OBSERVATIONS ON SOUND:

SHEWING THE

CAUSES OF ITS INDISTINCTNESS

IN

CHURCHES, CHAPELS, HALLS OF JUSTICE, &c.

WITH A

SYSTEM FOR THEIR CONSTRUCTION.

ALSO,

Objections to Vaults under Churches;

INCLUDING

ORIGINAL VIEWS OF THE NATURE OF CONTAGION; AND CAUSE OF THE DRY ROT, WITH A PROPOSED REMEDY.

TO WHICH ARE ADDED,

CRITICAL REMARKS ON ARCHITECTURE;

SHEWING THE

POSSIBILITY OF SAVING FROM TWENTY TO SEVENTY PER CENT. IN THE ERECTION OF EXTENSIVE OUT-BUILDINGS, STOREHOUSES, BARNS, SHEDS, &c.

BY H. MATTHEWS,

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MVSEVM
BRITAN
NICVM

TO THE

RIGHT HONOURABLE JOHN, EARL OF ELDON,

LORD HIGH CHANCELLOR OF ENGLAND;

HIS GRACE, THE MOST REV. ARCHBISHOP OF CANTERBURY;

THE OTHER RIGHT REVEREND AND RIGHT HONOURABLE

HIS MAJESTY'S COMMISSIONERS FOR BUILDING CHURCHES;

AND

THE HONOURABLE, THE JUDGES OF ENGLAND:

The following Observations

ON

THE PROPERTIES OF SOUND,

ARE MOST RESPECTFULLY ADDRESSED

BY HIS LORDSHIP'S,

HIS GRACE'S,

AND THEIR LORDSHIPS'

MOST HUMBLE, AND VERY OBEDIENT SERVANT,

HENRY MATTHEWS.

OBSERVATIONS ON SOUND,

&c.

THE author, reflecting on the nature of sound, has discovered that the kind of buildings at present used as churches, chapels, courts of justice, or other places; in which sound should be of the first consideration, are by no means adapted to convey it distinctly. The advantages that may be derived by a combination, or proper union of principles, all tending to produce a distinct comprehension of the human voice, are too numerous to be described here; and

too obvious to require it;—as the valuable time and patience of the courts of justice, need not (as at present) be unprofitably exhausted in the vain endeavour to comprehend the indistinct utterance of witnesses;—the almost impossibility of which frequently turns the stream of justice out of its proper course. The author himself once witnessed a case in point;—the evidence went to prove that a door, which HAD A LATCH, being left open, a woman could see from the road wearing apparel deposited on a chair; she went into the house and stole it. The judge in his instructions to the jury, informed them that the lifting a latch in the eye of the law was the same as breaking open a house; as though he had apprehended it to have been proved that the prisoner lifted the latch. She was, therefore, found guilty of the capital offence. Here was a fatal proof that the form of the

building did not admit the sound to reach the bench distinctly.

Improvement, in the science of sound, is of consequence as respects a still more sacred subject than even justice itself,—Divine Knowledge: this if at all important, is of all importance. There are men of eminent abilities in the sacred office, the feebleness of whose voice in churches, as at present constructed, does not allow of its being heard by more than two hundred persons: but after adoption of the author's plan, the same voice may be clearly heard by many thousands, without extra exertion by the speaker, or painful attention by the audience! It is written that "knowledge shall increase;" and the capability of conveying it to thousands being given, it should no longer be confined to hundreds. Had the place in which St. Peter preached on

the day of Pentecost, only contained fifteen or sixteen hundred persons, like most of our churches, then three thousand would not have been converted by one sermon;—at this time the scope of the human voice received enlargement by miracle, reaching even to the comprehension of foreigners. We may learn from this, that whenever the means of extending the word of knowledge shall be discovered; it is not the will of God that it should be bound to its former limits.

The author, in application of his Doctrine of Sound to the use of churches, feels himself unavoidably compelled to enter upon other topics, which, although foreign to that subject, are yet intimately connected with churches and their construction; *policy*, if he studied it, would forbid this, but integrity urges it.

It is not now intended to discuss the cause, but the properties of sound; and, first, its mode of procedure from its source. This should be carefully considered, in order properly to construct a building in a way that the voice may be heard to a considerable extent.

The mode in which sound travels through the air, has been compared to water when agitated by a stone, which forms circles that keep moving outwards; but in a current, these circles or rings proceed faster with, than against the stream. Similarly, sound proceeds in a current of air; and it can be heard, perhaps, five times as far with, as against the wind. Sound is subject to various interruptions; for instance, if the air be overcharged with humidity, it will impede its progress; and the breath, and heat, occasioned by, and ascending from,

a crowd, carry a much larger portion of sound upwards, than proceeds horizontally. It ascends with heated air, or vapour drawn forth by the sun; so that at night, when this upward current is spent, it may be heard at a much greater distance. Echo from the earth takes it upwards; and persons in a balloon, at an immense height, have distinctly heard voices, which, perhaps, were not heard on the earth, at the distance of one hundred yards. Here it may be remarked, if it were not so, perhaps the noise would be too great for endurance: inasmuch, if sound were not to meet with external interruption, it has a disposition to proceed to an almost infinite distance. It is not less in quantity at a mile from its source than at a yard;—the immense space over which it diverges, when it has proceeded far, leaves the quantity too minute in any one place for the ear to apprehend. But, could these minute divisions again be con-

verged into a focus, it would be as loud as at its source. Sound like light, all its diverging rays being held together, would proceed to an inconceivable distance without any diminution, if it met with no obstruction.

The next consideration that the author entreats attention to is Reflected Sound, or echo. If, in a perfect calm, on a plain, at a distance from a house, or hill, a person were to speak aloud, no echo would take place, except from the earth upwards; that part of the sound which would strike the ground close at the feet of the speaker, would ascend almost perpendicularly; and that at some distance, would rebound in a corresponding angle; and not being subject to the power of gravity, would continue to ascend; but if a rock, or high wall, presented a flat front towards the speaker, that portion of the sound which

struck it, would be repeated to him as if spoken by another person. If the front of the wall were to stand obliquely, it would not reflect it towards the speaker; but in the opposite angle; so that, if a person were to stand in a line with that angle, it would appear to him, as if there were two voices; for that part of the sound which proceeded in a direct line, would arive first; and that refracted from the oblique wall, having to perform a longer journey, would arrive later. This is the principle which destroys the distinctness of sound in churches, chapels, and all large edifices; the high side walls, the dome or flat ceiling, and the broad flat fronted galleries, being so close to the speaker, echo does not politely wait, like as from the distant rock, until the speaker has done; but the moment he begins, and before he has finished a word, she mocks him as with ten

thousand tongues. That part of the flat fronted gallery, which is nearest, commences the mockery first; and every inch of the more distant part of the same surface follows, one after the other, to make its report.

Soon after this, the nearest part of the ceiling begins; then the more distant parts claim to be heard; the walls next proceed with their account in the same way. Nor is this all; for the noise that each of these in all their parts, has made, is again and again repeated from the opposite sides; so that at the time the real voice is sounding the letters at the end of the word, some of these echoes are sounding those of the beginning and middle. Of course, this produces a continuation of indistinctness and discord, and a buzz or humming in the head, which, from custom, is endured without

the cause being discovered, much less removed. Besides producing these disagreeable effects; the brow, the brain, and even the placidity of the temper, are thereby disturbed. To describe this confusion more accurately, would be to write a word, and before the ink was quite dry, smudge it through, and then the ink from the first and second letters, would nearly cover all the rest from the sight; exactly so echo, in such buildings, destroys the distinctness of sound.

The voice being thus neuturalized, resembles a bell, that is struck in several places at the same time, and thereby the clear tone destroyed; for every particle of air, like a bell, being struck by sound vibrating, gives forth the tone received to the particles beyond, and these again, acting in like manner, impel forward

what they receive. But, if these particles are acted upon at the same instant, by a number of echoes, the report partakes of all, but faithfully represents none; but rather a confused embarassed and indistinct, buzzing. In this way (when confined between flat walls and high ceilings) sound is made to work its own destruction. It is obvious that these attendant effects on sound, have not received the attention due to their importance; if they had, the form and construction of places, in which it was intended the human voice should be heard to advantage, would have been differently planned or erected than they are. It is clear, also that sound does not proceed so distinctly against or across the wind, as directly before it; yet, by the general mode of ventilation, the heated air and evaporation from the audience, and their breath, carry the sound up towards the ventilating

holes in the ceiling; this forms a current which crosses the sound, and conveys up a large portion of what would otherwise have proceeded forwards to the audience; and the vacuum, occasioned by the escape of heated air, is supplied with fresh, from the windows, rushing towards the centre and beating back the sound, which would, otherwise, have reached the extremities of the building. Besides, a dangerous chill is frequently inflicted on the heated and relaxed nerves of those in its track, and that too in the back and glands of the neck.

The methods by which it is now proposed to counteract these effects, which are, as has been said, injurious to the person, as well as the influence of the human voice, are as follows. Where there is room, a circle should be preferred, or at least, a form, as nearly so as can be; this, however,

is not positively essential. The ceiling should be one entire inverted dome, or obtuse cone, with the base upwards, extending in that direction, to within about ten feet of the walls of the building. From the highest part, it should again descend to the wall, and nearly as low as the heads of the occupants of the back seats. The lowest point of the ceiling, if a circle, to be in the centre, not more than fifteen or sixteen feet from the ground, which ground, for some considerable space, should be flat, from thence each seat should rise fourteen inches, so that the highest be the one against the wall, like unto a gallery. But the author would prefer that there be no space as at present under the galleries to divide the sound, except the edifice is to be erected where sufficient ground cannot be obtained. In that case, the front of such galleries, should form an acute angle, as

no flat surface must present itself to the speaker, except the backs of the pews which cannot be prevented; these should be covered with the roughest kind of baize, not quite close to the wood. The part of the ceiling, that is now under such galleries, should be highest in front, and unlike the present plans, which frequently are lowest.

The station of the speaker should be under the lowest point of the cone, with a hollow sounding board about a foot above his head—and so constructed, as to convey a clear sound behind him. A constant breeze of air will, be made to pour forth in every direction, from holes in its sides, until it reaches the highest part of the ceiling. From thence, it cannot return; but will be drawn off with the steam of the breath by means of ventilators that will not ad-

mit cold air; but will leave the vacuum to be supplied from the sounding board only. In courts of justice and other places where the voice will have occasionally to proceed from different parts of the building, it can be made to proceed from the place where a person is speaking; and the moment he has done, to proceed from an opposite place in which another person also speaks. This air in winter can be heated to the degree required. Thus, the sound, instead of having occasion to cross the ascending evaporation, and be opposed to the current of air, which now rushes forwards to supply its place, and, which, if in the centre of towns, brings with it a confusion of external noises, that distract the attention, will flow with both wind and evaporation. Without this contrivance for ventilation, respiration will require high ceilings, and thereby give

the sound three times the space to expand and weaken itself.

In this desirable form of building, there will be no surface that can reflect an echo; and there being no way for sound to escape, or room to expand, except where it is required, the further it proceeds, the more it will be converged into a focus, in the same way in which it enters the ear-trumpet. Such a building will, in some respects, resemble the large amphitheatres of the ancients, not only in the rising seats, but also in the suspension ceiling: for in the opinion of the author, the awnings of the ancients, which were made for the purpose of keeping off the sun, answered, also, the purpose of preventing the sound from escape. This or any other thing respecting these amphitheatres did not occur to the author, until he had well considered the proportion of sound, and

had determined on his plan. He felt a mixture of vexation and pleasure; he was disturbed to find that a great part of his plan, for confining sound, and at the same time preventing echo, was in practice more than two thousand years ago; but, yet, he was pleased, notwithstanding, to perceive that he had attained a full demonstration of the correctness of his theory; and that he could now solve a mystery, that had long puzzled men of genius, and had not at all been understood or accounted for, by any one subsequent to the ancient era: viz. how was it possible that the human voice could be heard by one hundred and twenty thousand persons in these theatres; while in no modern building of any description, it can be heard distinctly by five thousand. Here, then, is full proof, that in such form of building, in which sound can be retained free from echo, the effects produced were twenty-four

times greater, than in a building, in which this particular has been lost sight of; and this accomplished, by only so much of the sound as could be detained by canvass.—The author's plan, therefore, is as superior to that of the ancients, as a speaking pipe made of a hard substance, would be to one formed of canvass. Indeed, a speaking pipe, with the addition of a gentle breeze, passing up the same way with the sound, would be a miniature representation of his plan; but without the breeze the present speaking pipe will not represent one fourth of the effect, to which the combined principle may be extended.

The foregoing arguments shall be reduced to a point; they amount to this;—first, sound is weakened in the exact proportion to the extent of space in which it is allowed to expand; if, therefore, without inconvenience to respiration, the

space can be contracted two thirds, by such contrivance alone, three thousand persons will hear as well as one thousand without it. Secondly, sound can be heard, say four times, as far in the direction of the wind, as in any other; if, therefore, the sound so condensed is all compelled to move in the direction required, twelve thousand will hear as distinctly as one thousand. But the third, and most important consideration is, *echo*, or REFLECTED sound. To confine sound without any regard to this, is only to assist in destroying it; as the following observations will prove. That proportion of sound, which flows in a direct line to the ear, is all that can, with propriety, be called good, or unmixed and pure; for that which goes in every other direction, is only reflected from the walls, or ceilings; and from coming too late to co-operate, or act in concert, will only increase the disagreeable buzz, and thereby

diminish its distinctness. In confirmation of this, on the days on which our schools assemble at St. Paul's, the preacher has been seen to move his hands only, by those who (with good ears) could not hear *the least sound of his voice.* Now it is certain, that had the same voice proceeded from a boat, on a smooth lake, in a perfect calm, there being nothing to reflect the sound, it would have been distinctly heard to an extent that would contain twenty times as many persons. Yet in this case, no one particle of the sound would take effect, except that which proceeded in a direct line; the remainder would escape upwards and be lost. In the cathedral of St. Paul's, this surplus sound is returned from the walls, &c. with a force fatal to the existence of that which proceeded in a direct line; hence it is also certain, that in churches constructed as they are now, all sound that is confined, is only rendered mischievous, instead of

useful; or, at least, nineteen parts out of twenty; for not more than one part out of the twenty, proceeds in a direct line to the ears of the audience. In the open air, *the nineteen parts are lost;* but in our present churches, &c. they are the enemies of the one good part. By the union of the following principles, namely, 1st, the *proper confinement of sound;* 2ndly, *the prevention of echo;* 3rdly, *the condensation of sound;* and, 4thly, *the power of propelling it when condensed to the place required,* without loss or confusion—the scope of the voice can be magnified several hundred times. These observations, however clear to the author, and consistent with the nature of things, would scarcely be credited, but for the positive demonstration of history, and the remains of the ancient theatres. In them a part only of these principles were brought into play, and but imperfectly; yet, it is certain, that the whole

hundred and twenty thousand must have heard distinctly, or the imperial seats would not have been on the back tier, and furthest from the speaker.

As the art of printing extends the power of letters many thousand times, so will the author's plan extend the power of oral communication many hundred times at least! This then is worthy of general consideration.

From what has been said, it will be seen that ventilation is intimately connected with the subject of sound; and that, therefore, it will lead to another, it would be desirable to avoid; but the author will be obliged, either to wink at what is both dangerous and disgusting; or, boldly give his reasons for advising a discontinuance of the practice; that is, of depositing dead bodies in churches, or chapels, at least in those that may be hereafter erected.

To support his reasons for this advice, he subjoins the following fact. In a close court, within the metropolis, a child was inoculated, and seventeen children, residents of the same place, caught the contagion ;—four of them died. A feeling of displeasure naturally arises against the person whose prejudices were the cause of this affliction ; but, who can calculate the number that may, or sometimes do, die from inhaling the evaporation which arises from putrid bodies, whose mortality was occasioned by peculiar disorders, or typhus fever?

Is it not enough that a whole house suffer from such a circumstance ; but a parish even, or a district should be subject to the same overwhelming calamity? If any of the different kinds of plague, which formerly visited this country, were to return, vaults under churches would quickly and effectually extend the dire

consequences. In proof, the prodigious quantities of exhalations which escape from putrefaction, are much greater than are generally supposed; and a considerable portion of them necessarily flows into the churches. If persons, from want of consideration, suppose that exhalation is prevented by coffins lined with lead and closely soldered, they suppose wrongly;—for a body so deposited after a time will be found to be much lighter; the deficiency in weight must, therefore, be occasioned by the escape of exhalation.

Musk, which is known to be an animal substance, is valuable; and merchants as much as they can, prevent loss of its weight by evaporation. It is, therefore, mostly placed in boxes lined with lead, similarly to coffins, and kept in cellars, not unlike vaults under churches. This article, although not subject to the rapid

decomposition which operates upon putrefaction, will nevertheless lose considerably in weight. It was musk that led the author to reflect upon the inconceivable minuteness of the particles which evaporate, and the extent to which the air is tainted in consequence.

The strong odour attached to musk shews this; and the author found that the escape of a few pounds, was sufficient to incorporate itself with, and taint every particle of air that came within a considerable distance of it during a whole year. A similar quantity from a dead body taints the air to as great an extent; although, being destitute of the strong odour it is not discovered; and yet its vitiating particles exist there. If, as from this, we have proof, that a few pounds are sufficient to taint even the largest church for twelve months; how thickly condensed

must be the particles of the corruption which escape, during the process of putrefaction, from innumerable bodies, equal beyond doubt to several hundred weight. This at all times is loathsome and sickening; but in the event of a contagion, would be dangerous and pestilential!

It may not be generally known, that in some vaults, bodies are placed without their coffins being lined with lead; and the author has discovered that musk will evaporate without lead lining, in more than double the proportion; so will the exhalations of bodies. Let it here be remarked, that near the ground, under most church-windows, iron gratings are placed, which allow the escape of corrupt exhalations. The windows over them, in summer, are partly opened to admit air to the congregation; a considerable portion of the corrupt air enters the church,

and, receiving warmth from the congregation, ascends, and escapes through the ventilators in the ceiling. The vacuum thus created must be supplied chiefly from the lower windows; and the tide of the vitiated air is kept up from the gratings to the windows, and from them to the lungs.

If the author be correct in his conceptions respecting the mode by which contagion is propagated, then there is danger in this practice; or at least it may prove so under certain circumstances. It is known that some of the most stupendous works of nature are carried on by insects or animalculæ;—coral rocks and submarine forests spring forth by their industry in the same way that the honey-comb is produced by the bee. We discover by the operations of the larger tribes, how the more minute, and to us invisible, ope-

rate;—putrefaction is, by their means, converted into a living mass, which again changes its mode of existence, and in some instances escapes in clouds in the form of flies, amid invisible exhalation, fit aliment for their continued existence. The putrid substance is thus diminished in weight, decomposed and dispersed.

Let it be further observed that the most minute insects which escape, carry with them the substance and nature of that mass from which they escape; and will, doubtless, inoculate the lungs into which they are drawn by inspiration, with the peculiar qualities of that substance, in the same way that the bee inoculates succeeding flowers, with the substance that clings to its legs, gathered from the previous one.

Various kinds of minute flies and other insects are known to be exceedingly

poisonous. For instance, the Spanish fly ; to inhale a cloud of these would produce a most frightful plague and certain death! Different kinds however produce different effects ; and are, perhaps, the causes of the various pestilential diseases which are so often known to afflict the body. Happily for the inhabitants of this part of the world, its climate is not so suitable to their propagation as others ; except nurtured by circumstances propitious to their nature ; similarly as the hot-house is to the exotics. What then can be so well calculated to hatch into vigorous life a cloud of embryo animalculæ, as the heat and breath of a crowded congregation! It has already been proved by the musk, that exhalations emanating from the wasting away of many hundred weight of putrefaction, is more than sufficient to keep the air of such churches fully charged with noxious vapour ; indeed, so offen-

sive has this been felt in some churches that it could scarcely be tolerated.

The foregoing observations will account for the difference of opinion entertained by contagionists and their opponents the non-contagionists; the opinion of each of whom may have been grounded on their own experience, notwithstanding the very different results. One man may pass a hive of bees five-hundred times, and not be stung; another shall go by but once and be almost covered and stung to madness, on account of its being the precise time of their swarming. The one may also pass a putrid body five hundred times, and receive no further inconvenience than offensive inhalation; the other may only pass once, but then it may be at the precise moment when the living myriads enveloping the corrupt mass, are receiving their new form of flies; through

the cloud of whom he may with difficulty find his way, and if only one enter his eye the poison will create intense pain! He who has passed the bees and putrid body, five hundred times harmlessly, will from experience be a non-contagionist; while he who has felt the stings of the bees and the fly in his eye, will have discovered by his experience, also, that there is something else connected with such evaporation, than mere vapour.

There is a difference of opinion between the disputants on another part of the same subject, which may, perhaps, be accounted for in a similar way. The one says, the seeds of a pestilential disorder cannot be conveyed from one place to another, as in a bale of goods or otherwise, and so lay dormant a considerable time and afterwards break forth; the other maintains that it is possible, and

that it *has* happened. We know that there are seeds of vegetables, as well as eggs of some insects, which if buried a considerable depth, will continue for ages unproductive, until they are brought forth to the sun and the elements; and that there are others will that lie dormant until introduced into a suitable climate; into artificial heat, or circumstances suitable to their nature. It has also before been remarked, that there is a particular time, at which the animalculæ change their form; and like the moth place their eggs on some substance on which they will remain until brought into a degree of heat, suitable to their future existence.

It is only at the time that the animalculæ contained in the matter of ulcer arrive at maturity to propagate their species, that infection can be communicated, either by inoculation, with such matter, or the

inhalation of the winged species, floating amid the putrid vapour, which arises from a living or dead infected subject.

The smallpox is palpably a plague; we see that the matter will produce no contagion until arrived at the generative state, discoverable by its virus, and peculiar appearance. The matter in such state being deposited upon any substance, would, even at a considerable distance of time, by contact, communicate disease. The very different facts contained in the statements of contagionists and their opponents, may, as above stated, be accounted for; the author, however, deems caution wise, even though there be innumerable chances against the communication of contagion.

The decomposition of animal substances is not all that is intended to be conveyed by

the foregoing observations: they extend to that of vegetable matter also. The author is led, therefore, to express here a few opinions on the subject of DRY ROT; and the more, because the preservation of wood is not irrelevant to the subject of building.

In the course of his own notice he has witnessed several of the different kinds of insects that exist in timber, and by which it is reduced to powder, or otherwise destroyed. Wood, in a dry state, is most propitious to the increase of some kinds of these insects; others are nurtured by humidity. Among the first is a grub, almost the size of a man's finger, and so hard as to bear the whole weight of a person without being crushed or killed. There are other kinds again enclosed in shells, and resemble cockles;—the different genera of these decrease

from the size of a walnut to the smallest grain of sand, and extend further even beyond the discovery of the human eye. These, as well as various others of the worm and grub classes, eat their way through the wood in separate tracks; and multitudes of some of the smaller tribes proceed in a compact body, so much so, at least, as to leave the separation between their cells invisibly minute. Close in front of this ravaging army the wood is comparatively solid; but, in their rear are dust and desolation; and this their work of destruction is called DRY ROT. These remarks originate in the author's own personal inspection, and not from any treatise that he has seen on the subject.

Very many kinds cannot be matured without humidity; these may be discovered, on cutting a few twigs full of sap, and placing them in a small quantity of

water for several days, until a part of the sap become incorporated with the water. A drop of this water was put on the head of a large pin; and by the solar microscope, it was found to contain more than 30,000 living creatures. No doubt the same space of putrid vapour contains as numerous an association of the winged species.

The above number, although sporting about, was counted; by an average taken in the squares formed by checquered lines on the wall, on which they were reflected, for ought we can tell, there might have been 300,000 of classes still more minute. These were only taken in the outskirts; the camp from whence they came, was no doubt thickly inhabited. Such armies, incessant in their operation, will, indeed, reduce forests, fleets, and even humanity itself to dust! It would from hence ap-

pear, that the seeds of the various kinds of animalcula must in some mysterious way be incorporated with the substance of the wood.

There are different kinds of Dry Rot; one kind is not to be discovered by any external appearance; the surface of the wood is perfectly sound, and like a thin shell, which, when broken through, is found to consist of a substance resembling snuff, and contained in the small cells above described. The other sorts are discoverable on the surface of the wood, by means of a visible mildew, white web, or some kind of fungus.

The author is not now describing the original cause of the corruption from which this excrescence arises; but that the fungus is a vegetable substance, he is satisfied; so also is the honeycomb.

The latter, however, is evidently indebted for its form to animal and not to vegetable life; and he has at times been induced to believe, that the fungus is so likewise. Be it as it may; it is certain, however, that just that stagnant state of atmosphere and degree of corruption which superinduce its production, are also propitious to the animalcula, which, he contends, reduce to dust a corrupted mass, whether it be an animal or vegetable substance.

It is difficult to conceive by what means these can effectually be destroyed; especially in a thick piece of timber. The author observes, that it may be effected to a considerable extent, by charring or burning each piece of timber in an iron case, placed over a brisk fire. By this means the aqueous qualities, which are the first cause of corruption, will be se-

parated; and, although the heat in charring may not be sufficient in the centre of the timber to destroy all the seeds of animalcula, yet their essential aliment being destroyed, they cannot necessarily exist to any considerable extent; and the author asserts, that in their absence, a rapid decomposition, that is, the Dry Rot cannot take place. In other words, the seeds of destruction having no existence in the substance, it will require foreign or external causes, and those of an extraordinary nature to produce sudden decay. Should it even come into contact with other infected wood, so as to be inoculated, yet by its being thus rendered unsuitable to the existence of the animalcula, it will not be very extensively affected by them.

Furthermore; the author would recommend that charring be performed,

more effectually than by any mode adopted that he has yet seen. The hasty burning off of bark, is not sufficient; the timber should be thoroughly baked. In many cases, it is possible to make two slabs, or thin pieces of timber, answer the purpose of one thick piece, by bolting them together. By this process charring will be more effectually performed. The operations of sawing, firing, and bolting together, may appear tedious; but, the durability that will thereby be ensured, will pay more than one thousand per cent. especially in the building of ships. Had the author influence, or arguments sufficiently powerful to induce their Lordships of the Admiralty to try and see these effects on one ship only, then he would conceive that he had lived to some purpose, because he had rendered an essential service to his country.

But to return to that part of the subject

connected with vaults under churches. The author has endeavoured to prove that the practice of burying in churches is not only disgusting, but dangerous; he cannot, however, honestly leave the subject even there; for, he is also impressed with the conviction, that it is profane, if not impious. Few persons, if any, are prepared to go with him so far; some of his remarks, he is conscious, are stronger than otherwise would have been made; but this subject, in his view, is of vast importance, and superior to all personal considerations. Whence is the custom derived,—from any part of Scripture? most certainly not; but, from those, who in this, as in every other thing, substitute their vain traditions, in order to make void the Scriptures of truth. To dwell in cells with dead men's bones, became a practice with such as were eager for a reputation for sanctity.

In the dark ages, this was considered as the ultimatum of piety; and a saint of this cast was deemed too precious to be buried out of sight! His relics must remain in the sanctuary, to excite reverence, and even adoration for his supposed works of supererogation, mortification, or abstinence! Hence, a desire of obtaining like posthumous honours increased; and, such burials became a source of great revenue to the priests, who admitted the dead bodies of none but those who could pay liberally for their being kept safe from the pains of purgatory. The light which burst forth at the Reformation, would have destroyed, it might be expected, this absurdity; but, the proud desire of being buried with the great has continued it to the present day! The practice, therefore, is derived from covetousness, and perpetuated for the gratification of pride, and not from the authority of Scripture.

It appears, therefore, that interment within churches is evidently one of those abominations which were brought into the church, by men of corrupt minds, who substituted gain for godliness!

There are Protestants who plead still for this practice; they say they feel a solemnity come over their minds, when near the remains of their parents or beloved friends, which produces in them a reverential awe, or pious feeling! Those who so plead, like the disciples of Christ, on one occasion, "know not what spirit they are of;"—to place before the EYE, or the MIND, any other object for reverence than GOD HIMSELF is IDOLATRY; and the supposed "pious feeling" is none other than a natural awe; and like the effect of the groves of the ancient idolators, or the gloomy cloisters of the monks. To be influenced by such a

spirit nurtures pride; and, those who are actuated by it, congratulate themselves upon their supposed piety and goodness of heart. Such is very different from that which is produced on the mind by the spirit of Christ; namely, humility and self-abhorrence, on account of a consciousness of a deficiency of those qualities.

The minds of the monks "being darkened through the ignorance that was within them," did not perceive that the spirit which influenced them to dwell with dead men's bones, was the same that made the poor maniac to dwell in the tombs; on receiving his right mind, he for ever left such a filthy and disgusting practice. Did those who first introduced dead bodies into the temple of God, take him to be a Molok, delighting in human flesh, that they made him such offerings?

"He is not the God of the dead, but of the living;"—he is an enemy of death and corruption, and will finally destroy both. Christ himself could find no stronger figure, by which to describe what was most hateful to him, than the inside of a sepulchre; who then but his enemies could first have converted his temple into one of them! The only indignity from which HE was to be exempt, was that of not seeing corruption! When God, by the prophet declared his anger against the high places of Bethal, the very climax of his threat was, that their altars should be defiled by dead men's bones; as though no possible indignity could surpass this!

There may, indeed, be some consistency in idolaters returning this indignity, by defiling the temple of the Lord in like manner; but Protestants can

have no fellow feeling with those who kiss the image of Baal, the "Queen of heaven," or any other, that they should revenge the cause of idolatry. The Saviour of men taught his disciples that washing hands and the like ceremonies were of no consequence; but the defilement of the temple he would not endure. Never did he display more marked indignation, than when his Father's house was defiled by money changing and merchandizing. What would he have said on bringing in of dead bodies into the temple? Would he have excused this kind of traffic, because it brought in more money than from simply selling doves, or because it augmented the revenue of the priests? If we are sure he would have condemned this practice, dare we, as Christians, approve of it?—First, to dedicate a place to God, and afterwards TURN IT INTO A CHARNEL HOUSE FOR GAIN!

Fie, fie; "let the dead bury their dead;" but, let those who preach the gospel, be rewarded in some other way, instead of receiving twenty or thirty pounds for the admission of every dead body into the vault of the sanctuary!

A few Catholic churches having received undue reverence, on account of containing the relics of some supposed wonder-working saints; in order to avoid their error, there are christians who fall into the opposite extreme, and pay no more respect to an edifice set apart for the service of God, than they do to any other building. This, however, they did not learn from St. Paul; who, such was his reverence of the temple, took a long and dangerous voyage, in order to worship in it. If a due veneration for the house of God had been a part of the ceremonial law, and about to be abrogated,

the mere selling of doves would not have received such marked displeasure.

It is not intended by the apparent severity of the foregoing remarks to give offence to the clergy of the present day, who cannot have had any thing to do with the causes of them; but it is the author's intention to expose them, and lead the way for their removal; he only professes to be a reformer as far as respects the construction of churches. Divines have been, and are, perhaps, very properly silent on this subject; their object being the "Master of assemblies," and not the places in which they are held; or, in other words, they reject exteriors for the sake of the essential principles of their religion.

Should the legislature, at any time,

look at this subject, it would, no doubt, be altered, and a suitable compensation be very properly made to the clergy. It was to the church, it appears, that the wide extension of the plague was attributed in former times; the climate itself of this country, without such assistance is not contributory to the furtherance of it. Vaults, then, may be justly deemed the hot bed, from which this exotic will spread and devastate the land.

This practice, hitherto, has stood like a strong fortress surrounded by three high walls (if the figure may be allowed) and a moat; and these are pride, covetousness, religious prejudice, and the usages of custom. If those who are determined to defend either of these walls, or the moat, make complaint of the severity with which the author's little "ram's

horn" has sounded the attack, let them look to it; for if a few blasts from larger horns, be but given louder or stronger, against this hideous hold of corruption; though it may have stood more than a thousand years, it will soon be prostrate in the dust, as prostrate as the walls of Jericho.

The stripling David having conquered a lion and a bear, was induced to attack a giant also: the author having successfully grappled with some considerable prejudices,* is at length also induced to

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* The roads throughout the kingdom were formerly of the barrel form, with sides suddenly sloped, so that every vehicle was compelled to run on the crown of the road, and consequently in the same ruts. H. Matthews (the author) was the first to attack the strong prejudice in favour of this form of roads; he pointed out, that if they were constructed nearly flat, every vehicle would take a separate track, the roads be worn equally in every part, and consequently ruts cease to exist.

attack one of a most gigantic and formidable description, having all Christendom

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This at the time was a theory only, no such road having been seen; his proposal, however, with others, being submitted to a Committee of the House of Commons, was well received; and he has lived to see his plan of comparatively flat roads, generally adopted, nearly to the total annihilation of ruts, as he predicted. The cause and credit have been ascribed to the breaking of stones: this, however excellent in itself, is *not* the *cause*. For instance:—the *Mile-End Road* was once the roundest, and consequently most rutty and worst of the roads entering into London: it is now the flattest and best;—but the stones are not broken in any other way than they have been for the last ninety years. Nor are they broken on many other roads which are equally good; and which, when round, were also bad. The credit and profit were properly awarded to the judicious person who carried the suggestions into effect.

Another prejudice the author has also conquered: it was generally contended for among coachmen, that weight placed on the roof of a coach created less draft, than when the centre of gravity was much lower; but the experiments of H. Matthews so completely succeeded in removing this prejudice, that now stage-coaches throughout the country are constructed in from nine to fourteen inches lower, whereby no doubt many lives are saved, and many mutilations prevented. If his plans were strictly followed to their full extent, such fatal occurrences, or accidents,

on its side. Whether he has made it successfully or not, must be left to the expe-

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would not happen. Coach-Makers also, nearly all of whom have made the attempt but without success, have declared it to be impossible that a two-wheeled vehicle could be constructed to ensure safety equal to a four-wheeled. This, however, H. Matthews has accomplished, and that without requiring any thing to be done at the time of danger. The mode in which safety is secured, is as follows: steps are fixed to the body instead of the shafts, and also a small scroll iron from the under part of the step, reaching to within a few inches of the ground; thus, without any visible appearance, the seat is prevented from descending more than one inch when the horse trips or falls. The horse is not only delivered from all weight at the commencement of his trip, but two-thirds of it are thrown on the hind part of the carriage, and act upon the shafts as levers, with a considerable force upwards, so as to prevent his falling. This is done by that very trip, or jerk, which in all other two-wheeled vehicles would force him downwards; and a counterpoise is created, which gives a perpendicular snatch at the only moment in which it can be serviceable; so that it is hardly possible for a horse with activity to fall. If, however, he should, the shafts are made to descend and rise again, without unseating or disturbing the occupants of the gig.

By trials upon roads of the very worst description, full

rience of the present and future day to determine.

It has been already remarked, that while almost every other thing has undergone alteration and improvement, Architecture has remained comparatively stationary. This can be accounted for; certain specimens of excellence having been selected from ancient architecture, which justly called forth admiration, were like a perpe-

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of deep holes as well as ruts, this gig was found to be much safer than a four wheeled carriage, and to be far preferable; as it rose with ease from holes that would, perhaps, have fixed the front wheels of a coach. Unskilful drivers, or horses frightened, are as likely to run the vehicle against any thing with four, as with two wheels: IT IS BY THE FALL OF THE HORSE ONLY, THAT TWO ARE RENDERED MORE UNSAFE THAN FOUR WHEELS.

All danger on this head is removed, it is repeated, by the Matthews' Patent Gig; and it, therefore, claims superiority even over four-wheeled vehicles, by its being lighter and creating less friction. It may be seen at the coach manufactory of Mr. Lambert, Jewry Street, Aldgate.

tual millstone chained about the necks of the profession. The architect who would live by his skill must restrain his genius from any thing original, and continue to copy these models. Under the tyranny of such a custom, it is surprising that architecture has reached the eminence it has ;—the profession being deprived of the privilege of other men,—the exercise of their own judgment!

To this we may ascribe the decorations of our churches, partaking more as they do of the heathen mythology, than of allusions which might have been drawn from our own religion. For instance; a triangular spire might allude to the Trinity; and seven pillars in a portico to the Creation. This latter was the practice previous to the fables of the heathen philosophers, which put the creation of the world out of remembrance. Solomon

refers to this practice; and in his time it appears to have been of ancient origin; "Wisdom," says he, "hath builded her house; she hath hewn out her SEVEN PILLARS." Here, let it be observed that seven pillars may be placed in a circular portico to appear as uniform as two, four, or six, by two different methods, both of which have occurred to the author.

Before these brief remarks on decorations or appearance are closed, the author will take leave to observe, that as a circle is the most perfect figure, so likewise it is the most beautiful; and this being universally allowed, requires no proof. It is also the strongest and cheapest form in which a church can be built; at least by certain plans not yet brought into use. It is acknowledged, however, that according to the methods now practised, circular work is far more expensive;

and this perhaps is the sole cause, that that perfect and most elegant form is so rare in this country. But lest it should be thought from the author's partiality to this form, that it is the only one applicable to his improvements on sound, he states that the square, or parallopipedon, can be made to partake of the principles of his system.

An idea of the comparative expense of erecting churches, chapels, school-rooms and other extensive buildings, may be gathered from the following remarks. A parallopipedon of the proportions in which some churches are erected, may be thus described; the length of the four walls inside admeasurement being 380 feet, 8 inches, and the whole superficial space inclosed being divided into allotments usually allowed for sittings, namely 2 feet, 4 inches, by 1 foot, 6 inches,

the number of persons it would contain without galleries would be 2056; and with a gallery of seven seats entirely surrounding the building, 3162. A building inclosed by a circular wall of the same extent, allowing the same space for each person, the number it will contain without galleries, is 3050; and with a gallery of seven seats, 4520; which is 1358 more than the oblong square, (no deduction in either case being made for aisles, which would yield a much further advantage to the circular form). In a building something larger the gain would be more than a third; for it increases with the size. There is in addition to this, a saving in the materials forming the roof, floor, ceilings, galleries, &c. of more than six and a half per cent. It arises in the following way; in the allotment to each person of two feet four inches, by one foot six inches, there is a waste of room;

for a person, when sitting, does not occupy so broad a space at the knee as at the back and shoulders. In a square building, however, no advantage can be taken of this; but in the circular building, although each person's seat, if measured at his back, be eighteen inches in length, yet towards the knee, each allotment converges; and the 4520 acute angles thus saved, amount to rather more than six and a half per cent. in the whole materials.

There are certain narrow slips of ground to be had, particularly in towns, which will answer for a building, the foundation of which is a parallelogram; but would not be sufficiently broad for a building the foundation of which is a circle. Where, however, ground can be had suitable, the circle, or a polyedronical figure approaching very near to it,

has the advantage in every possible point of view. Architects being seldom, or ever, in this country, called upon to produce designs of the kind, accounts for the foregoing remarks in its favour remaining unconceived, or at least unattended to.

Before the subject relating to saving expence is dismissed, it may not be improper to observe, that this form of building, and recommended by the author, is applicable to many purposes. One large building of such form, may be made to contain as many cubic feet as the contents of all the out-houses belonging to an extensive farm, be more convenient, and can be erected so as to yield a saving of from 20 to 70 per cent!

The author is not professionally an architect or surveyor; he is aware that his

father having been of the profession, gives him no title to obtrude himself upon the public as one; and to prevent his acting unhandsomely to those who are, he requests that he may not be called upon, *except* a professional man be employed. He must, however, in justice to himself, observe, that there are certain particulars necessary to be attended to in the completion of his plans, of which architects of the very first eminence may not be aware; and he feels confident that gentlemen of the profession will not undertake to act upon any modifications of his peculiar plans, without first calling for his aid. His expectation will be one per cent; stipulating, at the same time, that no deduction be made (on his account) from that of the architect or surveyor, whom he wishes not to supersede, but assist; if they be called upon to tread upon the author's own peculiar ground.

The author, before he concludes, will make an additional remark or two. Much, very much may be done towards the improvement of many existing churches and chapels, as respects the more distant conveyance of sound; the alterations at the same time will give an increased number of sittings, which, in many cases, will more than pay the expence of the improvement. In the course of his observations on sound, he has been led into topics that do not form part of the main object, though they connect themselves with churches, &c. He is aware that the views he has been compelled to take, are opposed to the generally received opinions on these points; and that judgements, once made, feel a strong aversion to the obtrusion of a disturber. He who is hardy enough to become one, will bring upon himself a large share of displeasure; this the author expects; and

he will be content to endure it, if he be but the means of bringing into discussion, matters so big with importance, and which he throws out, not so much with a desire to see his own views commended, as to excite deliberations where competence will not be doubted. Had his fear of criticism, or his desire to please, been stronger than his wish to be serviceable, he would have confined his observations entirely to the properties of sound, and construction of suitable edifices for their developement. And he takes leave to add, that that subject being capable of mathematical demonstration, and confirmation by historical fact, will stand preeminently above all criticism. His style may be destitute of scientific arrangement; or want the polish of elaborate description; but had his powers been equal to a classical display of the science, that, in his opinion,

would have been useless:—the application even of only a small degree of knowledge to some new and practical purpose beneficial to mankind, he considers more valuable.

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