccm .	145	—	0. 7. 0	—	0 7 0	—	—	—	0. 7. 0
51,415. 2 floaters for above .	145	—	0. 1. 4	—	0 1 4	—	—	—	0. 1. 4
		12. 6. 11	1. 11. 4	12. 19. 11	0 14. 4	12. 2. 11	1. 3. 0	11. 11. 11	1. 9. 4
Measuring of Length, Weight and Time. Introduction to Physics.									
51,426. Linear vernier model .	139	—	0. 10. 0	—	0. 10. 0	—	0. 10. 0	—	0. 10. 0
51,433. Metre rule with coloured graduation	16 & 19	0. 2. 0	—	0. 2. 0	—	0. 2. 0	—	0. 2. 0	—
51,459. Micrometer gauge . .	141	—	0. 5. 6	0. 5. 6	—	—	0. 5. 6	—	0. 5. 6
51,466. Cathetometer	140	—	7. 0. 0	—	—	—	—	—	7. 0. 0
51,506. Litre vessel, cube shape	19	0. 5. 0	—	0. 5. 0	—	0. 5. 0	—	0. 5. 0	—
Carried forward		0. 7. 0	7. 15. 6	0. 12. 6	0. 10. 0	0. 7. 0	0. 15. 6	0. 7. 0	7. 15. 6

Max Kohl A. G. Chemnitz, Germany.

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Object	No. in German Standard Collection	Collection 1		Collection 2		Collection 3		Collection 4	
		1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Brought forward		0. 7. 0	7. 15. 6	0. 12. 6	0. 10. 0	0. 7. 0	0. 15. 6	0. 7. 0	7. 15. 6
51,533. Analytical balance also suitable for specific gravity determinations, to carry 200 grams	142	—	7. 15. 0	—	7. 15. 0	—	—	—	7. 15. 0
51,578. Reimann thermometer, adjustable stage, glass plummet for specific gravity determinations	—	—	0. 9. 0	—	0. 9. 0	—	—	—	—
51,637. Rider weights	142	—	0. 5. 6	—	0. 5. 6	—	—	—	0. 5. 6
51,642. Precision weights, 1 mg to 200 g	142	—	0. 15. 6	—	0. 15. 6	—	—	—	0. 15. 6
51,570 a. Mohr's pillar tare balance, to carry 1 kg	14	1. 8. 0		1. 8. 0	—	1. 8. 0	—	1. 8. 0	—
— Short pan	14	0. 5. 0	—	0. 5. 0	—	0. 5. 0	—	0. 5. 0	—
51,657. Precision weights, 100 mg to 1000 grams	15	0. 16. 6	—	0. 16. 6	—	0. 16. 6	—	0. 16. 6	—
51,698. Seconds pendulum with audible seconds beat	138	—	2. 5. 0	—	—	—	—		2. 5. 0
51,749. Pycnometer	161	0. 3. 0	—	—	0. 3. 0	—	—	—	0. 3. 0
		2. 19. 6	19. 5. 6	3. 2. 0	9. 18. 0	2. 16. 6	0. 15. 6	2. 16. 6	18. 19. 6
General Mechanics.									
51,781. Atwood's fall machine	26	3. 0. 0	—	3. 0 0	—	3. 0. 0	—	—	—
51,829. Parallelogram of forces apparatus	21	1. 12. 0	—	1. 12. 0	—	1. 12. 0	—	1. 12. 0	—
51,838. Projectile apparatus	—	—	0. 17. 0	—	—		—	—	—
		4. 12. 0	0. 17. 0	4. 12. 0	—	4. 12. 0	—	1. 12. 0	—
Mechanics of Solids.									
51,851. Collection of apparatus for demonstrating the laws of mechanics, consisting of									
1 Frame of oak	137								
1 Lever of aluminium	23								
1 Tackle with 2 pulley-blocks, pulleys, arranged one behind the other	20								
1 Tackle with 2 pulley-blocks, pulleys arranged alongside each other	—								
1 Power tackle	20								
1 Differential tackle	155								
1 Arbour wheel	22								
2 Brass pulleys on iron cramps, pendulums on double threads, 1 Set of weights, 1 Hook with cramp		5. 18. 0	—	5. 18. 0		5. 18. 0	—	5. 18. 0	—
51,825. 3 Parallelograms	—	0. 1. 9		0. 1. 9	—		—	—	—
51,860. Inclined plane	24	1. 16. 0	—	1. 16. 0	—	1. 16. 0	—	1. 16. 0	—
51,867. Plate glass etc. for sliding friction experiments	—	—	0. 6. 0	0. 6. 0	—	—	0. 6. 0	—	—
51,905. Wood cylinder with paper surface	25	0. 3. 0		0. 3. 0	—	0. 3. 0	—	0. 3. 0	
51,911. Equilibrium apparatus	149	—	0. 12. 0	—	—	—	—		0. 12. 0
51,919. Double cone on inclined stand	151	—	0. 9. 0	—	—	—	—	—	0. 9. 0
51,927. Centre of gravity figures	150	—	0. 6. 0	—	0. 6. 0	—	0. 6. 0	—	0. 6. 0
51,938. Roman balance	153	—	0. 16. 0	—	0. 16. 0	—	0. 16. 0	—	0. 16. 0
51,941. Model of platform weighing machine	154	—	2. 2. 0	—	—	—	—	—	2. 2. 0
51,949. Whirling table	27	1. 15. 0	—	1. 15. 0	—	1. 15. 0	—	—	—
51,975. Centrifugal apparatus	27	0. 18. 0	—	0. 18. 0	—	0. 18. 0	—	—	
51,976. Wood and cork cylinders	27	0. 6. 0	—	0. 6. 0	—	0. 6. 0	—	—	—
51,982. Watt's pendulum	27	0. 11. 0	—	0. 11. 0	—	0. 11. 0	—	—	—
51,990. Flattening ring	27	0. 7. 0	—	0. 7. 0	—	0. 7. 0	—	—	—
51,993. Glass vessel for mercury and coloured water	27	0. 4. 0	—	0. 4. 0		0. 4. 0	—	—	—
52,012. Ring with hook	27	0. 1. 9	—	0. 1. 9	—	0. 1. 9	—	—	—
52,078. Schmidts' top with stand and suspension	160	1. 2. 0	—	1. 2. 0	—	—	1. 2. 0	—	—
Carried forward		13. 3. 6	4. 11. 0	13. 9. 6	1. 2. 0	11 19. 9	2. 10. 0	7. 17. 0	4. 5. 0

Object	No. in German Standard Collection	Collection 1		Collection 2		Collection 3		Collection 4	
		1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Brought forward		13. 3. 6	4. 11. 0	13. 9. 6	1. 2. 0	11. 19. 9	2. 10. 0	7. 17. 0	4. 5. 0
52,108. Reversing pendulum .	156	—	0. 9. 0	—	—	—	—	—	—
52,153. Adhesion plates . . .	148	—	0. 12. 0	—	—	—	—	—	0. 12. 0
52,159. Ivory ball with marble slab	158	0. 10. 0	—	—	0. 10. 0	—	—	—	—
52,161. Percussion trough . .	—	—	0. 16. 0	—	—	—	—	—	—
52,200. Simple spring balance	152	0. 5. 0	—	0. 5. 0	—	—	—	—	0. 5. 0
52,212. Dynamometer for compression and extension . .	159	—	2. 5. 0	—	—	—	—	—	—
52,236. Simple machines . . .	—	—	4. 15. 0	—	—	—	—	—	—
52,428. Model of a clock . . .	157	2. 10. 0	—	—	2. 10. 0	—	—	—	—
		16. 8. 6	13. 8. 0	13. 14. 6	4. 2. 0	11. 19. 9	2. 10. 0	7. 17. 0	5. 2. 0
Mechanics of Liquids.									
52,443. Tube level	143	—	0. 3. 0	—	0. 3. 0	—	0. 3. 0	—	0. 3. 0
52,447. Round spirit level .	—	0. 5. 0	—	—	0. 5. 0	—	—	—	—
52,452. Apparatus for the propagation of pressure . . .	164	1. 0. 0	—	—	—	—	—	—	1. 0. 0
52,463. Hydraulic press . . .	162	—	8. 10. 0	8. 10. 0	—	—	—	—	8. 10. 0
52,470. Model for explaining the hydraulic press . . .	28	0. 12. 0	—	0. 12. 0	—	0. 12. 0	—	—	—
52,479. Pascal's apparatus . .	163	—	3. 5. 0	—	—	—	—	—	3. 5. 0
52,492. Buoyancy apparatus .	29	0. 4. 6	—	0. 4. 6	—	0. 4. 6	—	0. 4. 6	—
52,496. Communicating tubes .	30	0. 4. 0	—	0. 4. 0	—	0. 4. 0	—	0. 4. 0	—
52,503. U-shaped tube for liquids of different gravity	—	0. 5. 0	—	0. 5. 0	—	—	—	—	—
52,509. Solid and hollow cylinders	31	0. 10. 0	—	0. 10. 0	—	0. 10. 0	—	0. 10. 0	—
52,514. Float apparatus . . .	—	0. 10. 0	—	0. 10. 0	—	—	—	—	—
52,542. Hydrometer, after Nicholson	144	—	0. 18. 0	—	—	—	—	—	—
52,546. 2 Hydrometers, after Baumé	32	0. 3. 0	—	0. 3. 0	—	0. 3. 0	—	0. 3. 0	—
52,547. 2 Hydrometers	32	0. 4. 0	—	0. 4. 0	—	0. 4. 0	—	0. 4. 0	—
51,749. Pycnometer: see among the apparatus for measuring lengths etc. . . .	161	—	—	—	—	—	—	—	—
52,582. Outflow apparatus . .	165	1. 0. 0	—	—	—	—	—	—	—
52,598. Barker's mill	33	0. 16. 0	—	0. 16. 0	—	0. 16. 0	—	—	—
52,611. Diminution of pressure	—	1. 0. 0	—	—	—	—	—	—	—
52,612.—52.614. Attachments for above apparatus . . .	—	0. 9. 0	—	—	—	—	—	—	—
51,992. Oblateness of a sphere of oil	172	—	1. 0. 0	—	1. 0. 0	—	1. 0. 0	—	—
52,679. 2 Wide tubes with capillary tubes	34	0. 8. 0	—	0. 8. 0	—	0. 8. 0	—	0. 8. 0	—
52,693. Capillary plates . . .	—	—	0. 10. 0	0. 10. 0	—	—	—	—	—
52,702. Endosmometer	173	—	0. 8. 0	—	—	—	—	—	—
		7. 10. 6	14. 12. 0	12. 16. 6	1. 8. 0	3. 1. 6	1. 3. 0	1. 13. 6	12. 18. 0
Mechanics of Gases.									
52,733. Pressure gauge apparatus	171	—	1. 1. 0	—	—	—	—	—	1. 1. 0
52,749. Barometer tube with mercury cup	38	0. 3. 0	—	0. 3. 0	—	0. 3. 0	—	0. 3. 0	—
52,758. Barometer tube with iron tube vessel	—	0. 14. 0	—	—	—	—	—	—	—
52,778. Syphon barometer . .	39	1. 12. 0	—	1. 12. 0	—	1. 12. 0	—	1. 12. 0	—
52,804. Aneroid barometer . .	170	—	0. 10. 0	0. 10. 0	—	—	0. 10. 0	—	0. 10. 0
52,818. Boyle's (Mariotte's) law apparatus	36	1. 4. 0	—	1. 4. 0	—	1. 4. 0	—	1. 4. 0	—
52,828. Magic jug	—	0. 4. 0	—	—	—	—	—	—	—
52,835. Mariotte's bottle . . .	166	—	0. 6. 0	—	—	—	—	—	—
52,838. Syphon, of glass . . .	37	0. 0. 6	—	0. 0. 6	—	0. 0. 6	—	0. 0. 6	—
52,840. Plunging syphon . . .	37	0. 0. 6	—	0. 0. 6	—	0. 0. 6	—	0. 0. 6	—
52,855. Heron's ball with rubber bellows	167	—	0. 16. 0	—	—	—	0. 16. 0	—	0. 16. 0
52,859. Heron's fountain . . .	168	—	0. 18. 0	—	—	—	—	—	0. 18. 0
52,861. Intermittent fountain .	—	0. 3. 6	—	—	—	—	—	—	—
52,864. Cartesian diver . . .	169	0. 2. 6	—	—	0. 2. 6	—	0. 2. 6	—	0. 2. 6
52,870. Model of a suction pump	40	0. 12. 0	—	0. 12. 0	—	0. 12. 0	—	0. 12. 0	—
52,876. Model of a force pump	40	0. 12. 0	—	0. 12. 0	—	0. 12. 0	—	0. 12. 0	—
52,881. Model of a fire engine	40	1. 2. 0	—	1. 2. 0		1. 2. 0	—	1. 2. 0	—
Carried forward		6. 10. 0	3. 11. 0	5. 16. 0	0. 2. 6	5. 6. 0	1. 8. 6	5. 6. 0	3. 7. 6

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.

Object	No. in German Standard Collection	Collection 1		Collection 2		Collection 3		Collection 4	
		1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Brought forward		6. 16. 0	3. 11. 0	5. 16. 0	0. 2. 6	5. 6. 0	1. 8. 6	5. 6. 0	3. 7. 6
52,904. Vacuum pump with oil packed piston, Kohl's system	35	8. 10. 0	—	8. 10. 0	—	8. 10. 0	—	8. 10. 0	—
53,009. Receiver, internal height 130 mm, int. diam. 105 mm	35	0. 2. 0	—	0. 2. 0	—	0. 2. 0	—	0. 2. 0	—
53,013. Receiver, inter. height 235 mm, int. diam. 185 mm	35	0. 4. 9	—	0. 4. 9	—	0. 4. 9	—	0. 4. 9	—
53,033. Glass sphere for weighing air	35	0. 10. 0	—	0. 10. 0	—	0. 10. 0	—	0. 10. 0	—
53,035. Magdeburg hemispheres	35	0. 16. 0	—	0. 16. 0	—	0. 16. 0	—	0. 16. 0	—
53,038. Dasymeter (baroscope)	35	0. 10. 0	—	0. 10. 0	—	0. 10. 0	—	0. 10. 0	—
53,072. Electric bell in a receiver	—	0. 12. 0	—	—	—	—	—	—	—
		17. 14. 9	3. 11. 0	16. 8. 9	0. 2. 6	15. 18. 9	1. 8. 6	15. 18. 9	3. 7. 6
Wave Motions and Acoustics.									
53,146. Wave machine, Mach's	49	5. 0. 0	—	5. 0. 0	—	5. 0. 0	—	—	—
53,158. Indiarubber cords	188	0. 3. 0	—	—	0. 3. 0	—	0 3. 0	—	0. 3. 0
53,164. Wave apparatus, Melde's	176	—	2. 10. 0	—	—	—	—	—	—
53,183. 2 String telephones	—	0. 8. 0	—	—	—	—	—	—	—
53,186. Sensitive flame burner	186	0. 8. 0	—	—	—	—	—	—	—
53,190. Air concussion apparatus	185	0. 9. 0	—	—	—	—	—	—	—
53,196 a. Megaphone, small	184	0. 6. 0	—	—	—	—	—	—	0. 6. 0
53,200. Trevelyan's rocker	—	—	0. 12. 0	—	—	—	—	—	—
53,203a. Siren disc with 8 rows	41	0. 7. 0	—	0. 7. 0	—	0. 7. 0	—	0. 7. 0	—
53,210. Siren with counter	174	—	2. 0. 0	—	—	—	—	—	2. 0. 0
53,232. Acoustic bellows	42	4. 10. 0	—	4. 10. 0	—	4. 10. 0	—	4. 10. 0	—
53,239. Labial pipe to be used open and closed	43	0. 10. 0	—	0. 10. 0	—	0. 10. 0	—	0. 10. 0	—
53,246. 4 Labial pipes of wood	—	1. 12. 0	—	1. 12. 0	—	—	1. 12. 0	—	—
53,261. Labial pipe with adjustable membrane	190	1. 0. 0	—	—	—	—	—	—	—
53,257. Labial pipe with piston	44	0. 16. 0	—	0. 16. 0	—	0. 16. 0	—	0. 16. 0	—
53,278. Reed pipe	45	0. 18. 0	—	0. 18. 0	—	0. 18. 0	—	0. 18. 0	—
53,289. Chemical harmonica	187	—	1. 6. 0	—	—	—	—	—	—
53,308. Gas flame manometer with rotating mirror	191	—	2 0. 0	—	2. 0. 0	—	—	—	—
53,315. Kundt's dust figures	177	—	1. 10. 0	—	—	—	—	—	—
53,320. 8 steel bars on box	181	1. 6. 0	—	—	1. 6. 0	—	—	—	—
53,340. 2 tuning forks c_1 (ut_3) for resonance experiments	46	2. 8. 0	—	2. 8. 0	—	2. 8. 0	—	—	—
53,424. Bass fiddle bow	189	0. 6. 0	—	0. 6. 0	—	—	0. 6. 0	—	—
53,418. Recording tuning fork	175	—	0. 18. 0	—	0. 18. 0	—	—	—	0. 18. 0
53,426. Monochord	47	1. 12. 0	—	1. 12. 0	—	1. 12. 0	—	1 12. 0	—
53,438. Apparatus for Chladni's figures	48	1. 2. 0	—	1. 2. 0	—	1. 2. 0	—	1. 2. 0	—
53,459. Resonance apparatus	50	0. 6. 0	—	0. 6. 0	—	0. 6. 0	—	0. 6. 0	—
53,461. Model of larynx	180	—	0. 6. 0	—	0. 6. 0	—	0. 6. 0	—	—
53,464. Model of ear	179	—	0. 12. 0	—	0. 12. 0	—	0. 12. 0	—	—
53,478. Galton's whistle	—	0. 16. 0	—	—	0. 16. 0	—	—	—	—
53,512. 9 Resonators	182	—	1. 10. 0	—	1. 10. 0	—	1. 10. 0	—	—
53,526. Apparatus for demonstrating the Lissajous figures	183	—	1. 4. 0	—	—	—	—	—	—
53,595. Sound interference tube	178	1. 10. 0	—	1. 10. 0	—	—	—	—	—
		25. 13. 0	14. 8. 0	20. 17. 0	7. 11. 0	17. 9. 0	4. 9. 0	10. 1. 0	3. 7. 0
Optics.									
53,626. Rectilinear propagation of light	—	0. 16. 0	—	—	—	—	—	—	—
53,674. Optical bench of wood, 3 m long	51	—	—	—	—	—	—	2. 10. 0	—
53,676. Optical bench after Weinhold, entirely of metal graduation 4 m long	51,192	4. 16. 0	—	4. 16. 0	—	—	4. 16. 0	—	—
53,678. Photometrical accessories with electric light, with Bunsen photometer	51, 52, and 192	2. 16. 0	—	2. 16. 0	—	—	2. 16. 0	2. 16. 0	—
53,687. Glow lamp for concave mirror and lens experiments	51	0. 5. 0	—	0. 5. 0	—	—	0. 5. 0	—	—
53,688. Perforated cylinder	51	0. 1. 6	—	0. 1. 6	—	—	0. 1. 6	—	—
Carried forward		8. 14. 6	—	7. 18. 6	—	—	7. 18. 6	5. 6. 0	—

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		1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Brought forward		8. 14. 6	—	7. 18. 6		—	7. 18. 6	5. 6. 0	—
53,692. 2 Screens for concave mirror and lens images .	51	0. 8. 0	—	0. 8. 0		—	0 8. 0	—	—
53,708. Apparatus for explaining the laws of reflection	53	1. 0. 0	—	1. 0. 0	—	1. 0. 0		1. 0. 0	—
53,739. Angle mirror	65	0. 8. 0	—	0. 8. 0	—	0 8. 0	—	—	
53,748. Conical mirror	—	0. 10. 0		—	—	—	—	—	—
53,768. Concave mirror, 150 mm	54	0. 7. 0	—	6. 7. 0		0. 7. 0	—	0. 7. 0	—
53,770. Convex mirror, 150 mm	54	0. 7. 0	—	0. 7. 0	—	0. 7. 0		0. 7 0	—
— Heliostat see equipment for physics and chemistry class rooms, vol. I . . .	55	—	—	—	—	—	—	—	—
— Different slits see accessories for projections in vol. I	56	—	—	—	—		—		—
53,806. Demonstration goniometer	202		18. 0. 0	—	18. 0. 0	—	—	—	—
— Projection screens see vol I	58	—	—	—	—	—	—		—
53,828. Model of a mirror sextant	204	—	2. 0. 0	—		—			
53,838. Rectangular glass box for experiments on refraction and total reflection .	53	0. 18. 0	—	0. 18. 0	—	0. 18. 0	—	0. 18. 0	—
53,859 Optical disc after Hartl	—	3. 18. 0	—	3. 18. 0	—	—	—	—	—
53,860. Addition for experiments with central pencils of rays		1. 6. 0	—	1. 6. 0		—		—	—
53,862. Polarisation apparatus for placing on the optical disc	—	2. 8. 0	—	2. 8. 0	—		—		—
53,863. Rapidly annealed glasses, set of 3, each 0. 3. 6 .	—	0. 10. 6	—	0. 10. 6					—
53,882. Totally reflecting prism	201	—	0. 5. 0	—				—	—
53,895. 6 Lenses in case . . .	57	0. 16. 0	—	0. 16. 0		0. 16. 0	—	0. 16 0	—
54,004. Carbon disulphide prism	64	0. 16. 0	—	0. 16. 0	—	0. 16. 0	—		—
54,029. Direct vision prism . .	199	—	1. 10. 0		—	—			—
54,036. Achromatic prism . .	63	1. 8. 0	—	1. 8. 0	—	1. 8 0			—
54,097. School spectrum appar.	—	4. 10. 0	—	4. 10. 0		—		—	—
54,120. Pocket spectroscope .	67	2. 5. 0		2. 5. 0		2. 5. 0	—		
54,129. 12 Small glass tubes with platinum lugs . . .	—	0. 6. 0	—	0. 6 0	—				
54,180. Absorption box . . .	203	0. 3. 0	—	—	—	—			—
54,188. Hollow cristal glass cube, 80 mm size	203	0. 6. 0	—	—	—		—	—	—
54,139. Lantern for objective chemical spectra	205	—	1. 6. 0	—			—		—
54,221. Apparatus for the reversion of the sodium line	206	0. 16. 0	—	—	—	—		—	—
54,236. Cube of uranium glass, fluorescing green	208	0. 2. 0	—	0. 2. 0	—		0 2. 0	—	—
54,238. Cube of didymium glass fluorescing red	208	0. 12. 0	—			—		—	—
54,256. 5 Phosphorescent substances	207	0. 7. 0	—	0. 7. 0	—	—	0. 7. 0		—
54,264. Folding camera . . .	200	5. 10. 0	—	—	5. 10. 0		5. 10 0	—	5. 10. 0
54,278. 54,282. Outfits with supplementary outfits . .	200	0. 19. 0	—	—	0. 19. 0	—	0. 19. 0	—	0. 19. 0
54,290. Model of the eye . .	68	0. 10. 0	—	0. 10. 0		0. 10 0	—		—
54,300. 30 drawings for showing the blind spot	—	0. 1. 6	—	0. 1. 6	—		0. 1 6	—	—
54,305. Stereoscope (Brewster's)	66	0. 5. 0	—	0. 5. 0	—	0. 5. 0	—	—	—
54,312. 368 Stereoscopic drawings	66	0. 8. 0	—	0. 8. 0	—	0. 8. 0			—
54,338. Projection plate for optical illusions	—	0. 6. 0	—	—	—	—	—	—	—
54,342. 7 Different coloured gelatine slabs	61	0. 6. 0	—	0. 6. 0	—	0. 6. 0	—	—	—
52,019. Stroboscopic drum . .	210	0. 14. 0	—	—	—	—	—	—	—
52,035. Colour disc for the whirling table	62	0. 4. 0	—	0. 4. 0	—	0. 4. 0			—
52,037. Disc apparatus for alternating mixed colours . .	209	0. 8. 0	—	—	0. 8. 0		—	—	—
54,355. Camera obscura . . .	59	1. 0. 0		1. 0. 0		1. 6. 0		1. 0. 0	—
54,375. 3 Ligroin lamps . . .	51	0. 6. 0	—	0. 6. 0	—	0. 6. 0	—	—	—
54,408. Simple microscope . .	60	3. 5. 0	—	2. 5. 0	—	3. 5. 0	—	3. 5. 0	—
Carried forward		47. 4. 6	27. 1. 0	36. 4. 6	21. 17. 0	14. 9. 0	15. 6. 0	12. 19. 0	6. 9. 0

Max Kohl A. G. Chemnitz, Germany.

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		1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Brought forward		47. 4. 6	23. 1. 0	36. 4. 6	24. 17. 0	14. 9. 0	15. 6. 0	12. 19. 0	8. 9. 0
54,510. Newton's colour glasses, 100 mm diam., on stand.	197	—	1. 18. 0	—	1. 18. 0	—	1. 18. 0	—	—
54,520. Fresnel's mirrors . . .	198	—	1. 4. 0	—	—	—	—	—	—
54,599. Demonstration polarisation apparatus after Grimsehl	194	1. 10. 0	—	—	—	—	—	—	—
54,624. Tourmaline tongs with 6 preparations	196	2. 12. 0	—	—	—	—	—	—	—
54,693. Glass plate with letters and calc-spar plate . . .	193	0. 16. 0	—	0. 16. 0	—	—	0. 16. 0	—	—
54,775. Calc-spar cube	193	0. 15. 0	—	—	—	—	—	—	—
54,735. Nicol prism, 10 mm side	195	0. 10. 0	—	—	0. 10. 0	—	—	—	—
		53. 7. 6	26. 3. 0	37. 0. 6	27. 5. 0	14. 9. 0	18. 0. 0	12. 19. 0	6. 9. 0
Heat and Meteorology.									
54,785. Brass sphere with ring, after S'Gravesande . . .	71	0. 5. 0	—	0. 5. 0	—	0. 5. 0	—	0. 5. 0	—
54,797. Contraction apparatus (Tyndall's) with burner. .	—	1. 0. 0	—	1. 0. 0	—	—	1. 0. 0	—	
54,799. Pyrometer for linear expansion	72	1. 8. 0	—	1. 8. 0	—	1. 8. 0	—	1. 8. 0	—
54,822. Water dilatometer . .	214	—	0. 18. 0	—	—	—	—	—	0. 18. 0
54,823. Glass cylinder with heating device	—	1. 4. 0	—	—	1. 4. 0	—	—	—	—
54,835. Expansion of mercury	213	—	0. 18. 0	—	—	—	0. 18. 0	—	0. 18. 0
54,858. Simple thermometer .	69	0. 1. 0	—	0. 1. 0	—	0. 1. 0	—	0. 1. 0	—
54,859. Cylindrical thermometer from —20° to +360°	69	0. 3. 0	—	0. 3. 0	—	0. 3. 0	—	0. 3. 0	—
54,862. Thermometer for calorimetric work	222	—	0. 5. 0	—	0. 5. 0	—	0. 5. 0	—	—
54,878. Thermometrograph after Six	70	0. 6. 0	—	0. 6. 0	—	0. 6. 0	—	0. 6. 0	—
54,891. Strips of steel and zinc	211	0. 2. 0	—	—	0. 2. 0	—	0. 2. 0	—	0. 2. 0
54,894. Metallic thermometer	218	—	1. 16. 0	—	—	—	—	—	—
54,955. Double thermoscope after Looser	212	2. 10. 0	—	2. 10. 0	—	—	2. 10. 0	—	2. 10. 0
54,956. Introduction to above	212	0. 4. 6	—	0. 4. 6	—	—	0. 4. 6	—	0. 4. 6
54,957a. Small collection of accessories for experiments on thermal expansion . .	212	0. 8. 0	—	—	0. 8. 0	—	—	—	0. 8. 0
54,958. Accessories for experiments on specific heats .	212	0. 12. 0	—	—	0. 12. 0	—	—	—	—
54 959a. Small collection of accessories for experiments on thermal conduction . . .	212	0. 12. 0	—	0. 12. 0	—	—	0. 12. 0	—	0. 12. 0
54,962a. — idem, for experiments on radiant heat . .	212	1. 12. 0	—	1. 12. 0	—	—	1. 12. 0	—	1. 12. 0
54,963a. — idem, for experiments on heat and work.	212	0. 4. 0	—	—	0. 4. 0	—	—	—	0. 4. 0
54,965a. — idem, for experiments on change of state	212	0. 10. 0	—	—	0. 10. 0	—	0. 10. 0	—	—
54,966. — idem, for heat experiments on gases and vapours	212	0. 16. 0	—	—	0. 16. 0	—	—	—	—
54,968a. — idem, for experiments on thermal effect of currents	212	0. 16. 0	—	0. 16. 0	—	—	0. 16. 0	—	0. 16. 0
54,969a. — idem, for using the thermoscope as a manometer	—	0. 12. 0	—	—	0. 12. 0	—	—	—	—
55,016. Hollow iron sphere with closing screw	225	0. 1. 8	—	0. 1. 8	—	—	0. 1. 8	—	—
55,017. 10 Spare iron spheres.	225	0. 8. 4	—	0. 8. 4	—	—	0. 8. 4	—	—
55,018. Cooling vessel for above	225	0. 5. 0	—	0. 5. 0	—	—	0. 5. 0	—	—
55,031. Steam barometer for showing the tension of water vapour	77	1. 4. 0	—	1. 4. 0	—	1. 4. 0	—	—	—
55,033. Copper dish for Leidenfrost's experiment	—	0. 2. 0	—	0. 2. 6	—	—	0. 2. 0	—	—
55,060. Water hammer . . .	—	—	0. 4. 0	0. 4. 0	—	—	0. 4. 0	—	—
Carried forward		15. 6. 6	4. 1. 0	11. 2. 6	4. 13. 0	3. 7. 0	9. 10. 6	2. 3. 0	8. 4. 6

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		1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Brought forward		15. 6. 6	4. 1. 0	11. 2. 6	4. 13. 0	3. 7. 0	9. 10. 6	2. 3. 0	8. 4. 6
55,070. Papin's digester with spring manometer	220	2. 8. 0	—	—	2. 8. 0	—	2. 8. 0	—	—
55,092 Steel cylinder for carbonic acid	224	—	1. 10. 0	—	—	—	—	—	—
— It is presumed that the liquid air which is necessary for the following experiences is obtained ready for use from the suppliers; if desired we supply apparatus for generating liquid air									
55,116 Double walled capsule for obtaining solid air	—	—	0. 5. 0	—	0. 5. 0	—	—	—	—
55,117. Lead plate with hammer and dish	—	—	0. 6. 0	—	0. 6. 0	—	—	—	—
55,118. 2 small glasses with ether and alcohol	—	—	0. 8. 0	—	0. 8. 0	—	—	—	—
55,123. Apparatus for the critical temperature phenomena	—	—	0. 6 0	0. 6. 0	—	—	—	—	—
55,150. Specific heat of metal spheres	216	1. 2. 0	—	1. 2. 0	—	—	—	—	—
55,154. Ice calorimeter	221	—	0. 15. 0	—	—	—	—	—	—
55,169. Water calorimeter	215	—	1. 4. 0	—	1. 4. 0	—	—	—	—
52,048. Friction heat	217	0. 5. 0	—	0. 5. 0	—		0. 5. 0	—	—
55,223. Pneumatic fire syringe	76	0. 16. 0	—	0. 16. 0	—	0. 16. 0	—	—	—
52,050. Puluj's apparatus	—	5. 5. 0	—	—	5. 5. 0	—	—	—	—
55,265. Sectional model of a steam engine	78	3. 4. 6	—	3. 4. 0	—	3. 4. 0	—	3. 4. 0	—
55,289. Thermal conduction in metal rods (Ingenhouss)	73	1. 0. 0	—	1. 0. 0	—	1. 0. 0	—	—	—
55,306. Davy's safety lamp	226	—	0. 8. 0	0. 8. 0		—	—	—	—
55,320. 2 spherical concave mirrors, 300 mm diam.	219	4. 16. 0	—	—	4. 16. 0	—	—	—	—
55,358. Leslie's cube	74	0. 18. 0	—	0. 18. 0	—	0. 18. 0	—	—	—
55,443. Hygrometer after Daniel	75	0. 15. 0	—	0. 15. 0	—	0. 15. 0	—	—	—
55,453. Polymeter, Lambrecht's	—'	1. 0. 0	—	1. 0. 0	—	—	1. 0. 0	—	—
55,458. Psychrometer, August's	223	—	1. 8. 0	—	—	—	—	—	—
55,487. 6 Meteorological maps	79	1. 8. 0	—	1. 8. 0	—	1. 8. 0	—	1. 8. 0	—
		38. 3. 6	10. 11. 0	22. 4. 6	19. 5. 0	11. 8. 0	13. 3. 6	6. 15. 0	8. 4. 6
Magnetism.									
60,002. Lodestone	227	—	0. 15. 0	—	—	—	—	—	0. 15. 0
60,005. 2 Bar magnets and 2 horse shoe magnets	80	0. 12. 0	—	0. 12. 0	—	0. 12. 0	—	0. 12. 0	—
60,026. Horse shoe magnet with 5 segments	81	1. 4. 0	—	1. 4. 0	—	1. 4. 0	—	1. 4. 0	—
60,046. Magnetic needle, 100mm	82	0. 3. 0	—	0. 3. 0	—	0. 3. 0	—	0. 3. 0	—
60,058. Stand for same	82	0. 2. 6	—	0. 2. 6	—	0. 2. 6	—	0. 2. 6	—
60,080. Glass tube, half filled with iron filings	230	0. 1. 6	—	0. 1. 6	—	—	0. 1. 6	—	—
60,082. Iron powder, 250 g.	229	0. 1. 9	—	0. 1. 9	—	—	0. 1. 9	—	—
60,083. Sifter for above	229	0. 1. 6	—	0. 1. 6	—	—	0. 1. 6	—	—
60,084. Soft iron rod	231	—	0. 5. 0	—	0. 5. 0	—	0. 5. 0	—	—
60,098. Dip circle	83	2. 8. 0	—	—	2. 8. 0	2. 8. 0	—	2. 8. 0	—
60,119. Ship's compass	228	—	1. 10. 0	—	—	—	—	—	1. 10. 0
— Knitting needles for magnetizing	84	0. 1. 0	—	0. 1. 0	—	0. 1. 0	—	0. 1. 0	—
62,363. Wood frame, with cardboard	229	0. 3. 0	—	—	0. 3. 0	—	0. 3. 0	—	—
60,129. Magnetometer, Weber's	233	—	3. 15. 0	—	—	—	—	—	—
60 131. Decrease of magnetic force with distance	232	—	2. 0. 0	—	2. 0. 0	—	2. 0. 0	—	—
		4. 18. 3	8. 5. 0	2. 7. 3	4. 16. 0	4. 10. 6	2. 12. 9	4. 10. 6	2. 5. 0
Static Electricity.									
60,142. Different rods with rubbers	85	1. 0. 0	—	1. 0. 0	—	1. 0. 0	—	1. 0. 0	—
60,158. Electric horizontal pendulum	86 and 245	1. 4. 0	—	1. 4. 0	—	1. 4. 0	—	—	—
60,160. Double electric pendulum	86	0. 5. 0	—	0. 5. 0	—	0. 5. 0	—	0. 5. 0	—
Carried forward		2. 9. 0	—	2. 9. 0	—	2. 9. 0	—	1. 5. 0	—

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.

Object	No. in German Standard Collection	Collection 1		Collection 2		Collection 3		Collection 4	
		1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Brought forward		2. 9. 0	—	2. 9. 0	—	2. 9. 0	—	1. 5. 0	—
60,186. 2 Electroscopes (von Beetz's), each £ 1. 2. 0	87	2. 4. 0	—	2. 4. 0	—	2. 4. 0	—	2. 4. 0	—
60,190. Electrometer (Szymanski's)	238	—	2. 10. 0	—	—	—	—	—	—
60,230. Distributing apparatus	240	1. 0. 0	—	—	—	—	1. 0. 0	—	1. 0. 0
60,244. Electricity resides on the surface	234	0. 18. 0	—	—	—	—	—	—	0. 18. 0
60,196. Aluminium Electrometer (Kolbe's)	243	—	3. 0. 0	3. 0. 0	—	—	3. 0. 0	—	—
60,222. Odstreil's apparatus for demonstrating Coulomb's law	244	3. 10. 0	—	3. 10. 0	—	—	3. 10. 0	—	—
60,257. Electrometer (Bohnenberger's)	246	2. 15. 0	—	2. 15. 0	—	—	2. 15. 0	—	—
— Apparatus for the study of potential see the following apparatus Nos. 60,258, 60,260 to 60,279.									
60,258. Water battery	243	—	3. 0. 0	—	3. 0. 0	—	3. 0. 0	—	—
60,260. 2 Small electroscopes	243	—	1. 13. 0	—	1. 13. 0	—	1. 13. 0	—	—
60 261. Sheet iron Cube	243	—	0. 5. 0	—	0. 5. 0	—	0. 5. 0	—	—
60,262 2 Hollow cylinders	243	—	2. 5. 0	—	2. 5. 0	—	2. 5. 0	—	—
60,263. Hollow cylinder	243	—	0. 12. 0	—	0. 12. 0	—	0. 12 0	—	—
60,264. Insulating table	243	—	0. 12. 0	—	0. 12. 0	—	0. 12. 0	—	—
60,265. Paraffin plate	243	—	0. 4. 6	—	0. 4. 6	—	0. 4. 6	—	—
60,266. 2 fixed sounders with solid balls and hollow balls	243	—	0. 10. 0	—	0. 10. 0	—	0. 10. 0	—	—
60,267. Adjustable sounder	243	—	0. 12. 0	—	0. 12. 0	—	0. 12. 0	—	—
60,268—60,279. Accessories	243	—	4. 10. 0	—	4. 10. 0	—	4. 10. 0	—	—
60,300. Flexible wire netting	—	0. 12 0	—	0. 12. 0	—	—	0. 12. 0	—	—
60,358. Electrophorus of 21 cm diameter	92	0. 12. 0	—	0. 12. 0	—	0. 12. 0	—	0. 12. 0	—
60,370. Disc electric machine, 36 cm diameter of disc	88	3. 10. 0	—	3. 10. 0	—	3. 10. 0	—	3. 10. 0	—
60,436. Self exciting influence machine	93and 235	4. 10. 0	—	4. 10 0	—	4. 10. 0	—	4. 10. 0	—
60,521. Connecting chain, 1 m	88	0. 1. 0	—	0. 1. 0	—	0. 1. 0	—	0. 1 0	—
60,526. Insulating stool	90	0. 7. 0	—	0. 7. 0	—	0. 7. 0	—	0. 7. 0	—
60,528. Chime	89	0. 9. 0	—	0. 9. 0	—	0. 9. 0	—	0. 9. 0	—
60,532. Electric whirl	89	0. 4. 0	—	0. 4. 0	—	0. 4. 0	—	0. 4. 0	—
60,535. Paper tassel	89	0. 4. 0	—	0. 4. 0	—	0. 4. 0	—	—	—
60,536. Electric dancing balls	89	0. 10. 0	—	0. 10. 0	—	0. 10. 0	—	0. 10. 0	—
60,577. Electric egg	241	—	1. 7. 0	—	—	—	—	—	—
60,569. Electric air thermometer	242	—	2. 0. 0	—	—	—	—	—	—
60,581. 2 Leyden jars, 40 cm high, each £ 0. 12. 0	95	1. 4. 0	—	1. 4. 0	—	1. 4. 0	—	1. 4. 0	—
60,584. Leyden jar with removable coating	94	0. 14. 0	—	0. 14. 0	—	0. 14. 0	—	0. 14. 0	—
60,586. Leyden jar battery, 4 jars of 26 cm height	236	—	2. 8. 0	—	—	—	—	—	—
60,608. Condenser (Weinhold's)	96	1. 10. 0	—	1. 10. 0	—	1. 10. 0	—	—	—
60,621. Discharger	91	0. 4. 0	—	0. 4. 0	—	0. 4. 0	—	0. 4. 0	—
60,625 Henley's discharger	237	—	1. 0. 0	—	—	—	—	—	1. 0. 0
60,605. Lane's measuring jar	239	—	1. 0. 0	—	—	—	—	—	—
		27. 7. 0	27. 8. 6	28. 9. 0	14. 3. 6	18. 12. 0	25. 0. 6	15. 14. 0	2. 18. 0
Voltaic Electricity.									
— Bohnenberger's electroscope see Static electricity	246	—	—	—	—	—	—	—	—
60,684. Volta's pair of plates	—	0. 16. 0	—	—	—	—	—	—	—
60,737. Zinc-copper cell with separate carbon electrode	97	0. 3. 0	—	0. 3. 0	—	0. 3. 0	—	0. 3. 0	—
60,762. Daniell's cell	100	0. 5. 0	—	0. 5. 0	—	0. 5. 0	—	0. 5. 0	—
60 781. 3 Bottle cells (Grenet's), each £ 0. 3. 6	98	0. 10. 6	—	0. 10. 6	—	0. 10. 6	—	0. 10. 6	—
60,785. Leclanché cell	100	0. 2. 6	—	0. 2. 6	—	0. 2. 6	—	0. 2. 6	—
60,792. 2 Hellesen dry cells, each £ 0. 1. 0	100	0. 2. 0	—	0. 2. 0	—	0. 2. 0	—	0. 2. 0	—
60,821. Immersion battery with 6 cells	99	3. 12. 0	—	3. 12. 0	—	3. 12. 0	—	3. 12. 0	—
Carried forward		5. 11. 0	—	4. 15. 0	—	4. 15. 0	—	4. 15. 0	—

Object	No. in German Standard Collection	Collection 1		Collection 2		Collection 3		Collection 4	
		1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Brought forward		5. 11. 0	—	4. 15. 0	—	4. 15. 0	—	4. 15. 0	—
61,093. 4 Terminals, each £ 0. 0. 4	101	0. 1. 4	—	0. 1. 4	—	0. 1. 4	—	0. 1. 4	—
61,134. Commutator (Ruhmkorff's)	103	0. 16. 0	—	0. 16. 0	—	0. 16. 0	—	0. 16. 0	—
61,147. Morse key	102	0. 10. 0	—	0. 10. 0	—	0. 10. 0	—	0. 10. 0	—
61,268. Tangent galvanometer	105	7. 0. 0	—	7. 0. 0		7. 0. 0	—		—
61,299. School galvanometer (astatic)	104	3. 15. 0	—	3. 15. 0		3. 15. 0	—	3. 15. 0	—
61,397. Moving coil mirror galvanometer	258	3. 0. 0	—	—	3. 0. 0	—	—	—	—
61,520. Demonstration ammeter	247	—	2. 10. 0	2. 10. 0	—	—	2. 10. 0	—	—
61,521. Demonstration voltmeter	248	—	2. 10. 0	2. 10. 0	—	—	2. 10. 0	—	—
61,854. Resistance of 1 ohm	115	0. 3. 0	—	0. 3. 0	—	0. 3. 0	—	0. 3. 0	—
61,882. Switch contact rheostat	261	3. 0. 0	—	—	—	—	—	—	—
62,117. Foster's apparatus	262	—	1. 16. 0	—	1. 16. 0	—	—	—	—
61,903. Simple Wheatstone bridge	249	—	1. 4. 0	1. 4. 0	—	—	1. 4. 0	—	—
62,006. Rheostat with 8 plugs	250	3. 10. 0	—	3. 10. 0	—	—	3. 10. 0	—	—
62,193. Voltameter, Hofmann's	106	1. 12. 0	—	1. 12. 0	—	1. 12. 0	—	1. 12. 0	—
62,256. Electro-plating apparatus for copper deposits	—	1. 0. 0	—	1. 0. 0	—		1. 0. 0	—	1. 0. 0
62,254. 2 Matrices of guttapercha, each £ 0. 1. 0	251	0 2. 0	—	0. 2. 0	—	—	0. 2. 0	—	0. 2. 0
		30. 0. 4	8. 0. 0	29. 8. 4	4. 16. 0	18. 12. 4	10. 16. 0	11. 12. 4	1. 2. 0
Electro-magnetism, High frequency, Electric waves and Thermo-Electricity.									
62,261. Oersted's apparatus	260	—	0. 18. 0	—	—	—	0. 18. 0	—	—
62,280. Electromagnet after Weinhold	107	2. 4. 0	—	2. 4. 0		2. 4. 0	—	2. 4. 0	—
62,280a. v. Waltenhofen's pendulum	—	—	1. 10. 0	—	—	—	1. 10. 0	—	—
62,325. Morse telegraph	254	2. 4. 0	—	—	2 4. 0		2. 4. 0	—	2. 4. 0
62,351. Electric bell	111	0. 8. 0	—	0. 8. 0		0. 8. 0	—	0. 8. 0	—
62,383. Ampère's stand	257	4. 4. 0	—	4. 4. 0		—	4. 4. 0	—	—
62,367. Wire coil for above	—	0. 8. 0	—	0. 8. 0	—	—	0. 8. 0	—	—
62,368. Zinc plate	—	0. 4. 0	—	0. 4. 0	—	—	0. 4. 0	—	—
62,371. Explaining the theory of lines of magnetic force	265	—	3. 10. 0	—	3. 10. 0		—	—	—
62,408. Roget's spiral	—	0. 16. 0	—	—			0. 16. 0	—	—
62,414. Rotation of a magnet about a current	259	1. 4. 0		—	—	—	1. 4. 0	—	—
52,061. Apparatus for generating Foucault currents	253	—	1. 8. 0	—	—		1. 8. 0		—
62,444. 2 Induction coils after Weinhold	108	0. 16. 0		0. 16. 0	—	0. 16. 0	—	0. 16. 0	—
60,007. Cylindrical bar magnet for above	108	0. 2. 0	—	0 2. 0	—	0. 2. 0	—	0 2 0	—
62,464. Magnetic hammer break	252	0. 16. 0	—	—	—	—	0. 16. 0	—	0. 16. 0
62,637. Induction coil for 200 mm spark-length	109[1]	17. 10. 0	—	17. 10. 0	—	—	—	—	—
62,660. Induction coil for 30mm spark-length	109	—	—	—	—	2 15. 0	—	2. 15. 0	—
62,589. Sparking pillars	—	1. 0. 0	—	1. 0. 0	—	—	—	—	—
62,652. Small induction coil, 6 mm spark-length		0. 10. 0	—	0. 10. 0		—	—	—	—
62,690. X-ray tube	—	1. 0. 0	—	1 0. 0		—	—	—	—
51,110. Simple wood stand	—	0. 5. 0	—	0. 5. 0	—	—		—	—
62,707. Fluorescent screen size 13 × 18 cm	—	1. 10. 0	—	1. 10 0	—	—		—	—
62,735. Model of a Pacinotti-Gramme-machine	110	2. 15. 0	—	2. 15. 0	—	2. 15. 0	—	—	—
62,737. Model of a magneto-electric machine	266	—	4. 4. 0	—		—	—	—	—
62,758. Schuckert flat ring	267	1. 0. 0	—	—	1 0. 0		—	—	—
62,759. Siemens armature	267	1. 0. 0	—	—	—		1. 0. 0	—	—
62,762a. Drum armature	267	1. 5. 0			1. 5. 0		1. 5. 0	—	—
62,781. Shunt dynamo for generating current	268	7. 5. 0	—	7. 5. 0	—	—	—	—	—
Carried forward		48. 6. 0	11. 10. 0	40. 1. 0	7. 19. 0	9 0. 0	15. 17. 0	6. 5. 0	3. 0. 0

[1]) This induction coil is sufficiently large to permit of making experiments with X-rays.

Max Kohl A. G. Chemnitz, Germany.

Object	No. in German Standard Collection	Collection 1		Collection 2		Collection 3		Collection 4	
		1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement	1st Acquirement	2nd Acquirement
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Brought forward		48. 6. 0	11. 10. 0	40. 1. 0	7. 19. 0	9. 9. 0	15. 17. 0	6. 5. 0	3. 0. 0
62,797. Glow lamp stand with glow lamp	112	0. 6. 0	—	0. 6. 0	—	0. 6. 0	—	0. 6. 0	—
62,903. Demonstration apparatus for rotating field experiments	—	—	6. 0. 0	—	—	—	—	—	—
62,815. Small arc lamp	113	2. 0. 0	—	2. 0. 0	—	2. 0. 0	—	2. 0. 0	—
63,022. 6 Geissler tubes	264	0. 8. 0	—	0. 8. 0	—	—	0. 8. 0	—	—
63,053. Hittorff's tube	264	0. 15. 0	—	—	—	—	0. 15. 0	—	—
63,096. Crookes' tube No. 15	—	0. 11. 0	—	—	—	—	0. 11. 0	—	—
63,241. Set of Tesla apparatus	—	—	6. 10. 0	6. 10. 0	—	—	6. 10. 0	—	—
63,268. Apparatus for repeating Hertz's experiments	—	4. 0. 0	—	4. 0. 0	—	—	4. 0. 0	—	—
63,310. Wireless telegraphy demonstration apparatus	—	10. 0. 0	—	10. 0. 0	—	—	10. 0. 0	—	—
63,360. Explaining the working of the telephone	255	2. 2. 0	—	2. 2. 0	—	—	2. 2. 0	—	2. 2. 0
63,374. Model of a microphone	256	0. 6. 0		0. 6. 0	—	—	0. 6. 0	—	—
63,413. Rod shaped thermocouple	114	0. 8. 0	—	0. 8. 0	—	0. 8. 0	—	—	—
63,426. Thermopile	263	1. 2. 0	—	—	—	—	1. 2. 0	—	—
		70. 4. 0	24. 0. 0	66. 1. 0	7. 19. 0	11. 14. 0	41. 11. 0	8. 11. 0	5. 2. 0
Total cost of Collections 1—4.		1st and 2nd Acquirement		1st and 2nd Acquirement		1st and 2nd Acquirement		1st and 2nd Acquirement	
Apparatus, etc. for general use		13. 18. 3		13. 14. 3		13. 5. 11		13. 1. 3	
Measuring of length, weight and time; Introduction to physics		22. 5. 0		13. 0. 0		3. 12. 0		21. 16. 0	
General mechanics		5. 9. 0		4. 12. 0		4. 12. 0		1. 12. 0	
Mechanics of solids		29. 16. 6		17. 16 6		14. 9. 9		12. 19. 0	
Mechanics of liquids		22. 2. 6		14. 4. 6		4. 4. 6		14. 11. 6	
Mechanics of gases		21. 5. 9		16. 11. 3		17. 7. 3		19. 6. 3	
Wave motions and acoustics		40. 1. 0		28. 8. 0		21. 18. 0		13. 8. 0	
Optics		79. 10. 6		64. 5. 6		32. 9. 0		19. 8. 0	
Heat and Meteorology		48. 14. 6		41. 9. 6		24. 11. 6		14. 19. 6	
Magnetism		13. 3. 3		7. 3. 3		7. 3. 3		6. 15. 6	
Static electricity		54. 15. 6		42. 12. 6		43. 12. 6		18. 12 0	
Voltaic electricity		38. 0. 4		34. 4. 4		29. 8. 4		12. 14. 4	
Electromagnetism — Thermoelectricity		94. 4. 0		74. 0. 0		53. 5. 0		13. 13. 0	
		483. 6. 1		372. 1. 7		269. 19. 0		182. 16. 4	
The total cost is distributed on the 1st and 2nd acquirement to		311. 5. 9	172. 0. 4	270. 1. 3	102. 0. 4	147. 6. 3	122. 12. 9	111. 12. 6	71. 3. 10

Max Kohl A. G. Chemnitz, Germany.

Estimates of Cost for Chemical Supplies.

In compiling this Collection it is assumed that physical instruction is imparted in a different room from chemical instruction. If, however, the classroom is common to both branches, the objects listed in the section "Apparatus, Supplies and Materials for General Use" can be entirely or partly dispensed with if already available in the Physical Collection.

It is further assumed that the "Equipments", and especially Lecture Table with gas, water and electric leads, etc., Cupboards, Reagent Stands, Tools and perhaps also an experimental Switchboard, or an electric Transformer, Water Air Pump, Water Jet Blower, etc. necessary for the Chemical Classroom, the Preparation Room and the Laboratory, are either available or will be ordered separately.

Estimates as to Equipments: see Vol. I.

The prices may be changed for **platinum goods** at the time of ordering in proportion to the price prevailing for platinum.

Collection 5.

This Collection contains the articles designated as generally necessary and desirable in the "Standard Code" (further particulars on p. 1075). A Collection of Chemicals in small quantities, with bottles for same provided with inscription, also in small quantities, is appended.

Apparatus, Supplies and Materials for General Use.

These objects are selected conforming the collection No. 3 re Physical apparatus and can be **dispensed** with when a common class room is employed for physics and chemistry.

	Standard-Code	£	s.	d.
— Apparatus, supplies and materials like p. 1076, collection No. 3, 1st and 2nd acquirement	7–13, 16–18, 137–141, 143–146	13.	5.	11
51,533. Analytical balance, also suitable for specific gravity determinations	142	7.	15.	0
51,578. Outfit for specific gravity determinations	—	0.	9.	0
51,637. Rider weights	142	0.	5.	6
51,642. Precision weights, from 1 mg to 200 g	142	0.	15.	6
51,570a. Pillar tare balance	14	1.	8.	0
— Short pan for above	14	0.	5.	0
51,657. Precision weights, from 100 mg to 1000 g	15	0.	16.	6
		25.	0.	5

Special Supplies.

51,232. Water bath with insertion rings	116	0.	8.	0
51,256. Gasometer of glass	117	2.	0.	0
51,339. Pneumatic trough	118	1.	0.	0
51,340. 5 Glass receiving cylinders	119	0.	5.	1
51,378. 3 Measuring flasks, without stoppers, 25, 100 and 500 ccm cap.	120	0.	1.	7
— 3 Measuring flasks, with stoppers, 50, 250 and 1000 ccm	120	0.	3.	0
51,341. 10 Measurings cylinders with lip	120	1.	1.	9
51,322. 3 Pulverising dishes	121	0.	3.	5
— Platinum crucible with lid, 12 g weighing, 12 ccm capacity (Price is subject to fluctuation)	122	4.	5.	0
51,364–51,366. 6 Hessian crucibles in 3 sizes	123	0.	0.	8
51,309. Crucible tongs	124	0.	1.	0
51,323. Blow pipe collapsible	125	0.	2.	0
51,403. 2 Gas washing flasks	126	0.	1.	10
51,395. Drying tube	126	0.	4.	0
51,382. 6 Retorts without tubes	127	0.	2.	3
51,383. 6 Retorts with tubulure and ground in stopper	127	0.	4.	3
51,386. 3 Receivers for retorts, without tube	127	0.	1.	1
51,387. 3 Receivers for retorts, with 1 tube	127	0.	1.	5
51,388. 3 Receivers for retorts, with 1 tube and ground-in stopper	127	0.	1.	10
51,390. 4 Funnel tubes	128	0.	0.	11
51,346. 30 Test glasses in 3 sizes	129	0.	1.	7
51,347. Test glass stand	129	0.	1.	6
51,172. 2 Cocks of pressed glass	130	0.	2.	0
51,173. Three-way cock	130	0.	2.	0
51,174. Brass tap with 2 undulated hose pieces	130	0.	2.	6
51,401. 30 hardened filters in 3 sizes of 4, 11 and 24 cm diameter	131	0.	2.	3
51,402. 50 Sheets of filter paper, medium thick	131	0.	6.	6
54,858. 2 Simple cylindrical thermometer for 0° to 100° C.	132	0.	2.	0
54,859. Cylindrical thermometer for — 20° to + 360° C.	132	0.	3.	0
		11.	12.	5

Further Supplies und Apparatus.

	Standard-Code	£	s.	d.
50,961. Retort for generating oxygen	269	0.	12.	0
51,282. Hydrogen generating apparatus (Kipp's)	270	0.	10.	0
— Apparatus for electrolysis and synthesis of water	271	1.	4.	6
51,282. Sulfuretted-hydrogen-generating Apparatus	272	0.	10.	0
51,407. 3 Spherical tubes	273	0.	2.	0
51,417. 3 Eudiometers	274	0.	12.	8
62,220. 3 U-shaped tubes with platinum and carbon electrodes	275	3.	10.	0
51,252. Gasometer, 30 l. capacity	276	2.	5.	0
51,253. — idem, 50 l. capacity	276	3.	0.	0
		12.	6.	2

Chemicals and Bottles for same.

The inscription on the bottles contains both the chemical formula and the written out description given below.

For a more complete collection with larger supply of chemicals, see p. 1090.

	£	s.	d.
— 111 different solid and 39 different liquid chemicals	7.	10.	0

1. Solid Chemicals.

S	Sulphur
S	Flowers of Sulphur
S	Sulphur Turnings
S	Sulphur in rods
SO_3	Sulphur Trioxide (fused solid in glass tube)
H_3BO_3	Boric Acid, artificial
H_3BO_3	Boric Acid, natural
$Na_2B_4O_7$	Borax, artificial
$Na_2B_4O_7$	Borax, natural
C	Graphite
C	Carbon
Br	Bromine
KBr	Potassium Bromide
I	Iodine
—	Tincture of Iodine
KI	Potassium Iodide
—	Potassium Iodide Starch Paper
HFl	Diamond Ink
SiO_2	Kieselgur
P	Phosphorus, white
P	Phosphorus, red
—	Thomas Meal
—	Guano.
As	Arsenic
As_2O_3	White Arsenic
Sb	Antimony
SbS	Sulphide of Antimony
—	Tartarised Antimony
—	Starch
—	Meal (for Bengal Lights)
—	Indigo
—	Litmus
—	Sugar
$H_2(C_4H_4O_6)$	Tartaric Acid
K	Potassium
KCl	Potassium Chlorate
KOH	Caustic Potash
K_2S	Potassium Sulphide
KNO_3	Potassium Nitrate
K_2SO_4	Potassium Sulphate
K_2CO_3	Potassium Carbonate
$KClO_3$	Kainite

Max Kohl A. G. Chemnitz, Germany.

Max Kohl A. G. Chemnitz, Germany.

Na	Sodium
NaCl	Sodium Chloride
NaCl	Cattle Salt
NaOH	Sodium Hydrate
Na_2CO_3	Sodium Carbonate
Na_2SO_4	Sodium Sulphate
Na_2SO_3	Sodium Sulphite
$Na_2S_2O_3$	Sodium Thiosulphate
$NaNO_3$	Sodium Nitrate
$NaNO_3$	Chili Saltpeter
$(NH_4)(NO_3)$	Ammonium Nitrate
$NaHCO_3$	Sodium Bicarbonate
$(NH_4)Cl$	Ammonium Chloride
$CaSO_4$	Powdered Plaster
$CaCO_3$	Chalk, powdered
CaC_2	Calcium Carbide
CaP	Calcium Phosphide, for making H_3P
$BaCl_2$	Barium Chloride
$Ba(OH)_2$	Barium Hydroxide
$Sr(NO_3)_2$	Strontium Nitrate
Mg	Magnesium Wire
Mg	Magnesium Tape
Mg	Magnesium Powder
$MgSO_4$	Epsom Salts
Al	Aluminium Bars
Al	Aluminium Wire
Al	Aluminium Powder
Al	Aluminium Foil
$Al_2(SO_4)_3$	Aluminium Sulphate
$Al_2K_2(SO_4)_4$	Common Alum
Fe_2O_3	Ferric Oxide
Fe	Iron Powder
$FeSO_4$	Ferrous Sulphate
FeS	Iron Sulphide
$K_3Fe(CN)_6$	Potassium Ferricyanide
$K_4Fe(CN)_6$	Potassium Ferrocyanide
MnO_2	Manganese Dioxide
$KMnO_4$	Potassium Permanganate (dark glass)
ZnO	Zinc Oxide
$ZnSO_4$	Zinc Sulphate
CrO_3	Chromium Trioxide
K_2CrO_4	Potassium Chromate
$K_2Cr_2O_7$	Potassium Bichromate
Cr_2O_3	Chromium Sesquioxide
$(H_4N)_2Cr_2O_7$	Ammonium Dichromate
Zn	Zinc
Mn	Manganese
Cr	Chromium
$CoCl_2$	Cobalt Chloride
CuO	Cupric Oxide
$CuSO_4$	Copper Sulphate (dark glass)
$CuCl_2$	Cuprie Chloride
PbO	Lead Oxide
Pb_3O_4	White Lead
$Pb(NO_3)_2$	Lead Nitrate
$(CH_3COO)_2Pb$	Lead Acetate
$AgNO_3$	Silver Nitrate (dark glass)
Ag	Silver Sheet
$HgCl_2$	Mercury Chloride (dark glass)
HgO	Mercury Oxide (dark glass)
Hg	Mercury
Cd	Cadmium
Bi	Bismuth
Sn	Tin Rods
Sn	Tinfoil
$SnCl_2$	Stannic Chloride
SnS_2	Stannic Sulphide
Pt	Platinum Sheet
Au	Gold Sheet

2. Liquid Chemicals.

NaOH	Caustic Soda
KOH	Caustic Potash
H_3N	Liquor Ammonii
HCl	Muriatic Acid, crude
HCl	Muriatic Acid, pure
HNO_3	Nitric Acid, crude
HNO_3	Nitric Acid, pure
HNO_3	Nitric Acid, fuming
H_2SO_4	Sulphuric Acid
$(CH_3)(COOH)$	Acetic Acid, dilute
H_2O_2	Hydrogen Superoxide
CS_2	Carbon Disulphide
C_2H_5OH	Alcohol, absol.
$C_5H_{11}OH$	Amyl Alcohol
$C_{16}H_{10}N_2O_2$	Indigo Solution
$(C_2H_5)_2O$	Ether (dark glass)
P in CS_2	Phosphorus dissolved in Carbon Disulphide
—	Tincture of Litmus
KJ	Potassium Iodide
K_2S	Potassium Sulphide
K_2CO_3	Potassium Carbonate
—	Soluble Glass
Na_2SO_4	Glauber Salt
Na_2CO_3	Soda
Na_2SO_3	Sodium Sulphite
KClO	Eau de Javelle
$CaCl_2$	Calcium Chloride
$Ca(OH)_2$	Calcium Hydroxide
—	Chloride of Lime Solution
$K_2Cr_2O_7$	Potassium Bichromate
$KMnO_4$	Potassium Permanganate
$Fe_2(SO_4)_3$	Ferric Sulphate
$FeCl_3$	Iron Chloride (dark glass)
$ZnSO_4$	Zinc Sulphate
$CuSO_4$	Copper Sulphate (dark glass)
$CuCl_2$	Cupric Chloride
$HgCl_2$	Mercuric Chloride (dark glass)
$Pb(NO_3)_2$	Lead Nitrate
$PtCl_4$	Platinum Chloride (dark glass)

	£	s.	d.
51,370. 105 Bottles for reagents, of 100 ccm, with wide neck for solid chemicals with burnt-in black inscription and tall stoppers, of transparent glass, £ 0. 1. 1 each	5.	13.	9
51,370. 5 idem, of brown glass, £ 0. 1. $2^1/_2$ each	0	6.	0
51,370. 31 idem of 100 ccm with narrow neck for fluids, of transparent glass, £ 0. 1. 1 each .	1.	16.	10
51,370. 5 idem of brown glass, £ 0. 1. $2^1/_2$ each	0.	6.	0
	15.	12.	7

Total Cost of Collection 5.

Supplies for General Use	25.	0.	5
Special supplies	11.	12.	5
Further supplies and apparatus	12.	6.	2
Chemicals and bottles	15.	12.	7
	64.	11.	7

If for instructions in chemistry and physics common rooms are employed, the sum diminishes for £ 25. 0. 5, so that the result is 39. 11. 2

Collection 6.

Chemical Supplies, Materials and Apparatus after the indications of **Prof. Friedr. C. G. Müller,** Brandenburg, **Supplies for pupils' exercises,** assembled by **Prof. Schaefer,** Recklinghausen.

Stands, Small Tables, Supports.

	For Realanstalten Number	£	s.	d.	For Gymnasia Number	£	s.	d.
51,104. Universal stand (Bunsen's) with accessories	2	2.	4.	0	2	2.	4.	0
51,104¹. Iron stands without accessories	2	0.	3.	4	—		—	
51,104 a. Bunsen burners for above	2	0.	7.	0	1	0.	3.	6
51,106. Heavy iron tripod	1	0.	3.	0	—		—	
51,111. Filter stand	1	0.	5.	6	—		—	
51,132. Table for setting up apparatus, adjustable from 25—30 cm	1	0.	6.	0	—		—	
51,133. — idem, adjustable from 25—40 cm	1	0.	7.	0	—		—	
51,147. Wood supports	4 sets	0.	16.	0	2 sets	0.	8.	0
51,150. Wide woodwedges	2 sets	0.	2.	0	1 set	0.	1.	0
51,220. Tripod of iron, 100 mm diam.	1	0.	1.	0	—		—	
51,222. — idem, 150 mm diam.	1	0.	1.	4	—		—	
51,224. Wire triangles	2	0	0.	2	2	0.	0.	2
51,226. Wire nets of iron	3	0.	1.	0	3	0.	1.	0
51,227. — idem, of brass	3	0.	1.	3	3	0.	1.	3
51,293. Mercury board, can be used as a tray	2	0.	14.	0	2	0.	14.	0
— Adjustable tube stands	2	0.	6.	0	2	0.	6.	0
Total		£	5.	18.	7	£	3.	18. 11

Burners and Accessories.

51,184. Bunsen burners	3	0.	3.	9	2	0.	2.	6
51,195. Universal gas burner (Teclu's)	1	0.	4.	6	1	0.	4.	6
51,195. A–E. Attachments and chimney	1	0.	8.	8	1	0.	8.	8
51,201. Gas burner with 4 burners arranged in a row	2	1.	14.	0	2	1.	14.	0
51,202. Gas burner (Dierbach's)	1	0.	10.	0	—		—	
— Combustion furnace after v. Babo, with 20 burners	1	2.	10.	0	—		—	
— Blast furnace (Fletcher's)	1	1.	0.	0	—		—	
— Gas blast lamp with lever adjustment	1	0.	16.	0	1	0.	16.	0
— Portable draught furnace for charcoal or coke	1	3.	15.	0	—		—	
Total		£	11.	1.	11	£	3.	5. 8

Hollow ware of glass, porcelain, clay etc.

	For Realanstalten Number	£	s.	d.	For Gymnasia Number	£	s.	d.
51,377. Boiling flask of glass of Jena								
100 ccm	20	0.	6.	8	10	0.	3.	4
200 „	20	0.	8.	4	5	0.	2.	1
500 „	10	0.	6.	8	2	0.	1.	4
1000 „	5	0.	5.	0	2	0.	2.	0
— Beakers of glass of Jena, with lip								
50 ccm	4	0.	1.	0	2	0.	0.	6
150 „	4	0.	1.	6	2	0.	0.	9
400 „	4	0.	2.	4	2	0.	1.	2
800 „	4	0.	2.	10	2	0.	1.	5
1500 „	4	0.	4.	0	2	0.	2.	0
— Flasks, Erlenmeyer's form, of glass of Jena								
100 ccm	10	0.	2.	6	2	0.	0.	6
300 „	10	0.	4.	2	4	0.	1.	8
600 „	10	0.	6.	0	4	0.	2.	5
1100 „	5	0.	4.	0	2	0.	1.	8
51,384. Retorts without tube, of glass of Jena, 100 ccm	5	0.	1.	8	—		—	
250 ccm	5	0.	2.	6	2	0.	1.	0
500 „	5	0.	4.	2	—		—	
— 1000 „	5	0.	5.	0	—		—	
— Retorts of refractory potash-glass, 125 ccm	3	0.	3.	0	—		—	
— Retorts with tubulure and stopper, of glass of Jena								
250 ccm	3	0.	3.	7	—		—	
500 „	2	0.	3.	6	—		—	
1000 „	1	0.	2.	3	—		—	
51,386. Receivers for retorts, without tube								
250 ccm	3	0.	1.	0	2	0.	0.	8
500 „	2	0.	1.	0	—		—	
— 1000 „	1	0.	0.	7	—		—	
51,388. Receivers for retorts, with tube and ground-in stopper								
250 ccm	1	0.	0.	7	—		—	
500 „	2	0.	1.	8	—		—	
— 1000 „	1	0.	1.	1	—		—	
51,346. Test glasses								
100 mm	50	0.	2.	1	—		—	
150 „	50	0.	2.	6	10	0.	0.	6
180 „	50	0.	3.	4	—		—	
— Test glasses of refractory glass, 160 mm	10	0.	1.	0	—		—	
51,389. Funnels of glass, different sizes, 5 to 15 cm	6	0.	1.	4	4	0.	1.	0
— Gas bottles with 2 tubes	4	0.	4.	3	—		—	
51,390. Funnel tubes (safety tubes)								
200 mm	5	0.	0.	7	—		—	
400 „	5	0.	1.	3	5	0.	1.	3
— Hot water funnel, 130 mm	1	0.	4.	0	—		—	
— Safety funnels								
300 mm	1	0.	0.	3	—		—	
400 „	2	0.	0.	6	—		—	
500 „	1	0.	0.	4	—		—	
— Woulff flasks with 3 necks, 500 ccm	3	0.	3.	0	—		—	
51,380. 1000 ccm	3	0.	4.	6	—		—	
— Flask with 2 necks and tubulature on the side, near the bottom, 500 ccm	1	0.	1.	5	—		—	
51,381. 1000 ccm	1	0.	2.	0	—		—	
2000 „	1	0.	3.	3	—		—	
51,394. Drying cylinder, 250 mm high	1	0.	1.	0	—		—	
— 400 mm high	1	0.	1.	7	—		—	
51,368b. Powder jars with flat stoppers								
150 ccm	10	0.	4.	0	—		—	
200 „	10	0.	4.	7	5	0.	2.	4
300 „	10	0.	6.	0	—		—	
500 „	10	0.	8.	0	5	0.	4.	0
1000 „	5	0.	6.	0	—		—	
— 2000 „	5	0.	9.	6	—		—	
51,369b. Bottles for liquids, with flat stoppers								
150 ccm	10	0.	3.	0	—		—	
200 „	10	0.	3.	6	—		—	
300 „	10	0.	4.	6	—		—	
500 „	10	0.	6.	4	—		—	
1000 „	5	0.	4.	9	—		—	
— 2000 „	2	0.	3.	0	—		—	
— 4000 „	1	0.	2.	7	—		—	
51,406. Bent tubing	2 kg	0.	4.	0	—		—	

Max Kohl A. G. Chemnitz, Germany.

	For Realanstalten Number	£	s.	d.	For Gymnasia Number	£	s.	d.
51,351. Crystallising dishes	10	0.	6.	0	—		—	
— Flasks with side neck, 500 ccm	2	0.	2.	0	—		—	
1000 ccm	2	0.	2.	11	—		—	
— Combustion tubes, 350 mm long, 20 mm wide	20	0.	8.	0	10	0.	4.	0
— idem, shut at one end	10	0.	5.	0	5	0.	2.	6
51,364. Hessian crucibles, 8 cm high	3	0.	0.	3	—		—	
— Graphite crucible, 95 × 55 mm	2	0.	1.	0	—		—	
51,413. Burettes with pinch cock, 50 ccm.	1	0.	2.	6	—		—	
100 ccm	1	0.	4.	6	—		—	
51,415. Floaters for above, each £0. 0. 8	2	0.	1.	4	—		—	
51,414. Burettes with glass stopcock, 100 ccm	1	0.	4.	8	—		—	
51,342. Measuring glass with stopper, 250 ccm	1	0.	2.	5	—		—	
51,341. Measuring cylinder with lip, 100 ccm	1	0.	1.	3	—		—	
200 ccm	1	0.	1.	7	1	0.	1.	7
500 „	1	0.	2.	3	—		—	
1000 „	1	0.	4.	1	—		—	
51,379. Measuring flasks, with stoppers, 100, 250, 500 and 1000 ccm	4	0.	4.	2	4	0.	4.	2
51,411. Overflow pipettes, 2 of each size of 1, 5, 10, 25 and 50 ccm	10	0.	5.	0	10	0.	5.	0
51,352. Porcelain dishes, 2 each of 60, 70, 85, 100, 125 and 155 mm	12	0.	4.	0	—		—	
— idem, 260 mm	2	0.	4.	0	—		—	
Porcelain dishes, 2 each of 70, 100 and 155 mm	—		—		6	0.	2.	2
— Small porcelain dishes for combustion experiments, 42 mm of diam.	10	0.	1.	6	—		—	
51,353. Porcelain crucibles, 2 sets	16	0.	8.	8	—		—	
— idem, 30 ccm alone	—		—		3	0.	1.	1
— Glowing capsules of porcelain	5	0.	3.	0	—		—	
— Glass rods, up to 10 mm thick	0,5 kg	0.	0.	10	0,5 kg	0.	0.	10
— Sieve-plates of porcelain, 40 mm	1	0.	0.	5	—		—	
— idem, of 70 mm	1	0.	0.	8	—		—	
— Sieve-funnel of porcelain, 80 mm	1	0.	0.	7	—		—	
— idem, 125 mm	1	0.	1.	0	—		—	
51,349. Watch glasses, 2 each of 50, 65, 80 and 100 mm	8	0.	2.	6	—		—	
51,250. Watch glass clamps, 1 set	4	0.	1.	3	—		—	
— Glass bell with flat stopper 300 mm high, 120 mm diam.	1	0.	3.	7	—		—	
300 mm high, 150 mm diam.	1	0.	4.	5	—		—	
250 mm high, 100 mm diam.	1	0.	2.	10	—		—	
150 mm high, 80 mm diam.	1	0.	1.	7	—		—	
— Cylinder with foot and brim 200 mm high, 50 mm diam.	2	0.	1.	4	—		—	
300 mm high, 50 mm diam.	2	0.	1.	7	—		—	
400 mm high, 80 mm diam.	2	0.	3.	8	—		—	
250 mm high, 80 mm diam.	2	0.	2.	5	—		—	
— Cylinder with wide neck and ground-in stopper 250 mm high, 80 mm diam.	2	0.	4.	6	—		—	
300 mm high, 60 mm diam.	3	0.	5.	0	—		—	
200 mm high, 60 mm diam.	2	0.	2.	9	—		—	
130 mm high, 40 mm diam.	2	0.	1.	4	—		—	
— Glass plate, round, matt on one side 20 cm	1	0.	0.	7	—		—	
— Joining stopcocks, 3 mm outlet	2	0.	3.	0	2	0.	3.	0
— Three-way-cock, 3 mm outlet	2	0.	6.	4	2	0.	6.	4
— Three-way-piece with 2 stopcocks	1	0.	3.	0	—		—	
51,174. Brass tap with hose pieces	1	0.	2.	6	—		—	
51,168. T-piece for hose unions	1	0.	1.	0	—		—	
51,170. +-piece for hose connections	1	0.	1.	6	—		—	
51,256. Gasometer of glass, 15 litres capacity	2	4.	0.	0	1	2.	0.	0
51,253. Gasometer (Pepys'), 50 liters capacity	1	3.	0.	0	—		—	
51,282. Gas generating apparatus (Kipp's), 1000 ccm	2	1.	0.	0	—		—	
51,403. Gas washing flasks (Bunsen's), 500 ccm	3	0	3.	0	—		—	
— Separatory funnel, 50 ccm	1	0.	1.	7	—		—	
— idem, 150 ccm	1	0.	2.	1	—		—	
51,407. Spherical tubes, 2 sets	6	0.	4.	0	—		—	
51,409. U-tubes (desiccating tubes), 2 each of 80, 130 and 180 mm	6	0.	2.	2	—		—	
— idem, 210 mm	4	0.	2.	4	—		—	
— Test glasses, cups, 50 ccm	5	0.	1.	6	—		—	
— 100 ccm	5	0.	1.	9	—		—	
— Mercury trough, 300 ccm. of porcelain	1	0.	2.	0	—		—	
— Double-shelled flask (Dewar's), 200 mm long, with foot	1	0	5.	5	—		—	
51,339. Pneumatic trough	1	1.	0.	0	1	1.	0.	0
51,322. Pulverising dishes, 70, 100 and 130 mm	3	0.	3.	5	—		—	
— idem, 70 and 130 mm	—		—		2	0.	2.	4
51,320. Mortar with pestle	1	0.	15.	0	—		—	
51,355. Flat iron dish, 80 mm	1	0.	0.	4	—		—	
51,356. — 100 mm	1	0.	0.	5	—		—	
51,357. — 150 mm	1	0.	0.	7	—		—	
— Iron tubes, 50 cm long, 2 cm wide, open	2	0.	2.	6	—		—	
— Iron tube, 40 cm long, closed at one side	1	0.	7.	0	—		—	
Total		£ 28.	9.	10		£ 6.	4.	7

Various supplies and tools.

Wall board and tool cupboard with tools for general use see in the collections of fittings for the Physics and Chemistry classrooms, vol. I.								
51,309. Crucible tongs, polished	3	0.	3.	0	1	0.	1.	0
— Tweezers, of iron.	1	0.	0.	5	—		—	

	For Realanstalten Number	£	s.	d.	For Gymnasia Number	£	s.	d.
51,319. Phosphorus spoon, of iron	3	0.	1.	0	—			—
— Spoon of glass, with spatulum	3	0.	2.	6	—			—
— Horn spoon with spatulum, 150 mm long	1	0.	0.	5	—			—
— 180 mm long	1	0.	0.	6	—			—
— 220 mm long	1	0.	0.	9	—			—
— Casting ladle, 50 ccm	1	0.	0.	6	—			—
— 200 „	1	0.	0.	9	—			—
51,325. Blowpipe	1	0.	1.	0	1	0.	1.	0
51,331. Cork boring apparatus with 8 steel piercers	1	1.	0.	0	—			—
51,334. Sharpener for cork-borers	1	0.	1.	6	—			—
51,335. Cork press	1	0.	3.	6	—			—
52,547. Hydrometers, for heavy and light liquids	2	0.	4.	0	—			—
— Glazier's diamond	1	0.	4.	0	—			—
— Cracking coals	10	0.	1.	0	10	0.	1.	0
— Glass tongs	1	0.	2.	0	1	0.	2	0
— Brush for small beakers	1	0.	0.	9	—			—
— Brushes for large beakers	1	0.	1.	6	1	0.	1.	6
— Brush for test glasses	1	0.	0.	5	—			—
— Glass knife with handle	1	0.	1.	3	—			—
— Iron spatulum, 210 mm long	1	0.	0.	6	1	0.	0.	6
— Mortar-cleaner of horn, 60 mm	1	0.	0.	1	—			—
— 100 mm	1	0.	0.	3	—			—
— Capsulator, 90 mm long	1	0.	0.	5	—			—
— 120 mm long	1	0.	0.	6	—			—
— Casting mould for bars, cast iron	1	1.	5.	0	—			—
— Planed cast iron plate, 20 × 25 × 2 cm	1	0.	5.	0	—			—
— Hammer for mineralogical purposes	1	0.	2.	0	—			—
Total		£ 4.	4.	6		£ 0.	7.	0

Materials, Chemicals, Bottles and Boxes.

50,947. Steel flask (bomb) for 1000 litres oxygen	1	1.	16.	0	—			—
50,948. Oxygen charge	1000 l	0.	10.	0	—			—
50,951. Foot board for oxygen cylinders	1	0.	5.	0	—			—
50,952. Lever key for oxygen flasks	1	0.	6.	0	—			—
51,292. Mercury, chemically pure	5 kg	2.	0.	0	3 kg	1.	4.	0
51,295. Mercury box, 3 kg capacity	1	0.	6.	0	1	0.	6.	0
51,402. Filter paper, medium thick	100 sheets	0.	15.	0	100 sheets	0	13.	0
— White blotting paper for washing	1000 sheets	1.	2.	0	1000 sheets	1.	2.	0
51,401. Hardened filters, 11 cm diam.	20	0.	1.	2	—			—
— Parchment paper		0.	0.	6	—			—
— Parchment tube, 5 cm wide	2 m	0.	0.	7	—			—
— Watch springs for burning in oxygen	20	0.	2.	0	—			—
— Steel flask for 10 kg carbonic acid	1	1.	16.	0	—			—
— Charge of carbonic acid	10 kg	0.	12.	0	—			—
— Cloth bag for solid carbonic acid	1	0	3.	0	—			—
— Asbestos wool, asbestos paper	1 kg	0.	2.	0	—			—
— Glass wool	100 g	0.	3.	0	—			—
— Hollow glass pearls	100	0.	3.	0	—			—
		10.	1.	3		3.	5.	0

— **Solid Reagents for Demonstrations and Laboratory Use.** (The figures given indicate size of bottle in ccm. The Collection for Gymnasia contains only the substances marked *).

		For Colleges No.	£	s.	d.	For Grammar Schools No.	£	s.	d.
		145	18.	15.	0	30	3.	15.	0
500	H_2O_2								Hydrogen Superoxide (3%)
*500	S								Sulphur
*300	S								Flowers of Sulphur
300	H_3BO_3								Boric Acid
300	$Na_2B_4O_7$								Borax
300	C								Graphite
*300	C								Charcoal
300	C								Animal Charcoal
300	C								Burnt Black
*300	CS_2								Carbon Disulphide
50									Fluorescein
50									Phenolphtalein
50									Methyl Orange
*100	Br								Bromine
100	KBr								Potassium Bromide
*100	I								Iodine
100	I								Tincture of Iodine
100	KI								Potassium Iodide
100									Potassium Iodide Starch Paper
300	H_2SiFl_6								Fluorsilicic Acid
200	HFl								Fluoric Acid
Rubber flask									
500	SiO_2								Kieselgur
*300	P								Phosphorus, white
dark glass									
300	P								Phosphorus, red
100	As								Arsenic
100	As_2O_3								White Arsenic
100	Sb								Antimony
100	Sb_2S_3								Antimony Sulphide
100									Tartarised Antimony
300									Glycerine
300									Oxalic Acid
*300									Starch
50									Indigo
*100									Litmus
*300									Sugar
300									Paraffin Wax
500	$KMgCl_3$								Carnallite
300									Rochelle Salt
100	K								Potassium
300	KCl								Potassium Chloride
*300	KOH								Caustic Potash
300	CyK								Potassium Cyanide
300	K_2S								Potassium Sulphide
300	KCyS								Sulphocyanide of Potassium
500	KNO_3								Potassium Nitrate
300	KNO_2								Potassium Nitrite
300	K_2SO_4								Potassium Sulphate
300	$KHSO_4$								Potassium Bisulphate
500	K_2CO_3								Potassium Carbonate
*500	$KClO_3$								Potassium Chlorate
300									Potash Soap
100	K_2CrO_4								Potassium Chromate
500	$K_2Cr_2O_7$								Potassium Bichromate
*500	Na								Sodium
*500	NaCl								Sodium Chloride, pure
500	NaCl								Common Salt
300	NaOH								Sodium Hydrate
*500	Na_2CO_3								Sodium Carbonate
500	$Na_2CO_3.10H_2O$								Soda Crystals
500	$Na_2SO_4.10H_2O$								Sodium Sulphate
300	$HNaSO_3$								Sodium Bisulphite
300	$NaC_2H_3O_2$								Sodium Acetate
*500	$Na_2S_2O_3$								Sodium Thiosulphate
500	$NaNO_3$								Sodium Nitrate
300									Sodium Oleinate
300	Na_2HPO_4								Sodium Phosphate
*500	CaO								Burnt Lime
500	$(NH_4)(NO_3)$								Ammonium Nitrate
300	$NaHCO_3$								Sodium Bicarbonate
*500	$(NH_4)Cl$								Ammonium Chloride
500									Ammonium Carbonate
300									Ammonium Molybdate
300									Sodio-Ammonic Phosphate
300									Ammonium Oxalate
100	$(NH_4)_2Cr_2O_7$								Ammonium Bichromate

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300	Ca	Metallic Calcium
500	$CaSO_4$	Burnt Gypsum
500	$CaCO_3$	Chalk, powdered
500		Soda Lime (granular)
500	$CaCl_2$	Calcium Chloride (granular)
500		Chloride of Lime
500	CaC_2	Calcium Carbide
300	$BaCl_2$	Barium Chloride
300	$Ba(OH)_2$	Barium Hydroxide
300	BaO_2	Barium Superoxide
300	$Sr(OH)$	Strontium Hydrate
300	$Sr(NO_3)_2$	Strontium Nitrate
300	Mg	Magnesium
*300	Mg	Magnesium Tape
*300	Mg	Magnesium Powder
500	$MgSO_4.7H_2O$	Epsom Salts
*100	Al	Aluminium
100	Al	Aluminium Wire
100	Al	Aluminium Powder
*100	Al	Aluminium Foil
100	$Al_2(SO_4)_3$	Aluminium Sulphate
*500	$Al_2K_2(SO_4)_4.24H_2O$	Potassium Alum.
300	Fe_2O_3	Ferric oxide
*300	Fe	Iron (powdered)
500	$FeSO_4$	Ferrous Sulphate
500	FeS	Iron Sulphide
300	$K_3Fe(CN)_6$	Potassium Ferricyanide
300	$K_4Fe(CN)_6$	Potassium Ferrocyanide
300	Ni	Nickel, sheet and wire
300	$NiSO_4$	Nickel Sulphate
50	Mn	Manganese
300	$MnSO_4$	Manganous Sulphate
*300	MnO_2	Manganese Dioxide, granular.
300	Zn	Zinc (granular, pure)
300	Zn	Powdered Zinc
300	ZnO	Zinc Oxide
300	$ZnSO_4$	Zinc Sulphate
100	Cr_2O_3	Chromic Oxide
100	Cr	Chromium
100	CrO_3	Chromium Trioxide
50	Co	Cobalt Metal
50	$CoCl_2$	Cobalt Chloride
50	Co_2O_3	Cobalt Oxide
*300	Cu	Copper (granular, porous)
*300	CuO	Cupric Oxide (granular, porous)
*500	$CuSO_4$	Copper Sulphate
100		Bremen Green
100		Schweinfurt Green
300	$CuCl_2$	Cupric Chloride
300	PbO	Lead Oxide
300	PbO_2	Lead Superoxide
300	Pb_3O_4	White Lead
300	$Pb(NO_3)_2$	Lead Nitrate
300	$(CH_3COO)_2Pb$	Lead Acetate
100	Hg	Mercury
100	$HgCl_2$	Calomel
100	Hg_2Cl_2 (dark glass)	Mercuric Chloride
100	HgJ_2	Mercuric Iodide
100	HgS	Cinnabar
*100	HgO (dark glass)	Mercuric Oxide
50	Cd	Cadmium
50	$CdSO_4$	Cadmium Sulphate
50	Ag	Silver, sheet
50	$AgNO_3$ (dark glass)	Silver Nitrate
50	Bi	Bismuth
*300	Sn	Tin (rods and foil)
300	$SnCl_2$	Stannic Chloride
300		Pink Salt
300	Pt	Platinum Sheet
300	Au	Gold Sheet

	For Realanstalten Number	£	s.	d.	For Gymnasia Number	£	s.	d.
51,370. Bottles for solid chemicals, 50 ccm capacity, with wide openings, enamel labels, burnt-in black inscription and flat stopper. The inscription consists generally of the chemical formula and the designation . .	12	0.	12.	0	—		—	
51,370. 100 ccm	29	1.	11.	5	5	0.	5.	5
51,370. 300 „	68	4.	16.	4	13	0.	18.	5
51,370. 500 „	31	2.	12.	11	10	0.	17.	1
51,370. Bottles of dark glass for solid chemicals, 50 ccm capacity, with wide openings, enamel labels, burnt-in black inscriptions and flat stopper . .	1	0.	1.	1	—		—	
51,370. 100 ccm	2	0.	2.	10	1	0.	1.	5
51,370. 300 „	1	0.	1.	7	1	0.	1.	7
— Caoutchouc bottle for HFl, 200 ccm .	1	0.	4.	0	—		—	
— **Liquid Chemicals** .	49	7.	10.	0	12	0.	18.	0

500	NaOH (rubber stopper)	Caustic Soda
500	NaOH	Sodium Hydroxide, normal
500	KOH (rubber stopper)	Caustic Potash
*500	H_3N	Liquor Ammonii
*500	HCl	Muriatic Acid, crude
*500	HCl	Muriatic Acid, pure
500	HCl	Muriatic Acid, normal
*500	HNO_3	Nitric Acid, crude
*500	HNO_3	Nitric Acid, pure
500	HNO_3	Nitric Acid, fuming
500	H_2SO_4	Sulphuric Acid, pure
500	H_2SO_4	Sulphuric Acid, dilute
500	$H_2SO_4.SO_3$	Sulphuric Acid, fuming
500	$(CH_3)(COOH)$	Acetic Acid
500	H_2O_2	Hydrogen Superoxide (3%)
500	CS_2	Carbon Disulphide
*500	C_2H_5OH	Alcohol
300	$C_5H_{11}OH$	Amyl Alcohol
*300	$C_{16}H_{10}N_2O_2$	Indigo Solution
*500	$(C_2H_5)_2O$	Ether
*500		Litmus Solution
300	KI	Potassium Iodide
100	KCyS	Potassium Sulphocyanide
300	$(NH_4)_2S$	Ammonium Sulphide
300	K_2CO_3	Potassium Carbonate
300	Na_2SO_4	Glauber Salts
500	Na_2CO_3	Soda
300	Na_2SO_3	Sodium Sulphite
300		Water Glass
300	CH_3COONa	Sodium Acetate
300	KClO	Eau de Javelle
300	NH_4Cl	Ammonium Chloride
300	$CaCl_2$	Calcium Chloride
300		Ammonium Molybdate
300	$K_2Cr_2O_7$	Potassium Bichromate
300	$KMnO_4$	Potassium Permanganate
300	$FeCl_3$	Ferric Chloride
300	$ZnSO_4$	Zinc Sulphate
*300	$CuSO_4$	Copper Sulphate
300	$HgCl_2$	Mercuric Chloride
300	$Hg_2(NO_3)_2$	Mercurous Nitrate
300	$Pb(NO_3)_2$	Lead Nitrate
100	$PtCl_4$	Platinous Chloride
100	NO_3Ag (dark glass)	Silver Nitrate
300		Tannic Acid
100	$CdSO_4$	Cadmium Sulphate
*500		Benzine (petrol)
*500		Petroleum
500		Soap Solution

51,370. Bottles for liquids, 100 ccm capacity, with narrow neck, enamel label, burnt-in black inscription and flat stopper	3	0.	3.	3	—		—	
51,370. — 300 ccm . . .	22	1.	11.	2	2	0.	2.	10
51,370. — 500 „	21	1.	15.	10	10	0.	17.	1
— 500 „ with rubber stopper . . .	2	0.	3.	5	—		—	

	For Realsantalten Number	£ s. d.	For Gymnasia Number	£ s. d.
51,370. — 2000 ccm, store bottles for hydrochloric acid, crude, normal, pure and sulphuric acid	4	0. 12. 0	—	—
51,370. — 5000 ccm, for aqua destillata . . .	1	0. 6. 0	—	—
51,370. Bottles of dark glass for liquid chemicals, 100 ccm capacity, with narrow neck, enamel label, burnt-in black inscription and flat stopper	1	0. 1. 3	—	—
51,370. Store bottle with wide opening, glass stopper, 1000 ccm capacity, for burnt lime	1	0. 2. 1	—	—
— Store bottle with wide opening and cork stopper, 2000 ccm capacity, for NaCl — sodium chloride . . .	1	0. 3. 3	—	—
— Store bottle with narrow neck, with cork stopper, 2000 ccm for lime water . . .	1	0. 3. 0	—	—
— Boxes of sheet metal, 1000 ccm, with label, for cuttings of sheet-zinc, pieces of marble, cement, clay, sand	6	0. 9. 0	—	—

Collection of Organic Chemicals.

— **Solid Chemicals** .	32	4. 5. 0	
300 Oxalic Acid		300 Collodion Wool	
300 Tartaric Acid		50 Fuchsine	
300 Citric Acid		300 Naphtaline	
300 $HgCy_2$		300 Anthracene	
300 Urea		50 Alizarine	
300 Hydroquinone		300 Paraffin Wax	
100 Picric Acid		300 Camphor	
100 Pyrogallic Acid		300 Common Rosin	
300 Benzoic Acid		300 Wax	
100 Salicylic Acid		300 Shellac	
500 Grape Sugar		300 Tallow	
500 Crude Sugar		300 Cocoanut Oil	
300 Honey		300 Glue	
300 Lactose		50 Morphia	
500 Starch		50 Quinine	
300 Gun-cotton		50 Cafein	
51,370. Bottles for solid chemicals of the organic collection, 50 ccm capacity, with wide openings, enamel label, burnt-in black inscription and flat stopper	5	0. 5. 0	— —
51,370. — 100 ccm . . .	3	0. 3. 3	— —
57,310. — 300 „ . . .	21	1. 9. 9	— —
51,370. — 500 „ . . .	3	0. 5. 1	— —
— **Liquid Chemicals** .	27	3. 0. 0	— —
300 $CHCl_3$ Chloroform		300 Benzene	
300 CH_3OH Methyl Alcohol		300 Toluene	
300 CH_2O Formaldehyde		300 Nitrobenzene	
100 CHOOH Formic Acid		300 Aniline	
500 C_2H_5OH Alcohol		200 Phenol	
100 Aldehyde		300 Creosote	
300 Acetic Acid		300 Toluidene	
500 Ether		300 Terpentine Oil	
100 Nitric Ether		300 Bone-oil	
100 Acetic Ether		300 Olive Oil	
300 Amyl Alcohol		300 Linseed Oil	
100 Amyl Acetate		50 Clove Oil	
100 Lactose		50 Oil of Citron	
500 Glycerine			

	For Realanstalten Number	£ s. d.	For Gymnasia Number	£ s. d.
51,370. Bottles for liquid chemicals of the organic collection, with inscription, 50 ccm .	2	0. 2. 0	—	—
51,370. — 100 ccm . . .	6	0. 6. 6	—	—
51,370. — 300 „ . . .	16	1. 3. 6	—	—
51,370. — 500 „ . . .	3	0. 5. 2	—	—
Total . . .		£ 63. 3. 11		£ 11. 1. 10

Tubing, Wires, Terminals, Stoppers.

51,154. Flexible leads, 2,5 sq. mm, 60 cm long	2	0. 2. 6	—	—
51,155. — 90 cm long .	2	0. 3. 0	—	—
51,157. — 150 cm long .	2	0. 4. 4	—	—
51,163. Rubber tubing No. 2/0	2 m	0. 0. 6	—	—
„ „ No. 1/0	2 m	0. 0. 8	—	—
„ No. 3	2 m	0. 2. 4	2 m	0. 2. 4
„ „ No. 6	2 m	0. 3. 4	—	—
51,165. Rubber tubing, gray, for connecting up gas burners . .	6 m	0. 6. 0	3 m	0. 3. 0
51,336. Rubber stoppers, 2 each of 16, 18, 20, 23, 25, 28, and 30 mm without holes . . .	14	0. 4. 9	14	0. 4. 9
51,336. Rubber stoppers, with holes, 16, 18, 20, 23, 25, 28 and 30 mm	14	0. 5. 4	14	0. 5. 4
60,172. Foot or stand clamps (Holtz's) . .	3	0. 18. 0	—	—
61,093. Terminals for connecting two wires .	3	0. 1. 0	—	—
61,098. Terminals for strips and wires . .	5	0. 2. 11	—	—
— Pinch cocks . . .	3	0. 0. 11	—	—
Total . . .		£ 2. 15. 7		£ 0. 15. 5

Apparatus for General Use.

51,233. Water bath with constant level . . .	1	0. 18. 0	—	—
— * Asbestos air-baths after Junghahn . .	4	0. 10. 0	—	—
— Drying closet of copper, 25 × 15 × 15 cm	1	1. 10. 0	—	—
51,397. Desiccator (Fresenius')	1	0. 4. 0	—	—
51,398. — (Scheibler's), with porcelain inset	2	0. 10. 0	—	—
51,537. Analytical balance without iron or steel parts, with aluminium beam, rider slide, glass case agate planes, to carry 200 grams, sensitivity 0,2 mg . . .	1	8. 10. 0	—	—
51,581. Hydrostatic balance, to carry 1 kg	1	3. 10. 0	—	—
51,625. Analytical weights, 1 mg to 200 g . . .	1 set	1. 17. 0	—	—
51,637. Rider weights .	1 set	0. 5. 6	—	—
51,651. Precision weights, 10 mg to 1000 g . .	1 set	0. 17. 0	—	—
54,097. School spectrum apparatus	1	4. 10. 0	—	—
54,129. Glass tubes with platinum lugs . . .	12	0. 6. 0	—	—
54,130. Stands for holding the glass tubes . .	2	0. 8. 0	—	—
54,214. 10 Reagents for spectrum experiments	10	0. 15. 0	—	—

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	For Realsantalten Number	£ s. d.	For Gymnasia Number	£ s. d.
54,400. Microscope with optical outfit for 60 to 1400 diameters, joint for tilting coarse and fine tube focussing, illuminating apparatus with iris diaphragm, with triple revolving nose-piece	1	15. 0. 0	—	—
54,850. Demonstration thermometer	1	0. 6. 0	—	—
54,859. Cylindrical thermometer for —20 to + 360° C.	1	0. 3. 0	—	—
— Cooler, Liebig's, 300 mm long	1	0. 1. 11	—	—
— 500 „ „	1	0. 2. 5	1	0. 2. 5
— Crucible of nickel, with covering, 25 ccm	1	0. 2. 6	1	0. 2. 6
— Crucible of quartz glass, transparent, with covering, 25 ccm	1	0. 5. 0	—	—
— Crucible of platinum, with covering, 12 ccm capacity, 12 g weighing	1	4. 10. 0	—	—
— Platinum wire, 0,35 mm, piece of 300 mm	1	0. 5. 6	1	0. 5. 6
— — 0,25 mm, piece of 300 mm	1	0. 3. 0	1	0. 3. 0
— Sheet-platinum, 40 × 40 × 0,03 mm	1	0. 8. 0	—	—
— Spongy platinum		0. 2. 0	—	—
— Platinum asbestos	10 g	0. 12. 0	—	—
Total		£ 46. 11. 10		£ 0. 13. 5

Apparatus and Supplies for definite experiments.

62,183. Voltameter	1	1. 0. 0	—	—
62,220. Hofmann's apparatus, one with platinum electrodes, another with carbon electrodes	2	2. 6. 0	—	—
— Apparatus for analyzing gases (M. T., Fig. 241) with phosphorus pipette, 2 simple gas pipettes, 1 combined gas pipette	1	3. 15. 0	—	—
— Apparatus for demonstrating the increase of weight of a burning candle	1	0. 3. 0	—	—
— Igniting tubes (M. T., Fig. 250)	2	0. 4. 0	2	0. 4. 0
— School apparatus for generating electrolytically hydrogen or oxygen (Ztschr. f. d. phys. u. chem. U. 23, 1910, p. 284)	1	0. 18. 0	1	0. 18. 0
— Apparatus for the electrolytical disengagement of chlorine (M. T., Fig. 248)	1	0. 12. 0	1	0. 12. 0
— Mercury gas-measuring bell (Ztschr. f. d. phys. u. chem. U., 23, 1910, p. 287)	1	1. 12. 0	—	—
51,246. Calibrated gas bells, 500 ccm	2	0. 16. 0		
Total		£ 11. 6. 0		£ 1. 14. 0

Supplies for Pupils' exercises in chemistry

after Prof. Schaefer, Recklinghausen (for 8 work places).

	Number per place	£ s. d.
— Iron support	1	0. 1. 10
— Iron support rings	3	0. 2. 3
— Clamp with double socket	1	0. 2. 8
— Retort holder with double socket	1	0. 3. 3
— Three-sided file	1	0. 0. 11

	Number per place	£ s. d.
51,163. Rubber tubing, 5 mm aperture	1 m	0. 1. 2
— Pinch cock	1	0. 0. 3
51,165. Rubber tubing for connecting gas burners	1 m	0. 1. 0
51,186. Bunsen burner	1	0. 2. 6
51,192. Slit annex	1	0. 0. 9
51,220. Tripod, iron, 100 mm diam.	1	0. 1. 0
51,226. Wire net of iron	2	0. 0. 8
51,227. Wire net of brass	1	0. 0. 5
51,308. Iron crucible tongs	1	0. 0. 10
— Test glass holder, sheet brass with slider	1	0. 0. 4
— Horn spatulum, 12 cm	1	0. 0. 4
— Iron spatulum, 18 cm	1	0. 0. 4
— Clay triangles, 40 × 60 mm sides	2	0. 0. 5
51,322. Pulverising dish, 100 mm diam.	1	0. 1. 1
51,325. Blowpipe	1	0. 1. 0
51,341. Measuring glass, 100 ccm	1	0. 1. 3
51,345. Beakers, 1 set	8	0. 1. 9
51,346. General test glasses, 150 × 16 mm	10	0. 0. 6
— Test glasses of refractory glass	2	0. 0. 6
51,347. Test glass stand for 12 glasses	1	0. 1. 6
51,349. Watch glasses, 65 mm	3	0. 0. 9
— Clamp for same	1	0. 0. 5
— Sand bath dish, 15 cm diam.	1	0. 0. 7
51,352. Porcelain dishes, 60, 70 and 85 mm	3	0. 0. 8
51,353. Porcelain crucibles, 65 ccm capacity	1	0. 0. 6
51,368. Powder jars, 300 ccm	1	0. 2. 0
51,369. Bottles for liquids, 300 ccm	2	0. 0. 9
51,370. Bottles for chemicals, 150 ccm, with inscription 1. HCl conc., 2. HCl dil., 3. H_2SO_4, conc., 4. H_2SO_4 dil., 5. HNO_3, 6. Na_2CO_3, 7. $(NH_4)_2S$, 8. KOH, 9. Na_2HPO_4, 10. $(NH_4)OH$, 11. $BaCl_2$, 12. $FeCl_2$.	12	0. 14. 6
51,376. Boiling flasks, 1 each of 100, 250, 500 ccm	3	0. 0. 8
51,382. Retorts without tubes, 100, 250, 500 ccm	3	0. 1. 0
51,383. Retorts with tubes, 100, 250 ccm	2	0. 1. 1
51,389. Funnels, 50 and 80 mm	2	0. 0. 4
51,391. Safety funnel	1	0. 0. 5
51,400. Spray flask, 250 ccm, with cork stopper	1	0. 0. 7
51,406. Bent tubing	¼ kg	0. 0. 6
51,410. Stirring rod, 25 cm long	1	0. 0. 3
— Litmus paper, blue and red		0. 0. 5
— Glass plates	4	0. 0. 7
— Refractory glass tube, 25 cm long	1	0. 0. 6
— U-tubes (desiccating tubes) 100 mm	2	0. 0. 6
— Brush for test glasses	1	0. 0. 6
— Filter paper	10 sheets	0. 0. 6
— Charcoal		0. 0. 4
— Stoppers of caoutchouc and cork	1 set	0. 4. 0
	1 place	£ 3. 0. 10
— Supplies for 8 places	8	24. 6. 8
51,370. Store bottles for the chemicals, 1000 ccm, with inscription	12	1. 5. 0
— Spare chemicals for pupils' exercises, the materials as above	12	0. 18. 0
Total		£ 29. 10. 6

Grand Total of Collection 6.

	For Realanstalten	For Gymnasia
Stands, Small Tables, Supports	5. 18. 7	3. 18. 11
Burners and accessories	11. 1. 11	3. 5. 8
Hollow ware of glass, porcelain, clay etc.	28. 9. 10	6. 4. 7
Divers kinds of supplies and tools	4. 4. 6	0. 7. 0
Materials, chemicals, bottles and boxes	63. 3. 11	11. 1. 10
Tubing, wiring, terminals, stoppers	2. 15. 7	0. 15. 5
Apparatus for general use	46. 11. 10	0. 13. 5
Apparatus and supplies for determinated experiments	11. 6. 0	1. 14. 0
Grand total (without supplies for pupil's' exercises)	173. 12. 2	28. 0. 10
Supplies for pupils' exercises, for 8 work places	29. 10. 6	—
Grand total with supplies for pupils' exercises	£ 203. 2. 8	—

Physical Apparatus for Projection.

☛ This collection replaces and cancels that given in Vol. I, pp. 190—192. ☚

The following pages contain a list of those pieces of physical apparatus which are used in conjunction with the projection lantern.

Further details as to these illustrations, references to literature on the subject etc. are to be found in this same catalogue under the respective list numbers.

We hold a large selection of photographs, diapositives, microscopical preparations etc. When requiring such, we should be glad if application be made for our complete list of these, stating in connection with which branch of the sciences the photographs and preparations are chiefly desired.

Projection lanterns, accessories and **auxiliary apparatus** for projection purposes (for projecting horizontal objects etc.) see vol. I of this list which will be sent on request.

Measurement of Lengths, Angles, Introduction.

	£	s.	d.
51,423. Linear vernier model, with forward vernier	1.	5.	0
51,424. — idem, with rear vernier	1.	5.	0
51,488. Circular vernier model	1.	5.	0
51,750. Divisibility of fuchsin	0.	2.	0

Mechanics.

	£	s.	d.
52,131. Foucault's pendulum experiment after Edelmann	9.	10.	0
52,138. Harmonic vibrations	2.	0.	0
52,588. Jet of water is composed of drops	1.	6.	0
52,589. Parabolic form of Water Jets	0.	16.	0
52,590. — idem, with 4 coloured discs, larger	2.	0.	0
52,617. Piezometer after Weinhold	2.	5.	0
52,660. Plateau's apparatus	1.	0.	0
52,671. Demonstrating surface tension	0.	4.	0
52,675. Dropping apparatus for surface tension	0.	6.	0
52,677. Wide tube and capillary tube	0.	4.	0
52,678. — idem, for surface tension	0.	3.	0
52,679. 2 wide tubes with capillary tubes	0.	8.	0
52,680. Wide tube with 5 capillary tubes	0.	6.	0
52,684. 5 Different capillary tubes	0.	2.	0
52,685. Capillary tubes with plane parallel glass vessel	0.	12.	0
52,686. 5 Capillary tubes with stand	0.	8.	0
52,687. Capillary tubes alone	0.	1.	0
52,689. Behaviour of wetting and non-wetting liquids in a conical tube	0.	2.	0
52,688. 5 Capillary tubes of different shapes	0.	3.	0
52,690. Set capillary tubes	0.	4.	0
52,691. Migration of a mercury drop	0.	8.	0
52,692. Capillary plates	0.	3.	0
52,693. — idem, with stand	0.	10.	0
52,694. — idem, larger, with adjustable angle	0.	16.	0

Wave Motions.

	£	s.	d.
53,150. Apparatus for Demonstrating wave motions	3.	15.	0
53,151. Lantern slide for wave motions. Each	0.	1.	6
53,153. Repulsion and Interference of wave motion	1.	4.	0
53,154. Adjustable mirror and bi-convex lens for above	2.	5.	0
53,169. Transverse wave machine	2.	8.	0
53,177. Projection wave machine	2.	0.	0
53,177a. — idem, with box for the glass discs	2.	5.	0
53,178. Wave machine after Crova	2.	0.	0

Acoustics.

	£	s.	d.
53,263. Manometric Flame Pipe, after König	1.	16.	0
53,456. 2 Tuning forks, one with small pendulum, for showing the resonance	2.	12.	0
53,519. Demonstrating the Lissajous curves	4.	4.	0
53,524. — idem, by means of vibrating springs	4.	16.	0
53,526. — idem, after Pfaundler	1.	4.	0
53,541. Tuning fork apparatus	13.	0.	0
53,542. — idem, for enabling compound parallel vibrations	15.	0.	0
53,544. Large tuning fork apparatus	18.	0.	0
53,552. 7 tuning fork curves on stand	1.	0.	0
53,577. 2 Massive tuning forks with resonator, for impact tones and Lissajous's curves	27.	10.	0

Optics.

	£	s.	d.
53,850. Tyndall's Drum	2.	0.	0
53,851. — with Mirror for total reflection	2.	10.	0
53,852. Light-refraction apparatus after Mach	3.	0.	0
53,853. Determining the refractive indices	2.	8.	0
53,854. Optical demonstration apparatus, after Stromann	8.	0.	0
53,855. Laws of refraction, reflection, total reflection	4.	0.	0
53,856. — idem, with perfect circle	4.	12.	0
53,857. Reflection and refraction Apparatus	5.	10.	0
53,858. — idem, after Silbermann	8.	0.	0
53,859. Optical disc after Hartl	3.	18.	0
53,860. Addition for central pencils of rays	1.	6.	0
53,862. Polarisation apparatus to the optical disc	2.	8.	0
53,863. 4 Rapidly annealed glasses	0.	14.	0
53,864. Baseplate for crossed glasses	0.	4.	0
53,864a. Projection lens	0.	4.	0
53,871. Light-refraction apparatus after Kolbe	9.	10.	0
54,079. Transparent colour disc	1.	0.	0
53,746. Projection kaleidoscope	1.	10.	0
53,874. Light-refraction apparatus after Reusch	0.	16.	0
53,876. Apparatus for refraction in plane glasses	0.	6.	0
52,590. Apparatus for total reflection in a water jet (see section: Mechanics, £ 2. 0. 0).			
52,589. — idem, smaller and without support (see section: Mechanics, £ 0. 16. 0).			
53,883. Apparatus for total reflection in glass rods	1.	5.	0
53,881. 2 Glass plates for total reflection	0.	4.	0
54,070. Spectrum and Fraunhofer lines	3.	0.	0
54,071. — idem, with larger prism and larger lens	4.	0.	0
53,935. Glass prism	0.	2.	0
53,936. Plate glass prism, 30 mm side	0.	5.	0
53,988. Prism stand for above	0.	18.	0
53,940. Plate glass prism, 50 mm side	0.	12.	0
53,993. Prism stand	1.	4.	0
53,995. Crossed prisms after Newton	2.	16.	0
53,996. Double prism on stand	1.	16.	0
54,000. Polyprism of five kinds of glass	2.	10.	0
54,004. Carbon disulphide prism	0.	16.	0
54,022. Wernicke liquid prism, 20 × 20 mm aperture	2.	15.	0
54,026. — idem, 45 × 45 mm aperture	8.	0.	0
54,029. Direct-vision prism after Königberger, 25 × 25 mm aperture	1.	10.	0
54,030. — idem, 40 × 40 mm aperture	2.	10.	0
54,033. Variable angle prism	2.	2.	0
54,035. Prism apparatus with three prisms	2.	8.	0
54,063. Crystal glass cone	1.	5.	0
54,072. Apparatus with 7 mirrors	4.	0.	0
54,073. — idem, with smaller mirrors	3.	0.	0
54,074. — idem, with three mirrors	1.	10.	0

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	£	s.	d.
54,075. Laminated mirror after Oosting	2.	10.	0
52,043. Oscillating prism for the whirling table	1.	5.	0
52,044. — idem, larger	1.	10.	0
54,141. Collimator tube and micrometer gap for demonstrating the spectrum	1.	4.	0
54,144. Revolving device for arc lamps	1.	0.	0
50,922. 6 Cored carbons filled with salts	0.	9.	0
54,176. 6 Small flasks with absorbent liquids	0.	10.	0
54,177. — idem, 9 liquids	0.	15.	0
54,178. — idem, 12 liquids	1.	0.	0
54,180. Absorption box, 55 × 35 × 10 mm	0.	3.	0
54,186. Hollow crystal glass cubes, 50 mm	0.	3.	0
54,190. Double absorption box	0.	12.	0
54,191. Absorption vessel, wedge-shaped	0	12.	0
54,194. Absorption vessel for gases	1.	10.	0
54,195. — idem, for filling with gases	0.	8.	0
54,196. Stand for holding absorption boxes, troughs, preparations	1.	0.	0
54,197. 3 Gelatine plates for absorption experiments	0	2.	0
54,198. 3 Coloured glass plates	0.	3.	0
54,199. Coloured plate	0.	13.	0
54,200. — idem, simpler	0.	6.	0
54,201. Absorption colour plate for reflected light	0.	4.	0
54,202. 5 Crystal plates with absorption phenomena	2.	10.	0
54,225. Bunsen-burner for reversing the sodium line	0.	14.	0
54,226. Stand with illuminating tube for reversing the strontium line	0.	16.	0
54,233. Solar spectrum, transparent	1.	0.	0
54,319. Apparatus for imitating the irradiation of the moon's crescent	0.	8.	0
54,320. Lantern slides after Plateau for demonstrating irradiation	0.	3.	0
54,324. Projection stroboscope	1.	0.	0
54,325. 3 Extra discs for above	0.	6.	0
54,326. Projection stroboscope with showing dancers	1.	4.	0
51,067. Cinematograph	7.	10.	0
51,068. Films for 1 metre length	0.	1.	6
54,327. Anorthoscope	1.	6.	0
54,328. Apparatus for optical fatigue and the successive colour-contrast	0.	6.	0
54,331. — idem, after Weinhold	0.	10.	0
54,332. Apparatus for successive and simultaneous colour-contrast	0.	8.	0
54,3... 2 Coloured glass plates for simultaneous contrast	0.	6.	0
54,334. Apparatus for showing the contrasted colours as coloured shadows	0.	12.	0
54,338. Projection plate for optical illusions, showing parallel lines apparently diverging	0.	6.	0
54,339. 2 Plates for above, showing parallel lines apparently bent	0.	3.	0
54,340. — idem, four right angles are showing apparently acute and obtuse in pairs	0.	3.	0
54,343. 2 Plane parallel glass vessels for objectively demonstrating the colours of pigment mixtures	0.	16.	0
54,346. 2 Colour discs for the mixing of coloured lights and the superposing of layers of transparent colours	1.	5.	0
9605. Projection chromoscope after Ives	13.	0.	0
9606. Photographs for above . . . . . each	0.	7.	0
54,350. Colour top with mixed colour effects	1.	0.	0
51,003. Small transparent projection screen	0.	10.	0
54,501. Small metal frame for soap solution for demonstrating the colours of thin plates	0.	2.	0
54,505. Newton's colour glasses, 70 mm diameter	0.	16.	0
54,506. — idem, 100 mm diameter	1.	0.	0
54,507. — idem, 120 „ „	1.	4.	0
54,508. — idem, 150 „ „	1.	12.	0
54,509. Newton's colour glasses, with stand, rotary, 70 mm diameter	1.	12.	0
54,510. — idem, 100 mm diameter	1.	18.	0
54,511. — idem, 120 „ „	2.	4.	0
54,512. — idem, 150 „ „	2.	10.	0
54,514. Interference Apparatus for Fresnel's mirror experiment, for projection apparatuses having 43 mm diameter objective	4.	0.	0
54,515. — idem, having 55 mm diam. objective	4.	0.	0
54,516. — idem, having 60 mm diam. objective	4.	0.	0
54,517. Fresnel's apparatus, size of mirrors 30 × 40 mm	2.	2.	0
54,518. — idem, size of mirrors 40 × 50 mm	2.	8.	0
54,519. — idem, size of mirrors 50 × 60 mm	3.	0.	0
54,520. Fresnel's apparatus, simple, size of mirrors 30 × 40 mm	1.	4.	0
54,521. — idem, size of mirrors 40 × 50 mm	1.	12.	0
54,522. — idem, size of mirrors 50 × 60 mm	2.	0.	0
54,523. Interference mirror on stand, with micrometer motion	7.	0.	0
54,524. — idem, without micrometer motion	4.	16.	0
54,525. Ocular micrometer after Fresnel	6.	0.	0
54,527. Interference apparatus after Grimsehl	3.	10.	0
54,529. Interference apparatus after Classen	2.	10.	0
54,536. Interference Prism (bi-prism) after Fresnel	1.	8.	0
54,537. Billet's half-lenses	2.	10.	0
54,538. Lens for observing the interference bands	0.	16.	0
54,540. Large bench for interference and diffraction experiments	27.	0.	0
54,541. Diaphragmic disc with Schwerd apertures	1.	10.	0
53,907. Cylindrical lens on stand, 60 mm diameter	1.	4.	0
53,908. — idem, 80 mm diameter	1.	10.	0
54,560. Photographed grating after Nobert	0.	18.	0
54,561. Copy of a genuine Rowland Grating	1.	4.	0
54,565. Photographed diffraction grating	0.	5.	0
54,566. Diffraction grating after Rowland. Price on application.			
— Further diffraction gratings and stands see page 549.			
54,575. Phase reversing plate, after Wood	0.	10.	0
54,576. Circular photographed grating	1.	0.	0
51,066. Projection diffraction-chromoscope, with optical bench	11.	10.	0
51,066a. — idem, without optical bench	10.	0.	0
54,584. Dust glass for colour rings	0.	4.	0
54,585. Reflecting stephanoscope after von Lommel	0.	16.	0
54,586. — idem, larger	1.	6	0
52,047. Polarisation apparatus for the whirling table	1.	10.	0
54,590. Polarisation apparatus after Weinhold	2.	8.	0
54,591. Further Set of Glass Plates, as polariser	0.	18.	0
54,592. Polarisation apparatus after Duboscq	3.	12.	0
54,593. Polarisation apparatus on stand	4.	15.	0
54,594. Demonstration polariser after Grimsehl	1.	2.	0
54,595. Demonstration analyser after Grimsehl	1.	15.	0
54,596. Plate of mirror glass with haft	0.	6.	0
54,597. Glass tube for polarisation in liquids	1.	8.	0
54,598. Auxiliary apparatus for demonstrating the calc-spar cross	2.	0.	0
54,599. Demonstration polarisation apparatus after Grimsehl	1.	10.	0
54,600. Simple polarisation apparatus with tourmaline plates	3.	0.	0
51,074. Polarisation apparatus for objective demonstration	7.	0.	0
54,601. 1 Set of preparations	3.	5.	0
54,602. Large projection-polarisation apparatus after Duboscq and von Lang	34.	0.	0
54,614. Column of glass plates	1.	16.	0
54,626. Polarisation apparatus after Mach	13.	0.	0
54,627. Wedge compensator after Babinet	5.	0.	0
54,628. Compensator after Soleil	6.	10.	0
54,634. Large Paalzow optical bench	34.	0.	0
54,635. Small Paalzow optical bench	16.	0.	0
— Auxiliary apparatus referring to polarisation and refraction, polarisation preparations, spectrum phenomena, microscopical phenomena, interference and diffraction see pages 559—561	Prices as per selection		
54,641. Glass press for showing the double refraction by pressure	1.	2.	0
54,642. Fresnel's press	2.	15.	0
54,643. Glass bending press	1.	2.	0
54,654. Rapidly annealed glasses	2.	10.	0
54,655. Crossed annealed glasses	0.	10.	0
— Preparations of gypsum, mica, calc-spar and quartz see pages 564—566	Prices as per selection		

Heat.

	£	s.	d.
54,788. Glass sphere with tube closed at top, for showing the expansion of liquids	0.	1.	8
54,789. — idem, with open tube	0.	1.	8
54,790. — idem, without filling for expansion of air	0.	1.	8
54,806. Apparatus for linear expansion of rigid bodies	2.	10.	0
54,819. Projection water dilatometer	0.	7.	0
54,827. Expansion-anomaly of water after Wais	0.	8.	0
54,832. Glass tube for circulation of water	0.	8.	0
54,837. Apparatus after Rühlmann for showing the expansion of water at constant pressure	0.	12.	0
54,854. 3 small thermometers with different liquids	0.	16.	0
54,855. Projection thermometer, divided from -40^0 to $+50^0$ C.	0.	6.	0
54,856. — idem, divided from -10^0 to $+160^0$ C.	0.	6.	0
54,857. Projection thermometer with long stem, divided from 0^0 to $+30^0$ C., graduation $^1/_{10}{}^0$	0.	12.	0
55,015. Freezing thermometer	0.	7.	0
55,036. Apparatus after Boutigny for the Leidenfrost experiment	2.	0.	0
55,090. Andrews' Press for compressing and liquefying carbonic acid	2.	4.	0
55,123. Apparatus for the critical temperature phenomena	0.	6.	0
55,123a. Protecting case for above	0.	12.	0
55,254. Sectional model of a steam cylinder	2.	6.	0
55,291. Apparatus for demonstrating thermal conduction in metal rods	0.	12.	0
55,296. Apparatus for demonstrating the different thermal conductivity of copper, lead and wood	0.	14.	0
55,301. Gypsum slab for showing the elliptical propagation of heat in crystals	0.	5.	0
55,311. Apparatus after Despretz, for showing decrease of temperature with distance.	0.	16.	0
55,342. Small flat flask for filling with carbon bisulphide and Jodine	0.	1.	9
55,345. Plane parallel vessel for alum solution	0.	12.	0
55,346. — the same, entirely of glass	0.	5.	0
55,347. Absorption of heat rays	0.	16.	0

Magnetism.

	£	s.	d.
60,072. Molecular magnet model	1.	16.	0
60,079. 2 Small magnets, 1 horseshoe and 1 bar magnet	0.	5.	0
60,082. Iron Powder, per 250 g	0.	1.	9
60,083. Sifter for above	0.	1.	6
60,089. Declination needle	0.	9.	0
60,096. Dipping circle	1.	4.	0
60,137. Magnetic pendulum, as suggested by Russner	7.	10.	0
60,138. — The same apparatus, for placing on the optical bench of projection apparatus	6.	5.	0

Static Electricity.

	£	s.	d.
60,186. Electroscope (v. Beetz's)	1.	2.	0
60,196. Aluminium electrometer (Kolbe's)	3.	0.	0
60,197—60,199. Accessories to the aluminium electrometer	0.	16.	0
60,202. Aluminium leaf electrometer (Grimsehl's)	3.	10.	0
60,203—60,205 and 60,208—60,210. Accessories	1.	18.	0
60,206. Graphite Conductor for demonstrating the potential drop in electric leads	1.	10.	0
60,207. — idem, with graduation	1.	17.	0

	£	s.	d.
— Absolute Lecture Electrometer, as suggested by Braun, for projection, see No. 60,211 to 60,215 and 60,216.			
Volts 0—1500 0—1500 3500 graduated from 100 to 100 500 to 500 100 to 100 Volts			
£ 2.18.0 2.7.0 3.2.0			
— idem.			
Volts 3500 10 000 graduated from 500 to 500 500 to 500 Volts			
£ 2.10.0 3.12.0			
60,217. Metal beaker for graduating	3.	0.	0
60,223. Pendulum electrometer (Weinhold's), for verifying Coulomb's law	4.	5.	0
60,280. Leaf electrometer	2.	8.	0
60,281. Accessories for graduating	2.	8.	0
60,283. — idem, by Faraday's method	0.	16.	0
60,324. Standard condenser for aluminium electrometer by Kolbe	0.	18.	0
60,649. Repulsion apparatus (Pucciani's)	0.	16.	0

Voltaic Electricity.

	£	s.	d.
60,682. Zinc and copper plates for electrometer (Grimsehl's) (see Voltaic Electricity)	1.	10.	0
60,703. Pile electrometer	3.	5.	0
60,704. — idem, with open piles	3.	15.	0
60,739. Small projection cell (Kolbe's).	0.	8.	0
61,293. Vertical galvanoscope	1.	13.	0
61,384. Projection moving coil galvanometer	4.	0.	0
61,562. Demonstration of hot wire instruments after Scotti	1.	10.	0
62,115. Apparatus for showing the generation of heat by the electric current	0.	10.	0
62,188. Voltameter	0.	12.	0
62,216. Apparatus for objectively demonstrating electrolytic decompositions and crystallizations	0.	14.	0
62,217. Saturn's tree inset for above	0.	4.	0
62,231. Apparatus for electric endosmose	0.	10.	0
62,237. Migration of a drop of mercury by the inequality of surface tension produced electrolytically	0.	8.	0
62,238. Capillary galvanoscope, after Weinhold	0.	12.	0
62,280. Electromagnet after Weinhold	2.	4.	0
62,365. Apparatus after Töpler, for the existence of the magnetic curves	1.	4.	0
62,370. Explaining the lines of force theory after Berghoff (horizontal projection)	4.	0.	0
62,422. Apparatus for the rotation of liquid conductors (horizontal projection)	0.	12.	0
62,483. Showing damping by induction (horizontal projection)	0.	18.	0
62,903. Demonstration apparatus for rotating field experiments	6.	0.	0
62,904. 4 Glow wires for above	1.	0.	0
62,931. Apparatus for demonstrating the flow of current in three-phase conductors	1.	10.	0
63,443. Electrothermic apparatus after Schumann	1.	12.	0

Divers Apparatus.

	£	s.	d.
55,414. Radiophone after Weinhold	0.	18.	0
55,415. — with a zinc sector disc	0.	14.	0
55,503. Rotary star chart	2.	0.	0
55,504. Universal clock	1.	8.	0
63,181. Electrometer for investigating radioactive substances	4.	0.	0
63,183. Electrometer after Curie	6.	0.	0

Max Kohl A. G. Chemnitz, Germany.

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