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Loading ivory at Zanzibar, the old Arab capital on the East African coast. The tusks are first carried on the porters' shoulders to the small boats, then transferred to the lighters which are towed alongside the ship at anchor in the roadstead

IVORY, THE PEARL OF THE FOREST

By ERNST D. MOORE

IVORY, for its grace and beauty, its use for the purposes of art and adornment in all lands for many centuries, for the intensity and persistency of the quest for it and the bloodshed and suffering attendant on its acquisition, may well be classed with gold and precious stones. It has ever been a material associated with the history, romance, art, development, and industry of the world from the earliest times of which mankind has left a record; it is a synonym for luxury and beauty in civilization and of barbaric splendor in the savage countries of the world.

The work of one of the earliest artists of whose product we have any example is scratched on a few broken bits of prehistoric ivory: pieced together they show the picture of a hairy mammoth, sketched by a human contemporary of the animal.

Solomon, so *Kings* and *Chronicles* tell us, had "a great throne of ivory," and to him came "the ships of Tarshish, bringing gold and silver, ivory, and apes and peacocks." Ezekiel pictures the craftsmanship of ancient Tyre in telling of its "benches of ivory inlaid in boxwood," and Pliny said the galleys of Tyre had benches made of ivory. The ancient Hebrews trafficked in ivory with Assyria; and in the days of Thothmes III, 14 centuries before Christ, cargoes of ivory from Abyssinia drifted down the Nile. The *Iliad* speaks of ivory studding on the trappings of horses, and the

Odyssey of the bosses of shields and the handles of keys being made of ivory, and of roofs inlaid with "the spoils of elephants." The statue of Jupiter Olympus, wrought by Phidias of ivory and beaten gold, was among the seven wonders of the world.

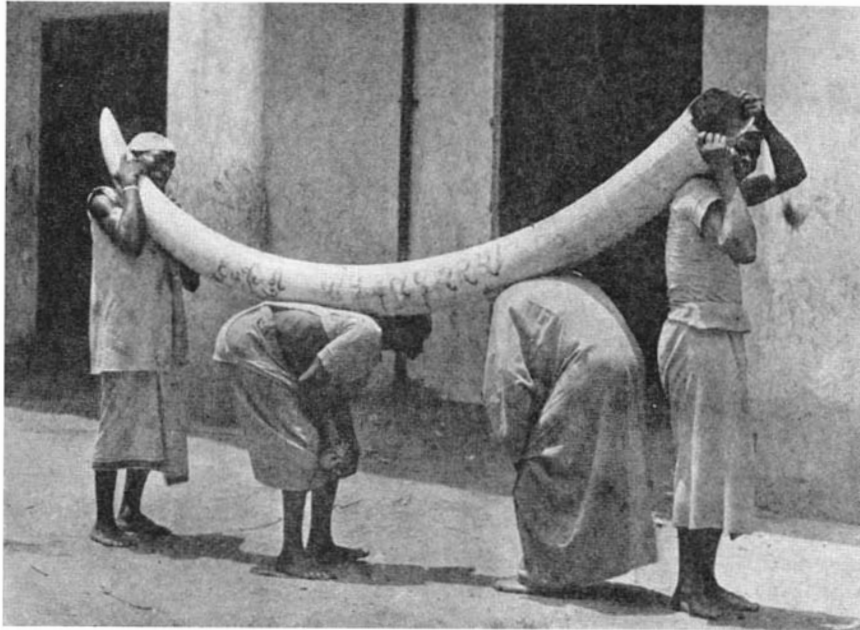
Hundreds of similar examples might be cited; it has truthfully been said that the use of ivory has been so constant and universal as to involve the world's art and history in all ages.

THE supply of ivory has had some curious fluctuations. The Romans put it to such reckless use that by the beginning of the Christian era the then-known sources of the precious material were almost completely drained, whereas only a few centuries before, according to Polybius, it was so plentiful in Ethiopia that tusks were used for stockades in the fields. After the fall of Rome and through the Middle Ages the demand subsided greatly; then as the art and culture of the Renaissance revived it, the Portuguese discovered new fountain heads of ivory tusks in their voyages along the central and southern coasts of Africa. The Portuguese in turn drew such immense quantities of ivory that by the middle of the 17th Century the available supply was almost exhausted again; but a little later the Dutch began to collect ivory in their South African settlements, and the supply rose again. Since then, with the ex-

ploration and opening up of the central portion of the continent by the Arabs, British, Belgians, and Germans particularly, ivory has fairly held its own with the demand for it.

There are various types of ivory, notably that of the elephant, its predecessor the mammoth, the hippopotamus, and the walrus, but in this article we use the word to describe the substance generally understood by the term—elephant ivory: the qualities, the quantities available, and the use of other kinds other than that supplied by the elephant have always been negligible in comparison.

The tusks of the elephant are, in the ivory trade, known as "teeth," and this designation is a correct one, for they are the upper incisors of the animal. They grow during the entire lifetime of the elephant, both outwardly, so that the solid portion protruding from the head becomes increasingly longer and thicker, and inwardly, as the part which is set in the skull, about one third the length of the average tusk, contains a pulp chamber which gradually becomes shortened and constricted as the beast ages. A nerve runs the length of the tusk, the canal of which usually is visible as a black speck at the pointed end of the tusk. It is this same nerve canal that is visible on opposite sides, in the exact center, of an ivory billiard ball. Along this nerve, abnormal growths known in the trade as "beans," and other

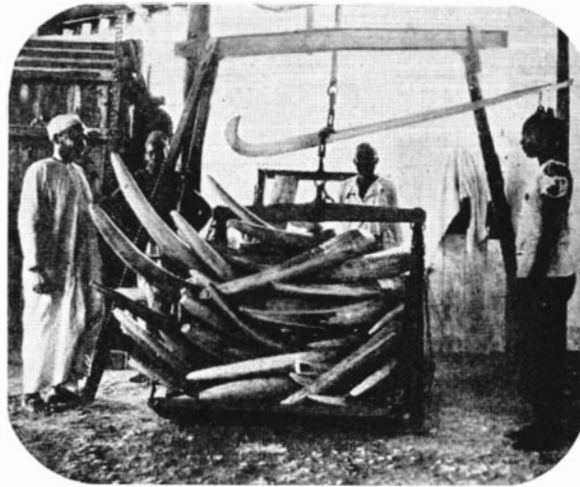


One tooth of the largest pair of elephant's tusks on record. This great tusk is now in the British Museum of Natural History at South Kensington, in London

evidences of disease which must cause the animals excruciating pain, are often found; so if we have jibed at the giraffe with a sore throat, let us pity the elephant with a toothache!

There are many varieties of elephant ivory—"descriptions," as the ivory buyers and workers know them—Asiatic ivory such as Indian and Siamese; the African kinds known by names of their geographical origin such as Abyssinian, Sudanese, Zanzibar, Uganda, Congo, Mozambique, Angolo, Egyptian, Senegal, Niger, and Ambriz; others named for the uses to which they are put, such as ball and bangle; and others with such odd names as Cutch, Gendi, scrivelloes, and so on. All ivory is divided into two great classes, "hard" and "soft." By far the greater portion of the world's ivory, from ancient times to our own, has come from Africa. The supply of African ivory has not only been many times greater than that of Asiatic ivory, but African tusks run larger and are of superior quality. There are large deposits of fossil or mammoth ivory in the tundra surrounding the mouth of the Lena River in Siberia and on the islands nearby, and though the tusks are much larger than the run of elephant ivory, they are largely defective, and of little commercial value so long as a good supply of African ivory may be had. Very little Asiatic ivory is exported from that continent; most of it is used in India for bracelets and bangles for native brides.

So ivory, as we generally know it, comes from the African elephant. Literally millions of those noble animals



Above: Weighing ivory in the compound of an American trader's establishment in Zanzibar. *Right:* An ivory poacher's caravan crossing a stream in the Belgian Congo with their stolen tusks. The ivory in both illustrations was shipped to America and there fabricated into ivory piano keys

have died at the hands of those whose only object was to seize the ivory they carried, for the elephant must be killed to secure its jewels, as the tusks poetically have been called. The elephant does not shed them; it requires hours of careful chopping in a fresh kill to free them from the bony sockets which terminate almost on a line with and between the eyes, or the carcass must be left several days until decomposition has advanced sufficiently to permit them to be

"drawn" without recourse to chopping.

Various estimates, running from 40,000 to 100,000, of the numbers of elephants killed annually for their ivory, have been made. These estimates, it should be added, were for the years from 1850 to 1900. It is the judgment of the writer, who spent several years in Africa as an ivory buyer, that around his time, from 1900 to 1915, not more than 25,000 African elephants were killed each year; probably the number has been less since then. Any figure of this kind, however, is at best a guess, for not only are complete and reliable export statistics of the *number* of tusks not available in the many ivory outlets of Africa, but no records whatever are kept of the age of the ivory—that is, whether the tusks come from long dead or freshly killed animals. From recollection alone, in Aden, Arabia, where the writer bought tons of ivory gathered as tributes and taxes by Ras Menelik of Abyssinia, very little of it showed signs of having recently been in a living head. On the other hand, in Mombasa and Zanzibar, the two greatest ivory marts on the East Coast, by far the greater proportion of large tusks—those weighing 40 pounds and over, the writer buying none smaller—undoubtedly came from freshly killed elephants, as recently dried bloodstains and tissue attested.

The largest pair of tusks of which there is any definite record weighed 228 and 232 pounds, and came from Tanganyika, then German East Africa, in 1898. Fifty years ago it was not uncommon for a lot of "prime" tusks to average 90



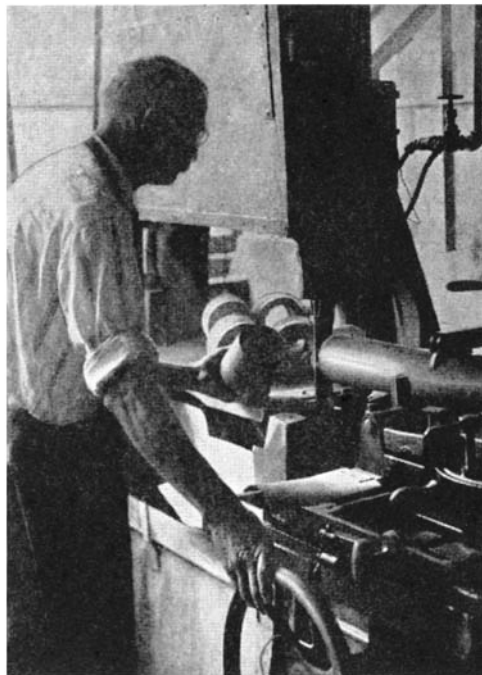
pounds in weight; 20 years ago the average ran about 70 pounds; and now an average of 55 pounds is considered good.

Not only, in the old days, were the tusks stained with the gore of the fallen elephants, but with the life-blood of countless humans besides. The story of the acquisition of ivory in the 19th Century is also that of Africa in the most

cruel aspect of all its tragic history. The slave trade and the ivory trade were one, interlocking and interdependent. Probably never in any other land or age did the natural treasure of a continent bring upon it so cruel a fate, over so immense a territory, as was Africa's in the years of the domination of the Arab ivory raiders. They pressed into the deep interior of the continent long before the first European explorers, and with their guns and powder terrorized and conquered, burned, enslaved and stole, throughout a country nearly as large as the United States east of the Mississippi, for decades.

THEY forced the natives, in every conceivable cruel manner, to deliver their accumulations of ivory, enslaved them when they could produce no more, and sold them for more ivory as human meat to the cannibal tribes about; then, since the only means of transporting the ivory was by human carriers—the tsetse fly making the use of beasts of burden impracticable—enslaved still more to carry the ivory to the coast. There the captive survivors of the slave march—it was estimated that not more than one in five slaves lived to reach the coast—were sold along with the ivory tusks they had carried. Without the ivory, so Livingstone and others were told by the Arabs, the slave trade could not pay. Livingstone proposed the placing of armed steamers on the African lakes to enforce a legitimate trade in ivory and thus kill the slave trade at its source.

Today most of the ivory comes from the Congo, the upper Sudan, Tanganyika Territory, and Portuguese Africa. The white traders and British Indians get most of it from the natives, from whom they buy it legitimately or surreptitiously, as suits the market best. In the former case the ivory tax is paid and the



Cutting into blocks across the grain; the first operation in making ivory piano keys

tusks follow the regular trade routes, whereas in the latter, they are taken across the line of an adjacent colonial sovereignty and the import duty paid, thus legitimizing the ivory. The natives find a great deal of ivory in scattered tusks and small hoards which the governments take at a fixed nominal sum and then sell to the traders.

In almost all jurisdictions the natives are allowed, within the confines of the district in which they were born and have lived a requisite number of years, to kill elephants and sell the ivory thus obtained. Sportsmen often sell their ivory to help defray their *safari* costs; government hunters often are despatched to kill troublesome or destructive elephants. Special ivory licenses are

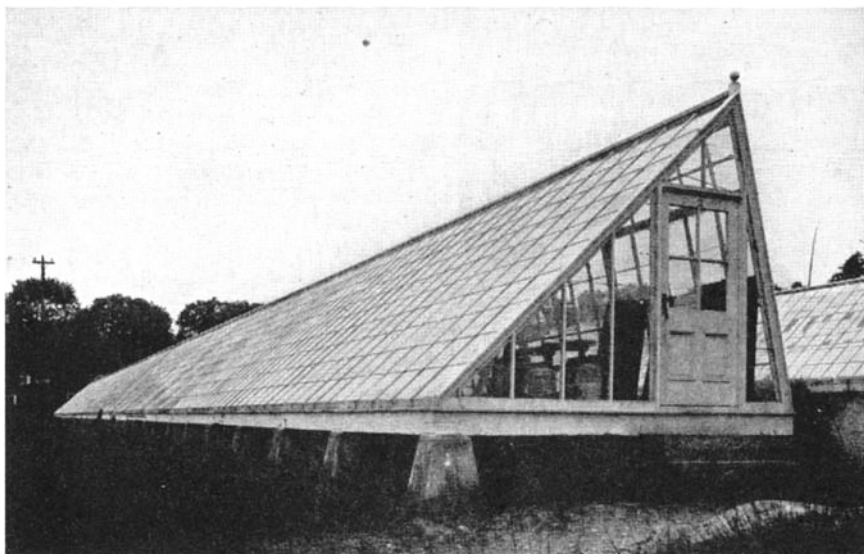
often easy to obtain if one is of the right nationality and has a little influence. A great deal of ivory is poached by elephant hunters in the Belgian Congo and Portuguese East Africa and brought over the British line, where, if necessary duty is at hand, there are no questions asked. Thus in many ways, straightforward or devious, the ivory is gathered, and started on its long journey to the working tools of the artisans of civilization.

Shipment of ivory will seem to many to be very carelessly attended to, for despite its great value and its easy susceptibility to damage, the tusks are shipped from Africa without any protective covering of any kind, the bare ivory being stencilled with the shipper's mark, number, and the port of destination. It has been found through long and costly experience that the appeal of the unprotected ivory itself is more potent in ensuring safe handling than any of the forms of cover-

ing that have been used.

One knows, of course, that ivory is used for carvings, for cutlery and other handles, for billiard balls, miniatures, and other objects; but, if we except the Indian bangle trade, more ivory is used for piano keys than for all other purposes combined. Ivory, not alone because of the exquisiteness of its contact to the human hand, is the ideal material for the piano keyboard. It is yielding to the touch, yet firm; cool, yet never cold or warm, whatever the temperature; smooth to the point of slipperiness, so that the fingers may glide from key to key instantly, yet presenting just enough friction for the slightest touch of the finger to catch and depress the key and to keep the hardest blow from sliding and losing its power.

THE largest individual users of ivory in the world are the American companies who manufacture keyboards for the piano makers of this country, Canada, and Australia. The center of the ivory industry in the United States lies in two small adjacent towns in Connecticut, on the river which gives the state its name. There is a large ivory cutting company in Buffalo, also. One of the Connecticut ivory cutters, Pratt, Read & Company, of Deep River, is among the oldest surviving manufacturers of any kind in this country, its ivory business having been established in 1806, during the term of Thomas Jefferson, on the same spot where the present factories stand. The photographs of piano key manufacturing were taken in their factories. The few American piano key companies—there are only three—influence almost to a dominating



The ivory wafers are left several weeks in glass houses to whiten in the sun. When one side is bleached the trays of ivory are inverted and the operation is repeated



Matching the ivory into sets of similar grain for piano keyboards



The board with the ivories glued thereon is separated by saws to form the individual keys

extent the price of ivory even in the remotest depths of Africa. At present the cost of a good quality of Congo ivory is about \$2.25 per pound at New York.

On arrival at the factories of the key makers, the tusks are stored in vaults, well protected from the light and any extreme changes of temperature and humidity. In the first manufacturing operation they are "junked," or cut across the tusk, to make blocks corresponding to the length of the pieces required for the piano keys. These blocks are then marked by a planner who is expert in the art of getting as many blocks of the broad pieces for the "heads" or front part of the piano key, and the "tails" which are the narrow pieces which run alongside the sharps or black keys, as is possible out of them, leaving at the same time as few wedges of scrap between the head and tail blocks as can

be managed. These pieces are then sawed out, and the resulting small oblong blocks are sliced into the ivory wafers that finally cover the piano keys. Each of the sawing operations is done under a stream of water to prevent burning the ivory; the condition of the saws is of vital importance and is watched carefully.

The ivory wafers are then bleached in jars containing peroxide of hydrogen, in the endeavor to make them as uniform in color as possible, for there are many shades and imperfections in a single tusk of ivory. After the immersion is over, the pieces are placed in glass houses which to the passerby seem to be the hot-houses of some horticulturist, and there left to whiten in the sun. From the sun bath the ivory pieces go to a department where, in the north light, they are graded according to their grain and matched into sets for the keyboards.

Meanwhile the wooden board which forms the major portion of the keyboard is being made from sugar pine from the Pacific slope or basswood from the middle West and marked, drilled, and bushed to the particular spacing or "scale" of the piano in which the completed keyboard is to be used. A frame or bed for the keyboard is also made and drilled correspondingly.

At the proper time the ivory and the board meet; a strip of white backing cloth is first glued on the board, and then on the cloth the ivory is glued

board. Gang saws spaced to the width of the keys in front and band saws for cutting the rearward portion of the keys that swing to right or left to meet the spacing of the piano strings, which is different than that of the front of the keys, are used for this work. Then the pieces which form the bases for the black keys are sent to another department to have the black tops or sharps glued on.

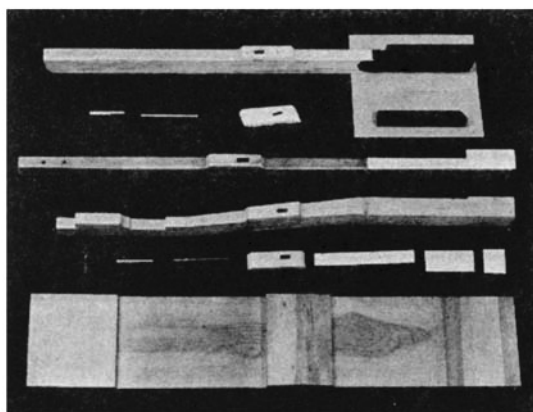
The sharps are made of various materials. They may be of ebony from Madagascar or boxwood from the West Indies, or of native birch. These pieces are stained a deep black in such a thorough manner that if you should cut one of them in two you would find that the wood was stained not merely on the surface but all the way through. This is done by forcing the stain into the wood under pressure in a chamber in which a partial vacuum has first been created. A very fine sharp is made, also, by forming a piece of black celluloid, first rendered plastic by heating, over a core of birch.

After the sharps are glued on, the black keys must find their way back to their own positions in the identical set of ivory keys from which they were parted, and they always do, though the thing appears as mystifying to the outsider as the process by which one finally gets one's own washing out of the steam-laundry's common tub.

THE final steps may be passed over quickly. The sharps and naturals are reunited, the frame is brought up, with its rows of shining pins firmly and accurately set, and on them the keys are fitted and regulated. Then with the final inspection done, the keyboards are shipped off in piano boxes, so that the piano maker who receives them can use the container again in shipping a piano. Soon all manner of human hands, from those which bear the stumbling fingers of practicing childhood to others tipped by the accomplished digits of the virtuosos, are at work on them with varying effects on our peace and happiness.

The making of piano keys is not quite as simple an affair as the foregoing may make it seem to be. Because of the never-uniform quality, texture, and susceptibility of the ivory it is in reality a tremendously difficult, tricky business, to which few set formulas apply, and one which necessarily requires constant expert, individual judgment to overcome the peculiarities of each tusk of ivory used.

If only the elephants would standardize their production, the ivory workers would be happy to do the same with theirs. Since, however, there is no way of inducing the elephant to co-operate, the skill of the workmen must be relied upon for the production of high quality articles from the pearl of the forest.



Piano keys and their components: frame, ivories, buttons, sharps, guide pins, capstans

with a light gray gelatinous adhesive made in France, and set firmly, but with extreme nicety, in a heavy press. Afterward the ivory on the board is planed, sometimes only one or two thousandths of an inch, by rapidly rotating cutters. Then the ivory is polished on buffers.

The next step is the separating of the keys, thus far all together in a single