

tioned (that is to say), when it just begins to give out a white light smoke, previously described; for the bottom surface of tanks or reservoirs, a simple covering of the said mastic, applied in a manner aforesaid, is sufficient; for the sides of such tanks or reservoirs, the face of each brick, which is intended to be inwards, and exposed to the water, is first covered with a thin coat of the said mastic cement or composition; this is done by laying the bricks side by side, on a level of ground, as if they were to form a pavement, then the fluid mastic is thinly spread over their whole surface; as soon as it begins to set, which is in a few seconds, and before it becomes hard, the blade of a large knife is passed between the bricks, cutting the mastic through, at the same time the process leaves each brick with one face covered with the said mastic cement. This done, the walls or sides of the tanks or reservoirs, are built, and each brick is set in fluid mastic, instead of calcareous mortar or cement, and for greater security, a space of about half an inch is left between the inner and outer bricks, which form the side-walls of tanks or reservoirs: this space is filled up with the fluid mastic, as the brickwork advances; this is the process usually adopted. From the above descriptions of the application of the said mastic cement or composition, it may easily be applied to various other purposes, to which cement, mastic, lead, zinc, or composition, is employed. And whereas, I do not claim as the said invention, the mode of reducing the said asphalte to powder, or the separate use of the said asphalte, or bitumen, or mineral, or other pitch, as a mastic cement or composition; but I do claim, as the said invention, the combination, by means of heat, of asphalte, meaning thereby a natural compound, consisting principally of carbonate of lime and bitumen, with a small portion of aqueous and other matter, by whatever name or names such natural compound be called or known, and bitumen, or mineral, or other pitch, into a mastic cement or composition, applicable to paving and road-making, and various purposes to which cement, mastic, lead, zinc, or composition is employed. And such invention, being to the best of my knowledge and belief entirely new, and never before used within that part of Her said Majesty's United Kingdom of Great Britain and Ireland, called England, Her said dominion of Wales, or town of Berwick-upon-Tweed; I do hereby declare this to be my specification of the same, and that I do verily believe that this my said specification doth comply in all respects, fully, and without reserve or disguise, with the proviso in the said hereinbefore in part recited letters patent contained, wherefore I hereby claim to maintain exclusive right and privilege to the said invention.—In witness whereof, &c.—[*Enrolled May 25, 1838.*]

Rep. Pat. Inv.

The Asphalte Mastic is obtained from Pyrimont, near Seyssel, and brought down the Rhone, and is a compound of a carbonate of lime and mineral pitch. After being roasted on an iron plate it falls to powder, or may be readily pounded. By roasting it loses about one-fortieth of its weight. It is composed of nearly pure carbonate of lime, with about nine or ten per cent. of bitumen.

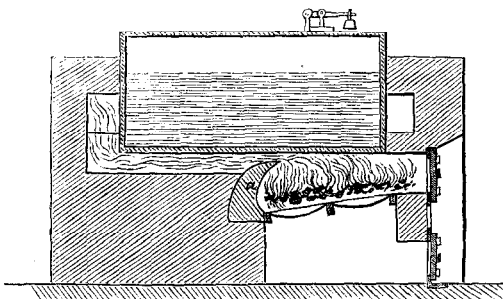
When in a state of powder it is mixed with about seven per cent. of a bitumen or mineral pitch, found near the same spot. This bitumen appears to give ductility to the mastic. The addition of only one per cent. of sulphur makes it exceedingly brittle. The powdered Asphalte is added to the bitumen when in a melting state; also a quantity of clean gravel, to give it a proper consistency for pouring it into moulds. When laid down for pavement, small stones are sifted on, and this sifting is not

observed to wear off. The mass is partially elastic, and Mr. Simms had seen a case in which a wall having fallen away, the Asphalte stretched, and did not crack. It may be considered as a species of mineral leather. The sun and rain do not appear to have any effect upon it; it answers exceedingly well for the floors of the abattoirs of the barracks, and keeps the vermin down; and is uninjured by the kicking of the horses feet. It may be laid down at from eightpence to ninepence per square foot.

Journ. Arts and Sci.

Specification of a Patent granted to JOHN HOPKINS, of the county of Middlesex, surveyor, for his invention of improvement in furnaces for steam-engine boilers and other purposes.—[Sealed 18th June, 1836.]

This invention consists merely of an improved fire bridge of a curved form, constructed in such a manner that the heat and the flames are arrested in their progress and thrown back from the end of the furnace, and in some measure caused to pass again over the surface of the burning fuel; by this means, the vapours arising from the combustion of that part of the fuel which is only partly ignited will be consumed.



The figure represents a longitudinal section taken through a furnace and steam-engine boiler, showing the position of the improved fire bridge, which is represented at *a*, and is constructed of fire brick; it will be seen that the fire bridge, instead of merely intercepting the flames, as in the ordinary construction, and causing the heat to rise upwards and act on the under surface of the boiler, by its bent form, causes the flames and heat to be driven back, and to act more effectually all along the under surface of the boiler.

The Patentee further states, that in marine and some other constructions of boilers, the fire bridge may be constructed of metal, and hollow, for the water of the boiler to pass into and become heated, instead of making it of fire brick.

It will be evident, from the foregoing description, that although the invention has been described as adapted to furnaces of steam-engine boilers only, yet it is equally applicable to the furnaces of other boilers in which bridges of the ordinary construction are used. In conclusion, the Patentee says, "Having now described the nature of my invention, and the manner of carrying the same into effect, I would have it understood that I claim, as my invention, the construction of the fire bridges of the furnaces of steam-engine and other boilers, as above described, either of fire brick, metal, or other suitable materials."—[Inrolled December, 1838.]

*An account of a recently invented Patent Spring, called "The Safety Spring," and applicable to Carriages and Carts of every description.**

By the Rev. R. J. BARLOW.

When springs were first brought into practice, they were imagined to be useful merely to give ease to the traveler, and a certain degree of security to fragile articles; reflecting persons, however, quickly discovered them to be a great means of saving the carriage and lessening the draught, which latter is clearly proved in the works of Drs. Helsham and Arnott. To save the road upon which we travel, has, since the formation of railways, become a consideration of the utmost importance, and so perfectly convinced are scientific men of the value of springs for that purpose, that the eminent engineer, Mr. Stephenson, does not permit a single wagon to be run upon the Manchester and other lines under his direction without springs, although the weight and expense thereby added to each wagon is very considerable.

Hence, it is evident, that besides the comfort and convenience of springs, their chief advantages consist in saving the horse or engine, the carriage itself, and the road upon which it travels; and consequently, the only argument against their being universally adopted by the Ordnance Department, and for farming carts, and common stage wagons, must arise from their being so expensive, so liable to break, and so ponderous when employed for heavy wagons, all which evils are in a great measure obviated by this invention, the peculiar properties of which may be thus briefly enumerated.

A greater degree of ease than those now in use;—almost perfect security against breaking, under any circumstances;—a saving of weight upon railways to the amount of three-fourths, upon the common roads to the extent of two-thirds;—much cheaper;—a direct up and down motion, which prevents the swinging and rolling of the carriage, and consequently secures it against being overturned under any extent of load;—simple, capable of being repaired by the most indifferent mechanic,—may, upon emergency, be increased in strength for bad roads and heavy luggage;—preserves the graceful appearance of the C spring so completely as to deceive the eye, and in all other cases is lighter and more elegant than those now in use.

That this spring is easier than those in general practice has been proved by comparing them with some of the best London manufacture for the space of a year, during which they were tried upon the worst description of roads; again upon the Whitby railway, where they have been in use for some months, they are found to have a much more pleasant motion than any hitherto employed. This is attributable solely to the spring being acted upon instantaneously, and completely without friction, which prevails to an enormous degree in the old springs, and renders them stiff or wooden to a great extent.

The superior security of this spring may be proved in this manner. The levers are constructed of two pieces of one-fourth inch plate iron, distant from each other, two or three inches, and connected by one or more small blocks of wood, or, as in the case of the C spring, by one solid piece, all firmly riveted together; by this means the iron receives the strain edge-ways, and, like the blade of a saw, or knife, supported in such a position, it may, with little weight, be made equal to any load.

The spring itself never exceeds eight or ten inches in length, and con-

* Communicated to the Whitby Philosophical Society by the Rev. R. J. Barlow, the patentee, of Linden Grove, near Stokesby, Yorkshire, September, 1836.

sists of several steel plates of a lozenge shape, inserted in a kind of case called a stop (from its regulating the quantity of motion and stopping it at a certain given limit.) This stop, by its tongue running through the centre, divides the plates into upper and under series, and contains, at each end, a rack or rest for every plate, which being supported at the extremities, the whole spring is pressed in the centre directly like an elliptic spring, and since every plate is supposed to be capable of bending more than it is permitted, it is not possible that the spring can ever break, because it is checked before it reaches the breaking point. Let it not, however, be imagined, that being thus checked, the motion must be unpleasant, for if the spring be proportioned to the weight, it will never collapse but with such a shock as might endanger the carriage. It should also be mentioned, that whereas all springs are found to break, or set, and lose their shape and original position if too heavily laden, this safety spring will, on the contrary, always return to the same height, when the load is taken off, be it ever so great; for, as has been shewn, it is impossible to break the spring, and when it has gone home, the strain then becomes entirely upon the levers, which are made beyond any, even the utmost calculated weight or strain.

The difference of weight between these springs and the old ones, has been accurately determined at the Whitby Railway, and is as follows:—old springs for a 3 tons carriage, 372 lb.; new springs for a 3 tons carriage, 90 lb., being, as stated above, a saving of three-fourths in weight; but it is further to be remarked, that in the old springs, double the load requires double the weight of springs; whereas in this invention, the spring alone requires increase, directly as the weight, a few pounds additional to the levers being sufficient; thus, for instance, on the Whitby line, 3 tons take springs of 90 lb., but 156 lb., is sufficient for 6 tons, the levers being increased by only 6 lb.

The saving of expense is evident from the simple nature of the invention, because all the parts can, without loss of steel, or iron, be cut in the cold state by heavy machinery, after which little hand labour is necessary: again it is to be considered that there is never more than one-third of the material employed, and that one-half of that is iron instead of steel.

The direct up and down motion will thus appear. In all cases, such as public coaches, phaetons with perches, and gigs, where the springs can be conveniently placed so as to run, not across, but along, the axle, should the weight by a jerk be thrown to one side, the lever or levers on that side will work the springs, and those on the opposite side being freed from duty, will fall at the same time, by which means the carriage is compelled to descend at both sides alike, and therefore will move directly up and down only, so far as the springs are concerned; whereas with the present springs, when the weight is thrown to one side, the opposite side of the spring being relieved from pressure, kicks up, and tends much to make the carriage swing and overturn.

The facility of increasing the strength for bad roads or heavy luggage, will be understood by supposing the stop and the racks to be so arranged, as to be capable of receiving at the top and bottom one or more plates. This will materially increase the strength, and may be performed by an ordinary servant. In the levers no change is requisite, as they are always capable of working a spring of much greater power than would suit the carriage under ordinary circumstances.

Fig. 1.

Fig. 1, exhibits the back of a phaeton hung so as to have the up and down motion, and avoid the side swing.

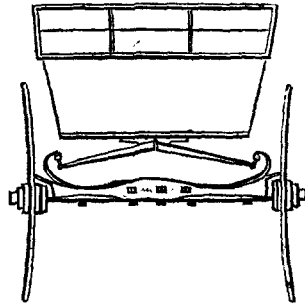


Fig. 2, represents the frame of a railway carriage, as seen with the patent springs and double guide plates of one-fourth inch plate iron, made, as shewn, of several pieces riveted together, or cut out of a single sheet. It is to be noticed, that the spring box plays within the guide plate, and thus the dirt and dust are kept from the oil, or the piece riveted on may be cut off, so as to allow the spring box to play outside, if preferred.

Fig. 2.

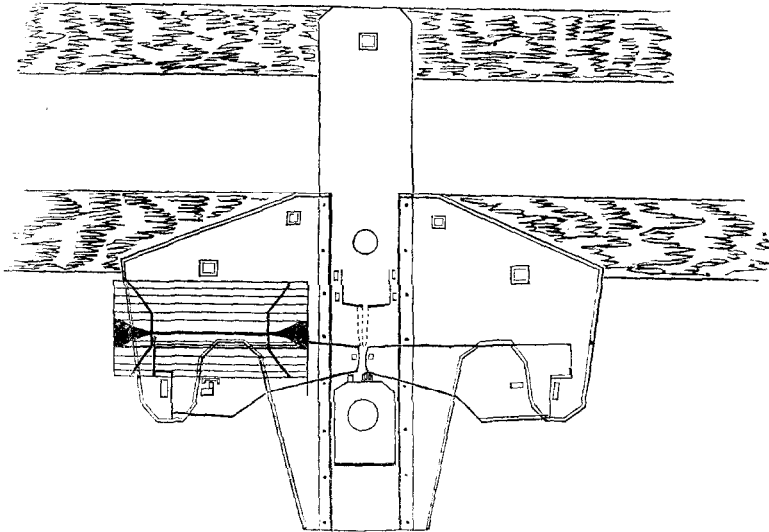


Fig. 3.

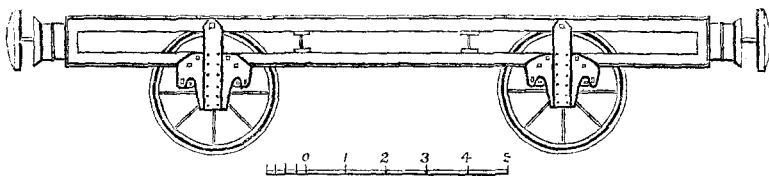


Fig. 3. exhibits, on a larger scale, the same kind of guide plate, which is expressed as if transparent, to render the inner works visible. Thus the shape of the spring box, the *position* of the syphon, the shape and action of the levers are apparent; and there is also displayed on one side a single spring of a 6 ton wagon inserted in its stop or case, the dark line being the tongue and rest.

In the plan above drawn, the carriages and wagons are hung lower than usual.

It may be necessary to add, that the small quantity of motion in the spring (not exceeding half an inch) is multiplied many times by the lever, before it is communicated to the carriage.

Ed. N. Philos. Journ.

Progress of Civil Engineering.

Section-Planography.

We insert the following paper from the British Magazine of Popular Science, as well for the value of the mode of delineation it describes, as for the raciness of the style in which it is written. G.

We believe we may say without fear of contradiction, and certainly with no intention of giving offence, that, comparatively, a very small number of persons of landed property understand a *plan*. This is principally owing to that culpable deficiency in practical education, which at present exists in all the great establishments in which our more elevated ranks spend the most precious years of their lives. If but a small number understand, thoroughly, a plan, still smaller is the number who can comprehend a *section*, and that combination of both *plan and section*, which is necessary to be made and understood before a clear idea can be obtained of the position of a particular part or point, with regard to all the other parts or points that surround it in every direction. The plans and sections of a single edifice are not to be thoroughly and satisfactorily understood, even by the architect, at a glance; lines in one, shrink into points in the other; planes become lines; and he cannot prudently judge of the whole, until, by sufficient study, his imagination so distinctly embodies the one, that he can instantly and involuntarily combine it, when looking at the other.

If this be true of delineations of objects so limited in magnitude as even the largest mansions, and whose delineated areas rarely extend to the borders of a sheet of double-elephant, how far greater must be the mental effort, when designs run from sea to sea, over a country of varying altitude and depression, and whose delineations even when miles are compressed into inches, defy the continuous longitude of an "endless sheet." Persons who have never visited that Office of the House of Commons where the plans and sections of intended rail-roads are annually deposited, can have no idea of the scene. One would think that the whole country had been stripped of its epidermis, that it had been manufactured into striated paper, and deposited there.

When a *line* is to be examined in a committee of the House of Commons, it is soon found that it is not a mathematical one in any sense of the word. The *breadth* of the line, and its horizontal vagaries, generally require the broadest kind of paper, and sheet after sheet, or rather ream after ream, until the scale of length prescribed by the "Standing Order" is accomplished. The *depth* of the line, and its vertical undulations, are far more reasonable in their demand for breadth, yet they have the same insatiable appetite for length. When the plans and sections necessary for the inquiry intended first appear before a committee, they have no

very alarming appearance ;—a portfolio, of no very gigantic dimensions considering the occasion, generally labelled “*PLAN*,” in gold upon red, and a cylinder, perhaps a foot high, and of a diameter varying from two inches to eight, embodies the *SECTION* ; but when under the process of examination, cross-examination, re-examination, and questions by committee, the engineer to the undertaking and his assistants, and the opposing engineers and their assistants, have turned over and turned back, unrolled and rolled, and unrolled again, portfolio and cylinder, with the most contrary intentions of comparing and combining, and proving and disproving, and have covered tables and floor with their convolutions, some little idea may be formed of the quantum of accurate information, which an impartial and constantly-attending member of a committee may obtain after fifty days’ inquiry, particularly if he happen to be a “gentleman born.”

But, as every country gentleman is not a member of a parliamentary committee, it may be hastily presumed that these perplexing mysteries can never annoy him. With the country, scored as it is with intended railways, no such gentleman can escape. This very portfolio and cylinder, or some few yards of each, is certain to roll into his hall, and be deposited on his library-table, either by friend or enemy, and he will find, sooner or later, that, though in undisputed succession of an ancestral estate, rich in preserves where poacher never entered, though a lover of that nature which has spread some of her loveliest scenes within his domain, and possessing health, and a keen relish for the field, this mysterious pair of unlike forms are the certain precursors of mighty evil. After a little time of execration on the *COMPANY* and their agents, he sits down with his attorney and surveyor. The three together can decide, within a mile, how near the railroad will approach that wood, or this lawn, and, perhaps, the amount of the lop-sided angle it will fill up of that sheet of water, which cost his grandfather thousands to create, in the geometrical style of gardening of his day. But the question, how the railroad is to maintain its level, and run down the side of that valley, and over that ridge, strikes out numerous inquiries, which end in the unrolling of the cylinder, and, in fact, nothing more ; for after hours spent in attempts to combine the *Section* with the *Plan* ; to connect the horizontal conditions of the one with the vertical conditions of the other, divorced as they are, the consultation generally ends, with, perhaps, a point or two accurately ascertained, but assuredly with a vexatious conviction, that some great mischief is about to be perpetrated, but in what way, or to what extent no clear notion has been obtained. What is the consequence? The landed proprietor either opposes the bill, shutting his ears against every proposition which might mitigate or remove the evil, and putting himself and the promoters to immense expense ; or, as the final event is, nine times out of ten, the same, he saves great pain, cost, and vexation, by doggedly submitting to his executioners. His estate is then dismembered, and his enjoyments destroyed, in a legal manner, under the humane superintendence of the acting engineer of the company. In two or three years, if the calls are paid up, instead of the green, sheltered, turfed and meandering lanes, there will be the sterile, exposed, iron road, having the very picturesque qualification of “no curve of less radius than a mile.” There, where the owner used to meet the lamb and its mother, and hear the tinkling bell of some fellow-wanderer he may be crushed by a locomotive ; for though he hears its snorting a

mile off, he has but a second or two to climb the "cutting of one to one," to save his life. Game he may find at his poulterer's in Jermyn Street, but there is not a wing in his closest preserve.

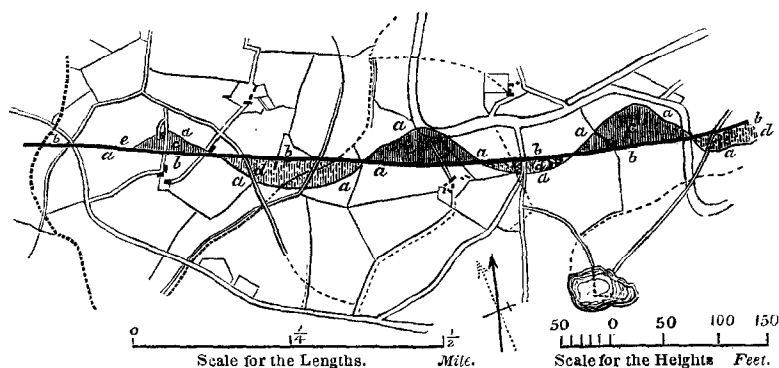
Mr. Macneill, by the invention we are about to notice, has made some small atonement for the terror he spread through the rural population a year or two ago, by his tables for facilitating "cuttings and embankments," and for the attacks his profession has hitherto covertly made upon the country and the dwellers therein, and against which there was little means of defence, for the extent of the evil threatened was always matter of doubt, and could be easily masked by bold assertion. A simple line running across a map, conveyed no notion of the gash that was to be so fearfully cut in that hill, nor of the dam that was to destroy the perspective of that valley, and choke the old acquaintance that once ran free and gurgling from one side of it to the other. It spoke not of viaducts from which passengers can now look into the chamber-windows of his mansion; and what was there in the solution of its continuity, those dots merely, by which tunnels could be predicted, in which nitrogen will never linger, and darkness be never dissipated? Yet, if this simple line be not early washed out from the map, by a process more expensive than a king's ransom, it may be legalized, may curse the ground on each side within a parliamentary boundary, driving out the astonished possessor, and teaching a fatal lesson of the consequence of "being troubled with a line."

But the enemy cannot now make so secret an approach; he can no longer blind his victims by his worse than useless "Plan and Section." The prayer of Ajax is granted, to all who ask it, and would to all who don't, if those who make and unmake "Standing Orders" would do their duty.* Railroads must assuredly, in certain cases, be executed: but the mischief necessarily attendant and consequent upon these numerous, and often gigantic, projects, ought to be seen, and easily seen, by every eye, very long beforehand. Hitherto this has been impossible, principally from the difficulty of getting at a correct notion of where, in a vertical as well as in an horizontal direction, the railway was to go. The annexed specimen of a new mode of delineation, invented by Mr. Macneill, and designated *SECTIO-PLANOGRAPHY*, will show, at a glance, that this difficulty can be removed. Here, on the same surface, in close and natural combination, are,—the virgin surface of the earth previous to the visit of the fell engineer, and the plan-line and the section-line of the railway proposed,—the offspring of his unholy contact. Each may be contemplated by itself, or in combination with either or both of the others. Look at the natural surface-line, (*a a*) and you can ascertain its correctness, &c.; for every point in it may be recognised by its juxta-position with the plan-line. Look at the plan-line, (*b b*); there may be seen, as usual, its direction, and its relation to lateral objects; but at every point in it you can estimate the facilities or the difficulties, by the coincidence with, or the departure above or below the surface-line, (*a a*). Now, suppose the paper were cut through along the latter line, (*a a*), and that, preserving the plan-line, (*b b*), in its present plan, the superior edges of the surface-line (*a a*), were elevated, and its inferior edges depressed, the whole section might be conceived to be turned upon the plan-line, (*b b*), as upon an axis, till it became vertical; it is now a section of the country, in its correct po-

* "Give me to see, and Ajax asks no more."—*Pope's Homer*.

sition as to the surface, and it gives a perfect representation of what must be done at all and every part of the line, to obtain the railroad at the given level. But the cutting of the paper is unnecessary. Raise the map with the section-plan so delineated from the table, and hang it on the wall. Now the section is vertical, and in its natural position, as before. Once familiarized with these experiments, neither is any longer necessary. A *coup-d'œil* of a section-plan laid down upon a map is no longer a limited and merely superficial view as in former years. It shows, previous to a great and important operation being performed, the wounds and the tumefactions which must be produced by the operator, however skilful, and if the party whose estate is to be operated upon is still "reluctant," he can ascertain if it be worth while to cut his own throat, or that of the engineer, before the professional "cuttings" of the latter scare away the mountain-nymphs of his home.

SPECIMEN OF THE APPLICATION OF THE SECTION-PLANOGRAPHY, IN THE DELINEATION OF A SURVEY FOR A RAILROAD.



a Natural surface of the ground.

b The proposed Railroad.

c Its passage through elevated ground ; a case of "Cutting."

d Its passage across depressed ground ; a case of "Embankment."

e Its passage along level ground.

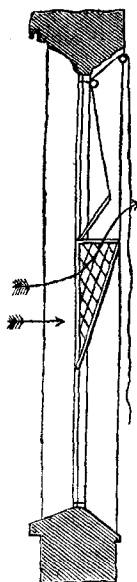
Mag. Popular Sci.

On the Ventilation of large Buildings by the Intervention of Openings in the Windows; by R. MALLET.

When in Liverpool, last September, at the meetings of the British Association, I went once to St. Jude's church. This edifice, which is in a sort of Gothic style, presents, when filled with people, a very imposing interior; partly from its magnitude intrinsically, but much more from this property not being, as it is so often, frittered away by innumerable divisions and subdivisions of parts, in the arrangement of ornaments on walls and ceilings. The ceilings are in this church particularly good, being simply divided across by the tie-beams (or representations of them) of the roof principals, which are moulded in a very bold style, and terminate at the walls in rich open Gothic brackets. The under line of these mouldings passes level and straight across, while the ceiling forms a large angle at the centre, probably

of about 160° ; thus giving an aspect of great strength and solidity. But to the point. There are two rows of windows at either side, one over and one under the galleries; and each window has a considerable portion of the sash cut out, and inclined inwards, and so fixed; with glazed sides and an open top, furnished with a glazed lid to open and shut by a cord. Fig. 1, is a

Fig. 1.



section of one of these, which represents them all, and is sufficiently plain without reference. The doors are judiciously contrived to prevent the currents of air which are often so distressing in churches; and hence ventilation may be considered as confined to these openings in the windows. Now, while the church is filling, and for, perhaps, the first half hour or so of service, nothing can be better than the ventilation: a delightful *aura* spreads through every part of the building, and feels fresh and breezy; but as the church heats this rapidly declines; and in about an hour, on putting my hand to one of the ventilators, where there had been a strong current in before, I could find none perceptible. This struck me as curious; and, on a little subsequent consideration, I believe I have seen the cause; and, as a great number of churches and other buildings are ventilated in this way, I have deemed it possibly worthy of notice in your Magazine.

Referring to Fig. 2, and supposing the wind to blow against one flank of the church, either direct or diagonally, as shown by the arrow, it is obvious that, pressing against the inclined planes of the ventilators, a portion of it will be driven upwards, as shown in Fig. 1, and into the church, and will tend to expel a certain portion of air, by a retrograde motion from the opposite side. The opposing forces that the air meets in entering are the inertia of the body of air in the building, and the force necessary to expel part of it from the leeward windows; but, besides this, as the air in the church becomes heated and ascends, it has a tendency to lodge above the upper row of windows, and, from the commencement of the process, gives a greater freedom of entrance to the fresh air below than above; but, as soon as the hot air above has increased

Fig. 2.

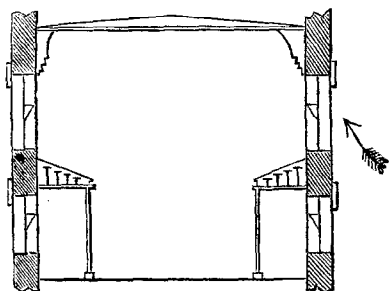
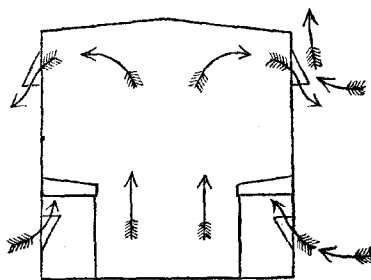


Fig. 3.



so as to have reached the level, or below the top, of the upper row of ventilators, the whole, or a part, of the current through them becomes stopped, depending on the temperature of the upper region; because this air to be displaced by fresh air, requires to be depressed into air colder, and hence denser, than itself, owing to the structure and position of the ventilators;