

# THE AMERICAN ARCHITECT AND BUILDING NEWS.

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THE magnificent energy and public spirit put forth by the State of Pennsylvania and by the city and the citizens of Philadelphia, in organizing and carrying through the Centennial Exhibition seem to have been succeeded by an apathy and indifference which threaten to imperil its permanent results. The Permanent Exhibition, after dragging along for three years in the Main Building, is now summarily brought to an end by the decision of the Park Commissioners to have the building at once removed. Meantime the Memorial Hall, erected by the joint efforts of the State and the city at a cost of a million and a half of dollars, is falling into decay, the roofing and the statues on the roof having been made of galvanized iron and other perishable materials, partly from haste, partly from economy. This building was intended to be a memorial of the great exhibition and of the distinguished part the State and city had taken in it, and it seems to be agreed that the building belongs to the State and should be cared for by it. Twenty thousand dollars are needed to put it in good condition, and a much larger sum will have to be spent if the original scheme of sculptured decoration were adhered to. But the legislature has at successive sessions refused to meet the case, appropriating at last a niggardly sum of five thousand dollars, — hardly enough to repair the broken skylights. The water pours into the building in every part after heavy rain-storms, so that the interior finish is rapidly deteriorating, while the sheet-iron eagles are gradually flying away from the roof, one wing at a time, and the statue of Columbia that crowns the dome has lost its laurel wreath and the hand that held it, and has so settled down through the decay of the base upon which it stands that the backbone of iron that supported it, projects above its head, giving the figure the general aspect of a martyr at the stake.

MEANTIME the building has been granted to the trustees of the Pennsylvania Museum and School of Industrial Art, a private corporation, who have undertaken to carry out the intentions of the city and the State by establishing schools of industrial art and forming such a museum of industrial art as their unrivalled opportunity made possible. Visitors to the exhibition will remember how many of the most interesting objects were marked as having been secured for these collections, mainly chosen, it was understood, under the advice of foreign experts, and at the close of the exhibition they were largely augmented by princely gifts from foreign governments. These unique treasures, worth from a quarter to half a million of dollars, are in daily peril of irreparable injury, the architectural and other drawings being especially in danger of utter ruin. In this state of things the trustees have appealed to the public for subscriptions which shall assure an annual income of at least five thousand dollars to defray the current expenses of the school, and for the maintenance of the building, until such time as the legislature will consent to take charge of it. It seems hardly possible that in a manufacturing community, whose prosperity depends so greatly upon the development of industrial art, this appeal will go unanswered, especially if its energies are no longer to be taxed to maintain the Permanent Exhibition. That an enterprise so eminently profitable to them should be in any danger of failure, when the

comparatively disinterested and patriotic work of the Centennial Exhibition met with such splendid success, would seem to show that in Pennsylvania, as elsewhere, the main springs of action are not altogether selfish.

THE sanitary condition of our crowded summer resorts has begun to engage the attention of thoughtful men. At Coney Island the drainage of three hotels, to which another will soon be added, flows into a shallow estuary behind them, whose state already gives rise to anxiety, and stories come to us of outbreaks of diphtheria in country boarding-houses, of hotel guests poisoned by filthy milk, or ice taken from ponds of sewage, of vacation tourists brought home with typhoid fever, and there are few to whom the watering-place "summer complaints" are not familiar. The pleasure settlements on the Massachusetts coast are peculiarly exposed to danger from zymotic diseases by reason of the rocky soil which underlies most of them, and the closeness with which the popular ones are built up. In the sandy soil of the more southern coast the drainage which escapes from vaults and cesspools may be long in reaching the wells from which the water supply is drawn, and even then is partly filtered and aerated, but the case is very different on the bare ledges which surround Massachusetts Bay. Here all the water which falls upon the surface, except the small portion absorbed by the scanty soil, finds its way over the top of the ledge, descending in a thin sheet until it finds one of the fissured seams which constitute the only water-bearing veins of such regions, and through them continues its course to the sea. All wells must be sunk to these seams, for in them only is there any chance of finding water. As the region is settled the leakage of vaults and cesspools must inevitably follow the same course, as there is no other, and every one of these seams, which are often long and widely branched-subterranean rivulets in fact — which is once reached by the stream of filth, is thenceforth dangerous to health, if not to life. We know that the typhoid infection has been carried a mile in such a seam, and a virulent case of fever in a favorable spot might infect a whole settlement, as a spark fires a train of gunpowder. The diphtheria contagion, though more obscure, we know can be spread in the same manner, and its attacks are even more violent and sudden than those of typhoid. The best security for the individual house lies in the total rejection of well-water in such places. The rain-water supply in summer is peculiarly scanty on the coast, but a scarcity of pure water is better than an abundance of poison, and those who are resolved to secure the conditions of health for themselves can do no less than to try also to avoid contaminating the water supply of their less careful neighbors.

WITH the revival of building comes also quarrelling as to the mutual rights of the parties to contracts. For the benefit of those interested some newspapers have been publishing remarks upon mechanics' liens which should be taken with allowance. The object of the lien laws is to protect the comparatively helpless workmen against the contractor, their employer, who may pocket all the money he receives on his contract, or whose other creditors may trustee his payments, the result in either case being that his workmen are deprived of their wages without fault of their own, while suits against him for their due would be of little avail. To remedy this, the law gives them a property in the building they have helped to construct, independent of any stipulations between the owner and contractor, which they can claim by giving public notice in the manner provided by law, but not otherwise, so that the owner, if no such notice is recorded within the legal time, is freed from any subsequent risk, and if he foolishly pays the amount of the contract before the period for filing liens has expired, and afterwards is compelled by means of them to answer for the contractor's dishonesty, he has only his own imprudence to blame. The time allowed varies in different States from thirty days to three years. In the first case it is sufficient to reserve the final payment till the term has expired; where the period is longer, the contractor should furnish bonds to secure the owner against liens. Some States provide that a formal notice given to the workmen by the owner that he will not admit liens from them deprives them of the privilege in regard to any work done subsequent to such notice. In one of these ways it is always practicable for a prudent man

to make himself safe. Liens for materials, where they are allowed, are even more easily dealt with. If those who propose to build would more often consult those whose business it is to advise them honestly, instead of putting themselves, as many of them do, utterly in the hands of a mechanic often unknown to them, whose every interest is opposed to theirs, we should hear less complaint of the uncertainties of contracts.

THE American Institute of Architects have printed the reports of the proceedings of their last two annual conventions, and, as an experiment, have separated the Appendix, which contains the papers on various subjects which were read before them on those occasions, into a small pamphlet by itself, of which a certain number are offered for sale through the book-stores. Some of the papers are well studied and thoughtful productions; those on fire-proof construction, for instance, comprise information never before collected, and may be said to form the only general view yet published of the present state of this branch of building science; while others are light in character, and hardly worthy of, as indeed they were not intended to have, a permanent place in the literature of the art. It is, however, a desirable object to bring more prominently before the public the subjects discussed and the information gained at the conventions of the Institute, matters which are of interest to a large portion of the public, and would be made more so if the public learned to look to the Institute for them. Another year we hope to see the experiment repeated. Not only will the Institute find its account in securing the best authorities on the most important subjects to write its papers, but the publicity given to the papers will tend to eliminate the writers who know they have nothing to say, and will call forth the best efforts of those who have, so that both the public and the profession will gain in a geometrical ratio. There will be no lack of interesting topics, or of competent writers on them, for a long time to come, and the Institute, with a little energy, can do much good in collecting and recording such information on professional subjects,—a work which has never been done for architecture with half such thoroughness as for medicine, law, or other branches of liberal study.

A CASE is mentioned in a late number of *L'Architecte* where a proprietor sought to hold his architect responsible for the rotting of his floors under peculiar circumstances. The beams had been filled in with a concrete of plaster and *décombres*, but without waiting for the roof to be covered in, so that the work became soaked with rain. As soon as the building was enclosed the proprietor ordered the floors to be laid, and the ceilings to be plastered. Soon after the beams showed signs of dry-rot, and the floors were all removed, and the beams replaced with the best and driest timber which could be obtained, the cost of the repairs amounting to nearly half as much as the whole contract price of the building. The proprietor, being now in a greater hurry than ever, as soon as the plaster filling seemed tolerably dry, had the ceilings put on and sized for decoration; but soon afterward the new beams also showed signs of rot, the disease appearing to begin in the places where the moisture had been slowest in drying out of the plaster. *L'Architecte* thought that if the architect had had proper control of the work he would have been responsible for negligence in allowing the beams to be enclosed above and below before the plaster between them was perfectly dry, under a decision of the Court of Bourges, which reads, "The architect is to blame for faulty execution, even though it be in obedience to the instructions of the proprietor: the special knowledge of the architect makes it his duty to point out to the proprietor the objections to the mode of construction proposed, and if necessary to resist even his positive orders;" but as it was shown that the proprietor had made his own contract with the builders, who were unknown to the architect, and had without consulting him imposed upon them an obligation to finish the building in a time clearly too short for its perfect execution, it seemed that he ought to be discharged of at least a part of the responsibility, and if it could be shown that he had fully explained to the proprietor the danger he incurred, undoubtedly he would be so relieved. It does not appear whether any award was actually made as to the architect; probably not, as up to the date of the paper the testimony seemed to have only gone so far as to exonerate the builders, who were proved to have furnished good material, and to have used it wrongly under compulsion.

#### THE OPEN FIRE-PLACE.—XV.

WITH any of the fire-places mentioned herein a flue for disposing of the ashes may be constructed below the grate, as shown in Fig.

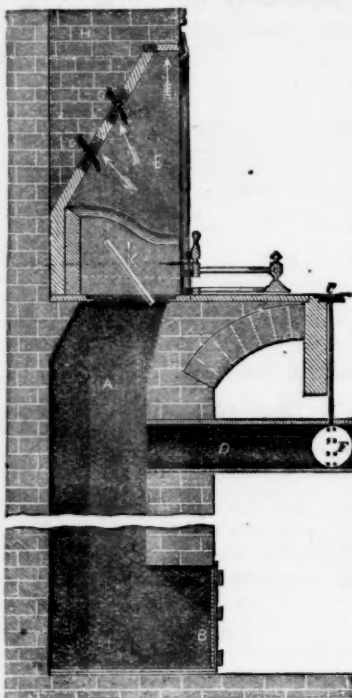


Fig. 123.

The reflecting surface over the fuel is intended to perform the double office of reflecting the rays of heat from the fire into the room, and

123. The flue forms an ash-pit, into which the ashes fall from the grate when shaken or dumped. The ashes are then removed through the door B, in the basement at the bottom of the flue. A "soufflet" pipe, D, has been provided, through which air may be taken from below to increase the draught, when desired, after the principle of the Winter Fire-Place; but the soufflet, in a well-constructed fire-place, is unnecessary, and its use is only to be recommended when better construction is impracticable.

In the Fire-Place represented in the accompanying cut, Fig. 124, called the "Franklin Reflector," the smoke circulates behind and below the fire, as indicated by the arrows, in order to increase the radiating surface of the heater. But no fresh air is brought in contact with these surfaces, and they are not arranged in the manner best calculated to give out their heat.

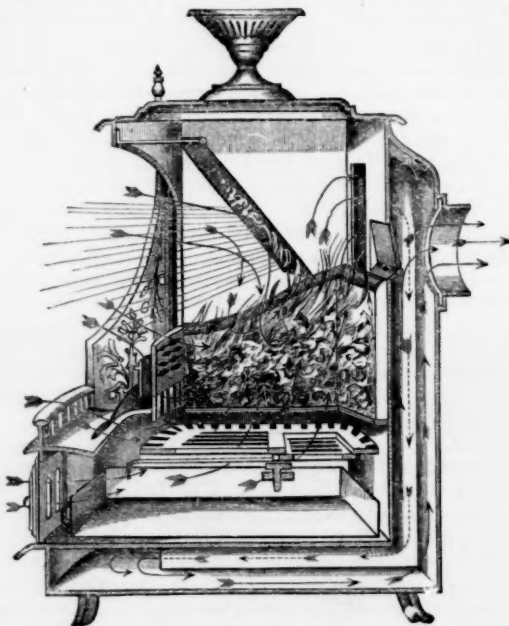


Fig. 124. Franklin Reflector.

of turning the currents of air from the room upon the fire, thus securing the greatest amount of radiation, and producing a more complete combustion of the fuel, while it also diminishes the amount of cool air entering the chimney flue. The same objects were accomplished by the Fire-Place of M. Touet Chamber, already described in Figs. 42 and 43, where the precaution was taken to provide openings above the reflector, for the purpose of carrying the smoke directly into the flue when the fire was first lighted. We believe that, with certain modifications hereafter to be suggested, the Franklin Reflector may be made to combine in the form of a stove most of the advantages possible to be obtained by an open fire-place. It is manufactured by James Spear & Co., of Philadelphia.

To conclude our historical sketch, we have reserved a fire-place described by Peclet in his "Treatise on Heat," and shown in Fig. 125, as the best in principle, and one which, though crude and defective in form, is yet most likely to lead to important results.

The principle of this device is the formation of the chief heating



surface above the fire-place, and in the waste space behind the chimney-breast, rather than in the immediate neighborhood of the fire.

The great advantages of the arrangement are (1), the acquirement

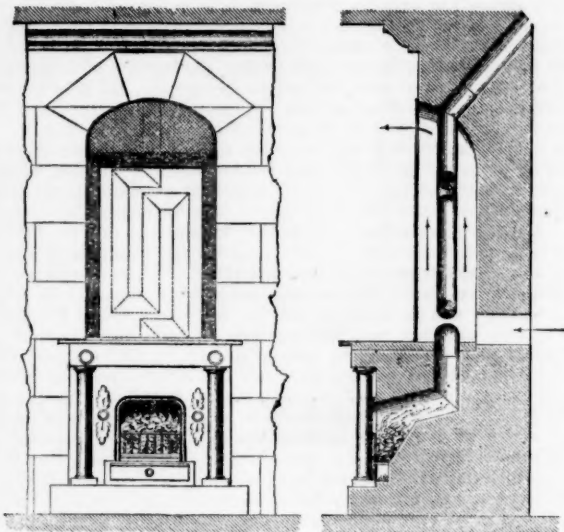


Fig. 125. From Peclet.

of ample room in the waste space of the chimney-breast for the proper development of the heating surface; (2), the removal of this surface from immediate contact with the fire, by which it may be overheated to the injury of the fresh air, and finally destroyed; (3), the detachment of the air-heating surfaces from the fire-place proper, which may, therefore, be made of any form or material desired. If the fire-place already exist it may be left untouched, except above, where it has to be connected with the air-heater; (4), the facility with which the heating surface may be reached for cleaning, repair, or renewal without disturbing fire-place or mantel; and, finally (5), the simplicity and cheapness of its construction. Notwithstanding its evident advantages, the principle was left undeveloped, and as the apparatus described by Peclet was defective it was abandoned. It was seen that the bends in the smoke-flue and the reversed course of the smoke were liable to injure the draught and corrode the pipe. These difficulties were easiest removed by simply pulling the pipe out straight again, which was accordingly done at once, and all that remained was the original Galton flue. Thus the problem was solved somewhat after the manner of the Gordian knot, and the device was summarily consigned to oblivion. Thus it is that the fire-place of to-day stands in practice nearly as it did at the time of Gauger. The English, whose national fondness for the old open fire-place ought to have led them to study its utmost development, seem, with their characteristic slowness to adopt new and foreign methods, to have

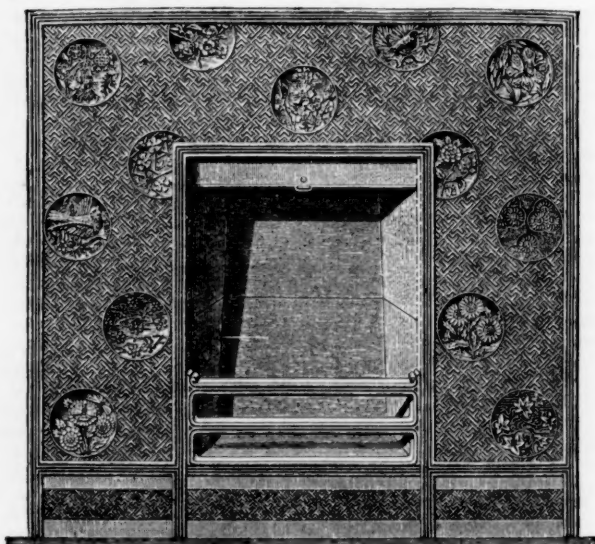


Fig. 126.

stubbornly refused to follow any other course than that laid out for them by Rumford.

The Germans are satisfied with their porcelain stove.

The French have been so busy working up the Gauger fire-place that they have not yet thought of looking behind the chimney-breast

to reflect upon the waste of useful space; and the Americans have been too busy with everything else to give the subject any thought at all.

The fire-place given in Figs. 126 and 127, for instance, just brought out in England with éclat, indicates the tendency in that country. A correspondent of the London *Times* of January 30, 1877, writes of

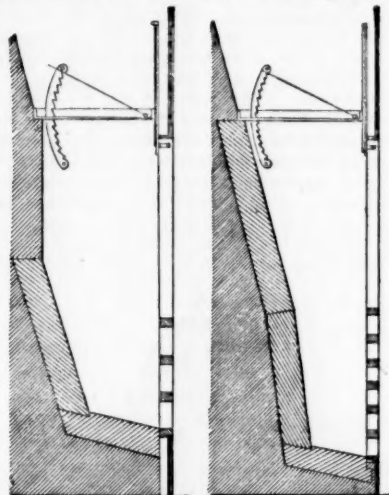


Fig. 127.

this form of fire-place: it "has excited much attention, for I have received in two days more than two hundred letters on the subject, to which printed replies will be sent in a few days. Many of these letters are from hospitals, public schools, military and other public institutions," etc. Yet they are nothing more than a modification of the Rumford grate, and yield, at the utmost, but from 5 to 15 per cent of the heat generated by the fuel, while they retain all the radical defects of the ordinary fire-place.

Constructed upon a principle quite the reverse of that of the Franklin Reflector, they are set high, and are in form high, narrow, and shallow, instead of low, broad, and deep. They have the advantage of heating the floor better for being set high, and occasion less dangerous draughts around the feet. Their shape is favorable for the slow combustion of coal, and for radiation; but they are not suitable for burning wood, since their depth is not over 4½ inches from back to front at the base, and 5½ inches at the level of the top bar. The floor of the fire trough is of fire-brick, and not of grating, so that air passes into the fire through the front of the grate, and not under it. This causes the coal to burn slowly, and each coal glows on the side toward the room. Coke, with a small admixture of coal, may be burned in them, instead of coal alone.

The Englishman, proud as he is of his careful arrangements for domestic comfort and luxury, is outdone in this most important particular even by the inhabitants of distant Asia. The Persian enjoys his pipe before an open fire-place as much more rational in construction as it is more pleasing in appearance than the comparatively miserable object now receiving the commendation of the civilized Briton. The picture at the end of this chapter shows us a cheerful fire sparkling like a gem in a casket so high and ample that its radiating power is utilized to the best advantage, while the hood and sides serve the purpose of a stove in heating the surrounding air and objects by convection and radiation.

The direct rays of the sun are necessary to the complete development of animal life, and the great difference in the amount of radiation of solar light and heat in the various parts of the globe causes a marked difference in national character. Where the sun cannot be enjoyed, or where its rays are feeble and insufficient, the open fire-place becomes its natural substitute, and so long as our physical natures remain the same, so long will the open fire be cherished as a priceless boon and companion.

It is a provision of nature that there shall be a wide difference between the temperature of our bodies and that of the air about us; and we find that the greater that difference, within certain reasonable limits, the more energetic and vigorous is the action of all our animal functions. Air entering our lungs at a low temperature near freezing point, does, as we have said, twice as much work in purifying the blood as the same amount of air entering at the temperature of our bodies, and in winter with the warm rays of the sun striking us we feel twice as vigorous as we do in summer, when the air is hot and suffocating.

When a room is warmed by an open fire the walls are warmer than the air, because radiant heat has the remarkable property of passing through air without raising its temperature. Thus the occupant breathes air refreshingly cool, while the walls, being comparatively highly heated, do not absorb his animal heat with inconvenient rapidity. Nevertheless the outside air must be tempered to a certain extent before entering the room to avoid the danger caused by cold currents striking our bodies, and it is the object of the vent-

ilating fire-place to temper this incoming air to the proper degree, without waste of fuel or labor.

We have reviewed the progressive steps already made in this direction up to the present time, and we find the utmost that has been accomplished, to our knowledge, by any form of fire-place, in the way of utilizing to good advantage the heat generated by the fuel. has been a saving of from 30 to 40 per cent, applied rarely to the best advantage in preparing and distributing the fresh air for our use. At its best, it is looked upon as a luxury too expensive for the poor man to enjoy. Under the assumption that the element of wastefulness is a necessary condition of its being, he turns, as his only resort, to the closed stove. The efforts of the inventor are therefore directed to increasing the economy of the heater which is used where the value of economy is best appreciated, to the neglect of the open fire-place which he has been accustomed to look upon as incurable.

It is the duty of those who entertain a contrary opinion, and who have the facilities for putting their views in a practical form, to contribute the results of their investigations to the general fund. Small as may be the value of individual results in themselves, they may yet serve as suggestions from which, in other hands, valuable fruit

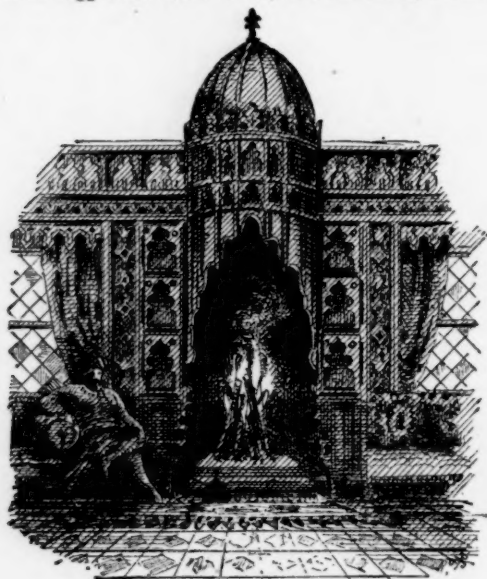


Fig. 128. Persian Fire-Place.

may spring; and little as we may expect to receive from any single contributor, yet the labor of many working together, in the light of past experience and with the aid of the advanced scientific and mechanical knowledge of the day, may, before long, be sufficient to convert the open fire-place from an expensive, troublesome, and even dangerous luxury enjoyed only by the few, into a source of health, comfort, and economy for all.

#### AMERICAN DRAMATIC THEATRES. — VI.

THE orchestra is a kind of debatable ground between stage and house. There are those who cling to the traditions of the past, and consider a full view of fiddlers and kettle-drums to be a legitimate part of theatrical entertainment; and there are doubtless musicians of such sensitive natures that they desire to be seen and personally appreciated, either for their talents or good looks. On the other hand, led by Wagner, there is a large class who would make the orchestra a concealed "music box," filling the scene with "sounds and sweet airs that give delight" and reinforce the effect of the actors' words. These consider the personality of the performer an intrusion and offence, and only wish him represented by the product of his art. The new custom has many advantages. It gives the musicians greater ease and freedom in various ways, relieving them from all formalities of dress and position while playing. It prevents the confusion in the orchestra, especially at the climax of a play, from interfering with its full enjoyment; and it enables the management to economize in the number of performers without appearing, or perhaps being mean. Of course the leader must be placed in full view of the stage and actors, as well as in a suitable position to control his musicians; and the foot-lights can be made available to light both orchestra and stage. With proper arrangement of the concealed orchestra there is no essential loss of tone or volume of sound, as has been proved by fair trial. At the Wagner theatre, at Bayreuth, this system was successfully adopted for grand opera. The arrangements for the band rarely suit the musicians at first, especially if novel. In time, if well considered and correct, they come to be approved. Each head of a department in a theatre considers his province of the greatest importance and desires all others sacrificed to it, while the public desire is for uniform excellence.

Of exit doors from the hall there should be an ample number, and each one wider than the aisle that leads to it.

Leaving for a moment the consideration of the remaining features of plan, there is something at this point to be said concerning certain peculiarities of construction of special importance in a theatre.

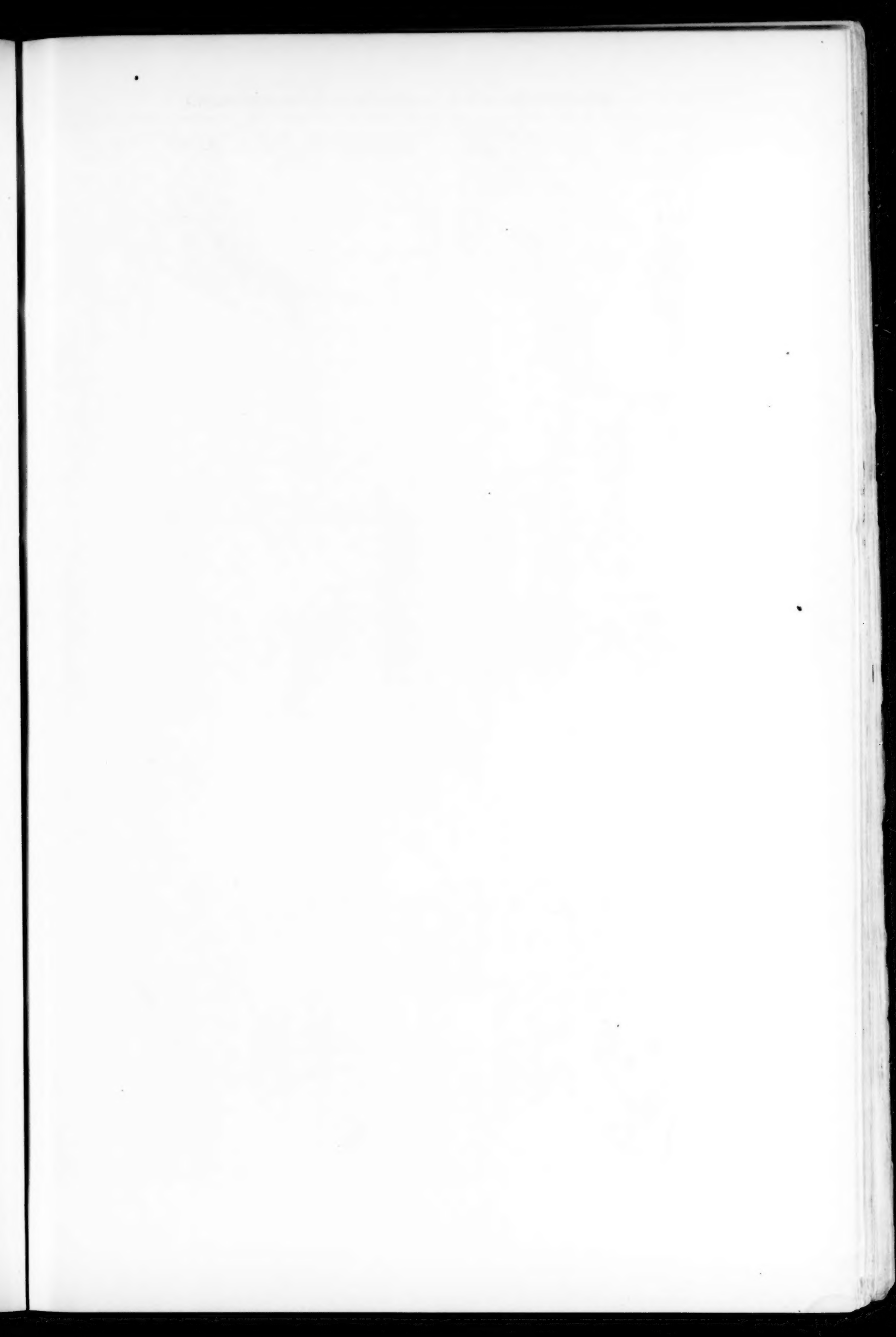
On the ordinary precautions incident to good building, and on the special need of their observance where an assembly of people is unusually exposed to exciting influences, it is perhaps unnecessary to enlarge. Everything that comes within reach or even view of the audience must be made extra strong. The cracking or snapping of some unimportant railing or other fixture, the burning of a play-bill over a gas bracket, or some such trivial occurrence, has been known to lead to serious results; and the chances of such events must be carefully considered, and so far as practicable guarded against.

In erecting a theatre it will be well to study carefully the rules laid down by Captain Eyre M. Shaw of the London Fire Brigade, whose valuable suggestions can scarcely be improved upon and should form the basis of state protective building laws for structures of this character. Captain Shaw says, that "it must be conceded that no theatre can ever be constructed fire-proof." He undoubtedly uses the term fire-proof in its strict sense; as he says elsewhere. "The two objects to be attained are these: first, to save the audience; secondly, to save the property; and these objects will be best accomplished by subdividing both audience and building into as many separate risks as possible, and so arranging the general stowage of the contents as to prevent that sudden blazing up which has hitherto constituted the special danger of theatres." . . . "Although a theatre badly built and imperfectly protected is not only dangerous in itself, but a source of danger to all buildings in its vicinity, nevertheless there is no difficulty whatever, unless expense be ranked under this head, why a theatre should not be so constructed, divided, and otherwise laid out and arranged, that it might contain a smoking-room, and if necessary, even kitchens, with as perfect safety as the present refreshment saloons, and at the same time insure the absolute safety of the audience and the partial safety of the building and its contents in case of fire." It may be said in comment on the above, that "expense" is the principal difficulty with which the architect has to deal in endeavoring to secure safety, under existing laws in America, with the prevalent notions among clients, and the apathy of the people when not specially roused, and their lack of reason when they are.

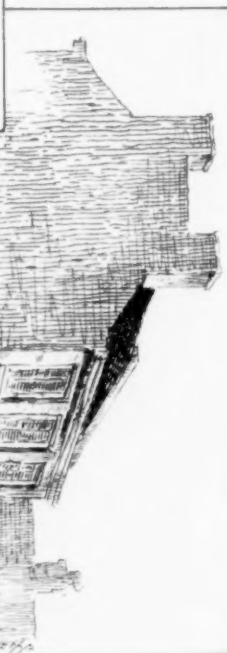
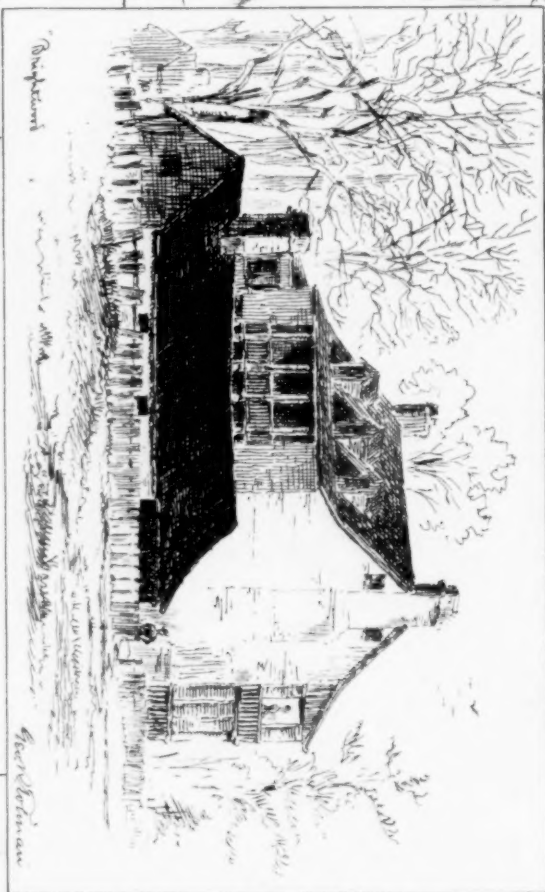
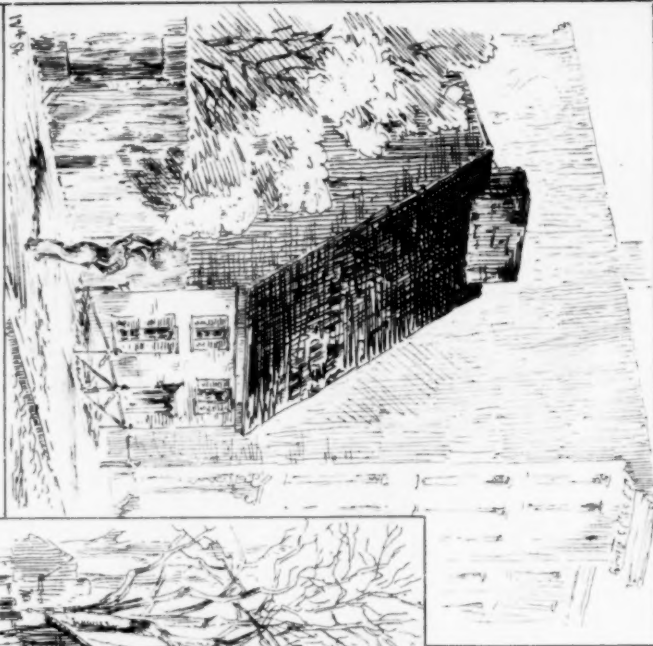
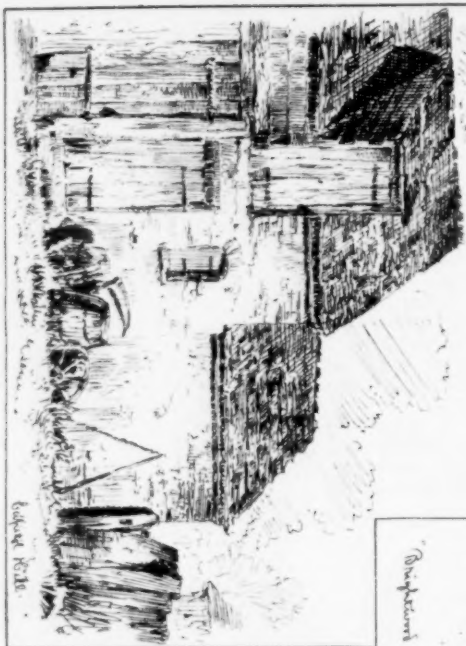
The stage should be divided from the hall by a brick wall not less than a foot thick and carried at least four feet above the highest part of the roof. The openings through this wall should be as few as practicable. In this the writer differs from the authority just quoted, who advocates openings at every landing. Some few openings are necessary, the one for the curtain being the largest. The others needed should be closed by fire-proof doors, double, or if possible with an intervening lobby. The multiplication of openings increases the chance of some of the doors being neglected and left open. The difficulty in compelling the constant use of safeguards in a theatre is a hundred times greater than any opposition to their introduction in building. The closing of the curtain opening has long been a matter of serious controversy. Some have strenuously advocated sheet-metal, others wire on the Davy-lamp principle, and others woollen or felted backed by wire, and kept wet by a sprinkling-pipe when needed. It is perhaps well not to insist on any one of these for all cases; as one might be better in one place, and another under different conditions. The chief objection to the iron is its weight, and the necessarily powerful machinery needed for working it, and the constant danger that it may fall into disuse. Whatever barrier is employed should be in constant use as the regular curtain, and no other should be allowed except for the "drop" between the acts. The prompt lowering of the usual green curtain and act-drop combined, has been known to hide a serious fire from the audience and confine it to the stage until it could be extinguished by the ordinary means.

The stage should be separated from the dressing rooms by brick walls. The hall should be cut off from the lobbies and stairways in the same way, and the connecting doors should all be of fire resisting materials, and the stairs and passages of exit should be sufficiently protected to hold out against fire for a reasonable time. Brick walls for the smaller partitions are not always necessary. Iron and stone are treacherous and unreliable. A good, strong, framed partition of heavy studding, filled in solid with brick, in mortar, or concrete, or plaster, and wire lathed on each side and plastered, will hold its own against a fire for hours. This will cost as much as brick, but occupies much less room and is not so heavy. A staircase supported on large square timbers, built into brickwork at the ends, the space between carriages being plugged solid with coarse mortar, and the rake and under side of landings wire lathed and plastered, will remain serviceable after one of stone and iron has been destroyed. As Captain Shaw has well said, wood cannot be destroyed by heat and water as stone and iron can, and even when exposed to the direct action of flame, if the sticks are large, it will last for a long time.

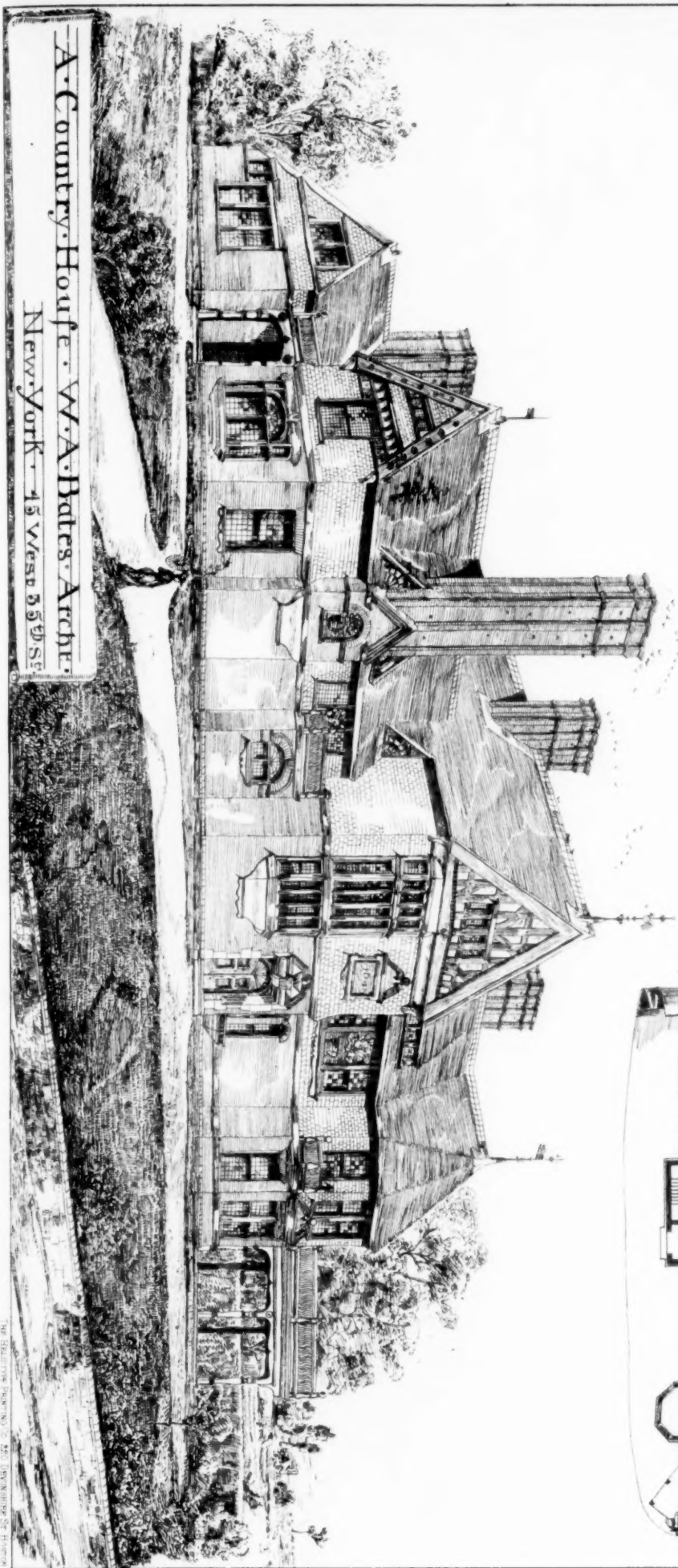
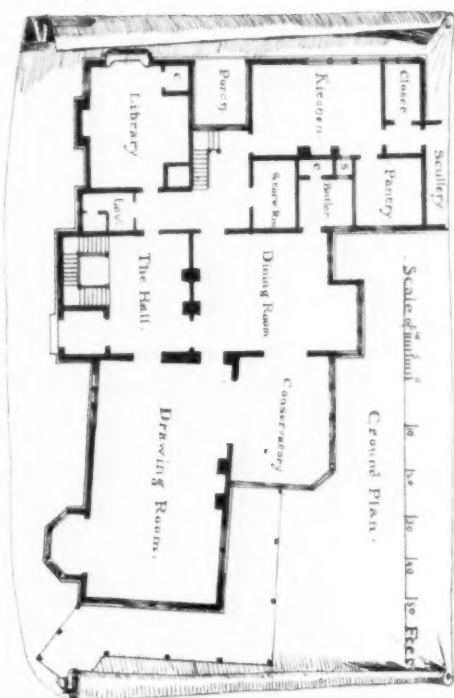
For doors those of solid wood covered both sides and edges with sheet-iron, or even with tin, are preferable to plate-iron ones. They are lighter and not so liable to get bound in the frames; in case of fire the wood supports the thin metal and the metal prevents the flame from reaching the wood. In the case of a conflagration in a lumber yard some years ago, such doors or shutters in a brick wall resisted a fire that consumed high stacks of lumber, piled nearly against them, until it burnt itself out, and were then intact and serviceable, and the premises they shielded uninjured.







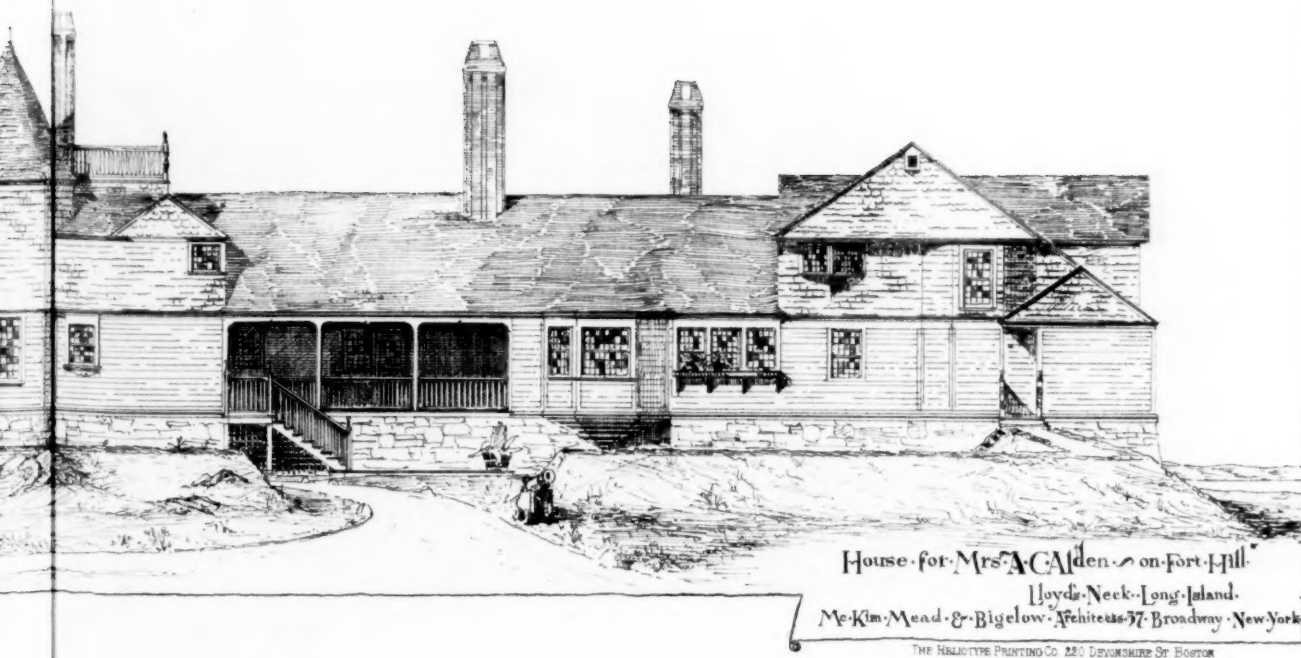
WASHINGTON  
or  
ABOUT.



A Country House. W.A. Bates. Archt.  
New York. 15 West 55th St.







House for Mrs. A. C. Alden on Fort Hill

Lloyd Neck Long Island

McKim, Mead & Bigelow Architects 37 Broadway New York

THE HELIOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON

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To return to the plan of entrances. The numerous doors of exit from the hall should open into lobbies or ante-rooms with sufficient standing room to accommodate that portion of the audience who have direct access to them. The lobbies and passages should be so planned as to avoid counter or cross currents of people; such currents being turned in one and the same direction before being allowed to mingle. The number as well as the size of the exits should be controlled by the size of the audience, and there should be at least two good ways out from each section of the hall. No projections into passages or stairs should be allowed, and there should be no narrowing towards exits; but right angle turns on stair landings or in corridors are a safeguard, as they reduce the force of a rush by dividing the pressure. Double strong hand-rails for stairs and passages are indispensable. All doors should open outward, or move freely both ways, and should be purposely made light and thin so that they could be easily broken through in an emergency.

The danger of a rush through a long wide passage is that the slow and weak may be overtaken by the swift and strong and be knocked down and trodden under foot. In case of a sudden check and crush the swaying from side to side may throw down women or children, who once down cannot get up again, and are suffocated or trampled to death. Women are often dragged down by those behind treading on the trains of their dresses. Captain Shaw says: "In long straight passages, where the pressure of a crowd might be likely to accumulate so as to become dangerous, perfect safety can be obtained by placing at intervals strong barriers running from alternate sides, and so arranged that not more than fifty or some such limited number of persons could press on each other at a time." Such an arrangement presupposes wider exits than are ordinarily available, and longitudinal divisions, which he also suggests, would answer the same purpose, with less waste of room and inconvenience to the public; although the end would be better accomplished by thin strong partitions rather than by rails three feet and a half high as he recommends.

Of course it is desirable to provide, in convenient neighborhood to the hall, suitable retiring rooms and lavatory accommodations for men and women, and these and the saloons or *foyers* for promenade and conversation, should be made as roomy and attractive as circumstances will allow. Proper cloak rooms should be located near the entrance, but so disposed that the current of the entering or retiring audience may not be checked or hindered by those waiting at such places. The box-office should also be located so as to be convenient to those buying tickets at night, without its "cue" being an obstruction to those who have procured seats in advance.

While taking all proper care for the safety of the public the entrances and their appurtenances should be so arranged as to require the services of as few attendants as consistent with entire security.

If this is not done the number is likely to be reduced by the management by closing some doors of exit. The architect may not be responsible for such abuses, but it is his duty to promote all proper economy consistent with more important considerations.

It has been suggested that plans of exits should be posted in different parts of the lobbies. Also that signs of direction should be painted on the walls. These are well as additional precautions; but such arrangement of parts and conspicuousness of doorways that the crowd will, without special thought, flow out at the places intended, are vastly more to the point. People do not read when panic-stricken. They are often blind, deaf, and dumb, and their intellects, for the time being, are paralyzed. Following a sort of animal instinct they rush from danger by the paths by which they advanced towards it, and it is very difficult to divert them in any other direction. Very few people are competent to guide their course by a plan, at the best, and very few would stop to study one. Plain directions for exit, printed on the play-bills, may prove of some use; but as a suggestion of danger is in a measure the creation of a danger, great care must be exercised in all such matters.

J. A. F.

#### THE ILLUSTRATIONS.

WASHINGTON AND ABOUT. SKETCHES BY MR. G. R. TOLMAN, ARCHITECT.

DESIGN FOR A COUNTRY HOUSE. MR. W. A. BATES, ARCHITECT, NEW YORK.

HOUSE FOR MRS. A. C. ALDEN, LLOYD'S NECK, LONG ISLAND, N. Y. MESSRS. MCKIM, MEAD & BIGELOW, ARCHITECTS, NEW YORK.

#### SEWER GASES AND DWELLING HOUSES.<sup>1</sup>

DOCTOR DE VARONA is a homeopathic physician in Brooklyn, who gained much distinction and a valued decoration by his services in the Spanish army in Cuba during a severe epidemic.

He has taken up the subject of which his little book treats, in an original and thoughtful way, and it gives much evidence of strong personal interest in the subject and much intelligence in its treatment. If any adverse criticism is to be made of it, it is that it covers too much ground for a small hand-book; that in some points, though by no means in many, it discusses matters of somewhat hypothetical scientific value and of little public interest; and that it gives the im-

pression of treating technical branches of the subject with only such knowledge concerning them as can be gained by reading. At the same time, these defects are but minor ones, and the originality of the author makes his intelligent comments on the main features of the subject really valuable. It is a book which will be found suggestive and valuable by the most experienced, and which cannot fail to be of great use to those who take up the subject for the first time. As a hand-book for a doctor to give to patients whose ills may be more or less due to defects in the drainage of their houses, it is better than anything else of the kind that we have seen. Its brevity and its simplicity are, from this point of view, great merits.

Concerning house drains we are told: "Whatever differences there may be in the name, it is perfectly clear that these house drains are nothing more than small private sewers lacking in their construction the engineering skill that is generally used in the public ones, and abounding therefore in the conditions that generate poisonous gases. If they are made of porous material, of unglazed pipe, of metals rough in their interior, if they are badly jointed, if they are unevenly laid so as to have bends and hollows, if they have sharp curves, or run in horizontal lines, if they have falls at right angles, deposits take place, which decompose and act precisely in the same manner as stagnant sewage."

The means for the admission of sewer gases through traps, etc., are thus stated: "Many traps are so constructed that a rush of water passing them will syphon them and leave them empty; especially when, as is often the case, their calibre has become much reduced by deposits. Secondly, because in cases where the trap is not frequently used, the vaporization of the sealing water leaves it open for the passage of gases. Thirdly, because sewer gases saturate water very readily and pass through it with the greatest ease, it taking only fifteen minutes for ammoniacal gas to react upon litmus paper through a trap sealed by a column of water two inches in depth."

"Under these circumstances, the forces that determine the passage of gases into the apartment are the following: The lesser specific gravity of sewer gases (carbonic acid excepted) as compared to atmospheric air, which causes the former to displace the latter, ascend in the pipes and pass through the openings. The excess of pressure in the sewer arising from the backing up of water in the outlets. The impact of winds and the sudden filling of the pipes with rain-water. The direction of the descending column of water establishing a current of air in an inverse direction. The draughts generated in houses by chimneys, closets, dumb-waiters and elevators, which establish a demand for air from every possible source. The higher temperature of the house air as compared with that of the drain and sewer, causing the latter to rush in through the smallest crevices."

One or two points in the author's practical directions indicate that he is hardly a reliable guide for the construction of drainage works. He proposes to deliver the ventilator of his soil-pipe through the kitchen chimney. This would be very well if the kitchen chimney were *always* to be warm; if the house were never to be left unoccupied for a single week. This condition we can never be sure of. When the house is vacated and the chimney is closed, there will, during certain conditions of the atmosphere, be a downward current in one or more of the chimneys, and it may be in the kitchen chimney, which would have the effect of drawing back into the house the foul gases escaping at the top of the soil-pipe ventilator. This method of ventilation, although a favorite one with many plumbers, has been, so far as we know, entirely abandoned by sanitary engineers. For the ventilation of the sewers, or as an accessory thereto, and as a further aid to the ventilation of the house drains, it is proposed to have "horse-post ventilators" three feet high at the edge of the sidewalk in front of all houses. The obvious objection to this is met by the suggestion that foul air discharged under the noses of foot passengers will be at once oxidized and rendered harmless. This will hardly be accepted by an ignorant public as a sufficient justification for introducing at the very worst point in our streets the smells of the sewer. Nor, we believe, will it be accepted by engineers as having any practical value. If, as seems to be the case, sewers are best to be ventilated by openings into the streets, these openings certainly should be in the middle of the street and at its surface. That is, at the greatest possible distance from the sidewalks and from the fronts of houses.

As might be expected from the profession of the author, the most valuable portions of the book are those which relate to the composition of sewer gases and their relation to health and disease, and to the very important matter of the influence of soil moisture (which means damp cellars), and the possible influence of the contained gases of decomposition within the soil. "The class of diseases most frequently noted in connection with ground water, as revealed by damp cellars, are phthisis pulmonalis, inflammatory diseases of the respiratory organs, especially bronchitis and pneumonia, rheumatism, more particularly of the chronic order, chronic perversions of digestion; also, a lessened power of resistance to all diseases when contracted."

"In order to ascertain the influence of dampness upon health as indicated by the rate of mortality, we should examine the effect of a wet atmosphere, and compare it with that of a dry one. The number of deaths from consumption in towns which are naturally dry is so much smaller than in towns situated on a water-logged soil, that many authorities hold the ground water alone responsible for the production of the disease."

<sup>1</sup> *Sewer Gases, their Nature and Origin, and How to Protect our Dwellings.* By ADOLFO DE VARONA, A. M. L. L. B., M. D. Of the Royal Order of Epidemics, etc., etc.



The following is at least suggestive as to the use in bedrooms or bedroom closets of stationary wash-basins which are not separated from the drain by mechanical traps. "Before retiring for the night the bed-chamber should be thoroughly ventilated, and if there be reasons to suspect the presence of sewer gases in the atmosphere of the room, this should be disinfected, after which, if there be a stationary basin in or near the room, its waste-pipe should be disconnected from the room by a temporary trap formed in the following manner: Place the stopper in position at the bottom of the basin, and to prevent its being displaced by a sudden gush of gas (a thing that often happens), put a weight upon it. Stop each one of the holes of the overflow at the top of the basin with a well-fitting cork. Then fill the basin with water to half an inch above the overflow.

"Examine the waste-pipe under the basin and see that the mouth of the overflow fits well over the spout of the basin and is well joined to it; if there is a crevice, a thing that may, and very often does, exist for years without occasioning a leak, fill it in (temporarily) with a putty made of pulverized charcoal and tallow, or with a putty made of one part carbolic acid and four parts of linseed oil mixed with sufficient whiting to the desired consistency. With these precautions it is safe to infer that no gases will find their way through the waste-pipes into the room."

What a dreadful thing it is to live in such a world as this, is suggested by the following, printed in gold on the cover of Dr. de Varona's book:—

"We live upon the back of a huge subterranean monster: its arteries, veins, and capillaries wind in all directions under our feet; its thousand gaping mouths surround us on all sides; its million scenting tentacles follow us into our very houses; we are never out of reach of its fetid breath; what it pours forth from its putrid lungs we take into ours. Is it to be wondered that one half of those who die, owe their demise to this foul communion?"

#### CAMERON'S PLASTERERS' MANUAL.<sup>1</sup>

The author of this little book says: "After an extended period of practical experience in the plastering business, during which time we have not seen a book of any description devoted exclusively to plastering, we have concluded that it would be a benefit to plasterers in general to write such a work and place it before the public." A wise conclusion, indeed, and on the whole, Mr. Cameron has done his work well, and deserves, what he will no doubt receive, the success which generally awaits books written in the sincere desire to assist the inexperience of others, by persons who know thoroughly what they undertake to teach.

The only regret we have in reading his work is, that in his desire to fill out to the proper dimensions what he had to say, he should have "lugged in" accounts of the composition of the "eminently hydraulic" and water-limes, the manufacture of béton, etc., which he does not perfectly understand himself, since he confounds Rosendale cement with hydraulic lime, and which in any case are totally useless to the public for which he writes, and could be learned by others much better out of General Gillmore's book. In another edition, if he will replace this scientific matter, of which, however, there is very little, by some comparisons of the Thomaston, Rockport, Rockland, Canaan, Glenn's Falls, and other rich finishing limes generally used on the Atlantic Coast, and of the black Vermont and the up-river ground lime used in New York, and will also give us his opinion on the causes and cure of chip-cracks, the radiating cracks about the angles of doors in partitions, the small-pox-like disease in which little cones of plaster fly out from the wall, leaving pits, each having at the bottom a tuft of black wool, and the various other diseases which afflict plastering, he will make still more acceptable and useful to the large body of masons, carpenters, builders, architects, and amateurs what is already almost a model book of its kind.

As a matter of general interest we cite the author's opinion that lime should be slaked by first putting on a small quantity of water to moisten the lime and start the process, then adding more, and stirring the lumps constantly. This, as is well known, is contrary to the instructions of Gillmore, the best living authority, perhaps, but it is in accordance with those of Rondelet, who says, after many experiments, that the paste of slaked lime forming on the exterior of the lumps will prevent the slaking of the interior portions unless the lime is constantly stirred. Into the merits of this question we will not enter; it is one which will repay investigation.

Mr. Cameron says also that the old notion that plastering mortar should stand ten days or more before using is erroneous; but he does not give very convincing reasons for it. That the mixture of lime, sand, and hair should not stand long, there is no doubt; but of the advantage of slaking the lime separately some days before mixing with the sand and hair we are ourselves thoroughly persuaded, and trust he will consider the point carefully in another edition before committing himself against a mode of work so inconvenient for speculating builders, but in our opinion, so valuable as a partial protection against the evils which come from bad lime and careless slaking.

**FIRE-PROOF PAPER.**—Fireproof paper may be made, according to the *Pharmaceutische Zeitung*, from a pulp consisting of one part of vegetable fibre, two parts of asbestos, 1-10 part of borax, 1-5 part of alum.

<sup>1</sup> *Cameron's Plasterers' Manual.* By K. Cameron. New York. Bicknell & Comstock. 1879.

#### CORRESPONDENCE.

##### EXCAVATIONS ON DELOS.

THE ÆGEAN, July, 1879.

THE island of Delos, much as its ancient celebrity promises to the investigating archaeologist, has, until lately, been but very superficially examined. The early editors, who, following the example of Stuart and Revett, first made the world acquainted with the beauties of Hellenic architecture, spent only a short time here, and the researches of Blouet were still less thorough. There is not even yet an approximately correct map of the island,—those existing having been prepared without a survey,—while there are excellent special charts of every notable site in Greece, as well as of many of the islands far less important than Delos. This seems strange when one thinks of the study devoted to much less attractive remains, but the reason for so apparent a neglect is a simple one. The place is so out of the way, so desolate, that it is possible to exist here only by procuring the necessities of life by great trouble and cost from a considerable distance. The island is entirely deserted; it is only temporarily inhabited by a few shepherds who come to tend the flocks of goats that wander among the rocks. Upon what these animals subsist does not appear, the parched ground bearing at this season only a few thistles. A single fisherman's boat has come to this strait to catch for the market of Syra the fish peculiar to this spot, whose flavor was so highly esteemed by Pliny; but if the traveller expects to find upon the island aught that could remind him of the ancient reputation of its inhabitants in fattening poultry he will be bitterly disappointed.

A more discouraging rock upon which to spend the time necessary for thorough investigations cannot well be imagined. It is to this alone that so long a delay can be attributed. The French were the first to undertake the work of excavation, and it has remained in their hands. M. Lebègue, with a small sum, furnished him while at the École d'Athènes by his minister of public instruction, began to uncover from fallen masses of stone the primitive cavern-like fane on the side of Mt. Cynthia, which he supposes to be the ancient site of the Delian oracle. It is well known by the plates and texts given in the *Revue Générale de l'Architecture*, 1874, IV.; and is described at length in the monograph upon Delos, which has subsequently been published (*Recherches sur Delos*, par J. Albert Lebègue, Paris, 1876). The exact acquaintance with this structure was the only direct result of M. Lebègue's work, though his book is a valuable contribution to literature, collecting all that it knows of the island and those points of comparative mythology which concern it. He possibly goes too far in the attempt to render importance to his fane, which is in itself only a half-built, half-excavated cellar, little calculated to support the immense weight of literary testimony, ranging from Homer to Ovid, which he brings to bear upon it. Four years after this beginning, M. Th. Homolle, also a member of the École d'Athènes, commenced the thorough work of excavation, upon which he is now engaged. The whole plan of this Apollo temple, and the forum like place around it, has already been unearthed, a large space in the middle of the city being freed from the superincumbent rubbish. It is impossible too highly to commend the manner in which this is being done. The removal of the earth and formless stones is effected with the greatest care; the architectural members being allowed to remain in the position in which they were found,—a great assistance in deciding their original place,—though here much has been dragged around by the destroyers and robbers of every age. This amateur piracy of antiquities, from which Delos has suffered more than any other Greek city, was inaugurated by Verres, a fit predecessor and patron of the class of which Lord Elgin stands a preëminent representative. The island has been fearfully pillaged; has served as a quarry for every vessel which, while lying to leeward of it, protected against the gales which disturb this part of the Mediterranean, has found leisure to take in a ballast of statues and columns of fine marble, easily to be disposed of elsewhere. Whole ship-loads have thus been carried off,—an evil work in which the English have, of course, been most active, though other nations have not been blameless in this instance. The care of M. Homolle in marking the situation of the architectural blocks, so well worthy of imitation, is thus unfortunately of comparatively little moment here in Delos, stones being found at great distances from the buildings to which they belonged; the architraves and cornices of two different temples lying cheek by jowl upon the plan of a third. The condition of everything is lamentably ruinous, early overthrown, and much weathered, being protected only by a shallow soil. The plan of the Apollo temple can never be accurately determined; from the substrations it seems to have been perfectly normal with pronaos and epinaos of usual proportion,—there were six columns upon the front, perhaps thirteen upon the side. Among the newly-found details the capital of the pronaos columns and the gutter, carved with anthemions and lions' heads, are the most important. Little more can be expected. The temple was of quite a late period, though of graceful forms and good Athenian workmanship. Towards deciding the plans of the portico of Philip and of the building with the curious steer capitals, not much has yet come to light. The former seems to have been always supposed too shallow, having a depth of fully ten inches, while in the latter the steers faced inwards, not outwards, as they are commonly restored. The portico must have had a wooden ceiling, and this accounts for the great attenuation of its columns and their wide intercolumniation. The proportions of a temple front would

have been out of place if applied to them, supporting as they did only their entablature and so light a roof. More may be hoped for as the work of excavation goes on, special attention not yet having been devoted to these structures. The site of the smaller temple of Artemis (or Latona) has been uncovered, but nothing of architectural moment has been found. It would be pleasing to meet with the cubical altars that were here, the story of which is so well known. The Delians were told by an oracle to erect an altar as large again as the one standing; they doubled its dimensions, and thus had one eight times the bulk of the first, a mistake which caused much speculation upon the cube root of two, — a troublesome question for the primitive mathematicians of that age. The blocks may yet come to light, and show how precisely they solved the problem. More important than the architectural remains are the statues and inscriptions; the latter have been discovered in great number, mostly dedications of the time of the Athenian supremacy — there must be now nearly one hundred of them. The statues are all much mutilated, — chiefly archaic, — and indeed of more direct importance to archaeology than to art. A few fragments are of great beauty, apparently of the time of Alkamenes. Most noteworthy among them is a female figure with a male torso, supposed by M. Homolle, according to the analogy of certain terra-cotta figurini, to represent the Rape of Proserpina. These statues, like everything that is discovered, are the property of the Greek Government. I have had occasion before, in a notice of the excavations at Olympia (*American Architect*, No. 120), to speak of the careless and unworthy way in which such treasures are treated. The stubborn neglect of the Greek officials reminds one strongly of a certain fable concerning a dog, told by their ancestors. The case of the Delian marbles seems even more hopeless than that of the Olympian; having been rescued from oblivion by so great labor and expense, the prizes are seized upon and thrown roughly into an inaccessible magazine on the neighboring island of Mykonos, where they will stay for years, the hope only remaining that at the end of the present condition of affairs they may experience a happy resurrection. In the mean time one must be thankful that photographs have been secured of them, some of which have been published in numbers of the *Bulletin de Correspondance Hellénique* for 1879. The work is at present being carried on by a force of between thirty and forty men, and advances southward towards the portico. A pretty little Roman exedra has just been uncovered in so good a state of preservation that by the readjustment of a few overthrown blocks it is nearly entire. M. Homolle thinks to complete his investigations and to have the results ready for publication in the course of two years. An architect will soon join him to assist in the preparation of the plates. The appearance of his volume will be looked forward to with much interest. Among the little dwelling-houses it would be useless to dig; all are too much ruined. They covered the greater part of the city, but must have been of the latest Roman period of the island's history. Built of rubble masonry of the mica schist of Mt. Cynthia, their remains are absolutely formless; only here and there is it possible to pick out a bit of mosaic pavement. In this sadly demolished condition, in which all these traces of antiquity exist, the attraction of Delos depends greatly upon that sixth sense, that powerful second sight which recognizes crowded streets and imposing edifices where lie but shapeless blocks and disjointed fragments. The past history of the sacred isle of the Ægean is reacted before the dreamer upon its deserted shores, a story of splendor and misery without an equal. What could be more happy than the brilliant Delos, — celebrated by poets, venerated by peoples and kings — Hellenic and Barbarian; respected even by pirates, peaceable during wars which armed all Europe and Asia. What more debased than the subjugated and unresisting island, under the yoke of Athens, and bearing, as it were, the brunt of the miseries which fell upon that state; its effeminate inhabitants fattening upon the offerings to their temples, exempt from any manly service, following the meanest of callings — mixers of salves, cooks, manufacturers of eunuchs. It is a history of human immunity from strife and of consequent deterioration, of a state at once venerated and servile. Its commercial importance as the centre of the Ægean, — of the Cyclades which circle around it, — as a port midway between Thrace and Crete, between Asia and Attica, — has been transferred to Syra. Its religious importance utterly passed away with the fall of Greek civilization from its pure height. The philosophers of Greece were full of pity at the decline of Delos, while the early fathers of the Christian Church rejoiced with a malicious glee at its fall. But the island sacred to Apollo has been true in its allegiance. No sanctuary of another faith has ever stood among the ruins of its temples, entirely overthrown as these have been for centuries.



## THE GOVERNMENT BUILDING — A LEGAL CASE.

CINCINNATI, O.

SHOULD all things else fail in Cincinnati to form an architectural subject for contemplation, the government building kindly steps into the breach and thoroughly fills any void or vacancy. It has done so for the past five years, and will do so for five years yet to come, no doubt. Things go on but slowly. The seven immense derricks that we spoke of last year are still as anxious, now as then, to grapple with any stone that may come within the reach of their long arms.

The stone is now being set for the fourth story, which is, perhaps,

half finished. The openings for this floor, unlike those below (which are all square headed), will have semi-circular heads; above these openings is to come the main cornice and dormer-windows; and then (sometime in the future) the immense roof.

This building, we take it, is the best of the large number of large buildings designed under Mr. Mullett's administration. The main lines are classic in their conception, there can be no doubt about that, the details are a cross between French and Italian, and while they are in themselves good yet one cannot help wishing that some greater master had had control and had throttled the abortion at its birth. The greatest mistake of the building, and one that will last for all time, is, that the first-story columns are channelled in regular courses, in the same manner as the rusticated work of the Italian school; thus giving the appearance of an actual weakness to what should be the most substantial part.

One wonders, as he gazes at this immense pile of granite stacked up in the open court, why the Ohio freestone of which this city is mainly built was not good enough for this building, but was the very thing for Chicago, four hundred miles away, and that we have to go to Maine for the material with which our building is built. These facts will certainly afford food for reflection for future ages.

The case of *George H. Pendleton et al. vs. Samuel Fosdick et al.*, lately tried before Judge Foraker, was of considerable interest to the building fraternity in that most of the architects and many of the builders were mixed up in it. It appears that the plaintiffs own the bank building next adjoining on the south the five-story stone-front building that was destroyed by fire last January, as recorded in the *American Architect* at the time, — while the defendants own the destroyed building, who, after the insurance companies had adjusted the losses, retained Mr. A. C. Nash as their architect, and commenced to rebuild.

There was a question as to whether the wall dividing the premises was a party-wall or not, but we leave the question as one of law, and come to the main issue, to wit, as to the strength of the party-wall (assuming it to be such) to sustain the weight it was intended to sustain. The old wall was thirteen inches thick; was built in olden times, when it was supposed that honest work was done; was of hard brick, and laid in cement. The plaintiffs claimed that this wall was insufficient; that it had been injured by the fire from one to two inches; that the iron joists in falling had further weakened the wall by tearing out parts of it; and they brought numerous witnesses who offered voluminous testimony (about 500 pages in all). The burden of proof of course lay with the plaintiffs, and in order to prove their claim they brought on to the stand, as probably their chief witness, Colonel A. L. Anderson, Chief Engineer of the Board of City Commissioners, whose testimony was well received until it came to the cross-examination, when it appeared that his knowledge of architecture was limited to the erection of officers' quarters on the frontiers, and that there was no building in Cincinnati that at all approached his standard of safety, and that if there were any the walls would probably be about ten feet thick.

The burden of the entire investigation seemed to be to ascertain how much the wall had been weakened by the intense heat and the great quantities of cold water thrown upon it during the fire. Most of the testimony seemed to show that the wall had been weakened two inches in depth.

Mr. Nash viewed the old wall (the one so well built) as a mere foundation for his new wall, and, after exhaustive computations, decided it strong enough; and the court seemed to think the same, for judgment was rendered in favor of the defendants. C.

## MR. CLARKE'S ESSAY ON "THE HYPÆTHRAL QUESTION."

ASHFIELD, August 20, 1879.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Gentlemen, — After the criticism in your last number (August 16), by Mr. Thomas Davidson of Mr. Clarke's Essay on "The Hypæthral Question," it may interest some of your readers to learn the opinion of one of the most eminent German authorities as to the worth of Mr. Clarke's paper.

Dr. Franz Reber is the Director of the Old Pinacothek at Munich. He is the author of probably the best existing concise history of ancient art, and of a history of ancient architecture, which exhibits not only thorough scholarship but rare good sense. He is also known by an elaborate and authoritative work on the Ruins of Rome, and he has given special attention to the text and the interpretation of Vitruvius.

In a letter to me dated June 19, he says: "Clarke's essay is excellent. I believe that the Hypæthral Question, considered up to this time as settled by Böttiger, is fairly opened again by Clarke's work, and lies undecided, unless a decision be made at once in favor of the Ross-Clarke view. I incline to it, and shall give expression to this inclination first in a critical journal, and then in (the new edition of) my book."

I am, very truly yours,

C. E. NORTON.

CURIOUS BEHAVIOR OF LIGHTNING. — A house in the Avenue de Clichy, Paris, was struck by lightning, which followed a water pipe to the earth, and then reascended to the fourth story. — *Les Mondes*.



## NOTES OF EXPERIENCE AND INEXPERIENCE.

34. **STOVE.** — I hope Subscriber will find his client willing to pay for the privilege of breathing fresh air from one of the open stoves made by the Open Stove Ventilating Co., 78 Beekman street, New York, which will warm and ventilate at the same time. For ventilation, without a great deal of heat, a Franklin stove of iron or soap-stone can be had of the Murdock Co., 21 Washington street, Boston, or W. H. Jackson, Union Square, New York. If he insists on heat without ventilation, the soap-stone stoves made by J. H. Serene, 4 Peck Slip, New York, are as cheap as iron, and much better. If he must have iron, the Magee Co., Union Street, Boston, can furnish him with all kinds, beautifully cast and finished, and hundreds of other makers can do nearly as well. The base-burners are the most convenient for hard coal, and are now well made by any manufacturer. The makers will give the size necessary. The Magee Co. make an open stove for hard coal which can be made air-tight by pulling up a kind of lid. This warms very well, and gives good ventilation also. C.

35. **WATER-COLOR PAPER.** — R. B. will find Whatman's Antiquarian paper, in solid blocks or small sheets, very good for water-color sketching. For finished pictures Harding's paper, which has a cream tint, helps the warmth and softness of the work. The French *papier torchon*, though rough, is pleasant to work on, especially in sketching. The Harding paper is comparatively smooth, but if still smoother is desired, the Antiquarian hot-pressed will be found good in every way. C.

## NOTES AND CLIPPINGS.

**THE PROPOSED BRIDGE OVER THE ENGLISH CHANNEL.** — In order to give as clear an idea as possible of this gigantic enterprise, it will, perhaps, be advisable, after stating that the viaduct is to span the Channel from Cape Grisnez to Folkestone, to begin at the beginning, or, rather, at the bottom of the sea. According to the Admiralty soundings, the greatest depth of water to be found on the passage is 55 metres, and this only for a distance of some 4 kilometres, about half-way between the Varne Rock and the French coast. This Varne Rock and its neighbor, the Calbart Reef, are destined to play an important part in the scheme before us. The former, situated at 15 kilometres from Folkestone and 20 kilometres from Cape Grisnez, is some 4 kilometres broad, covered with no more than from 2 to 15 metres of water. Being of solid rock, and in a direct line with the projected viaduct, it offers itself as a natural half-way resting-place. This rock has till now constituted one of the greatest dangers to the navigation of the channel. M. De Sainte Anne, however, proposes not only to turn it to account by using it as the foundation for a portion of the viaduct, but also, in conjunction with the Calbart Reef, for the construction of a free port, in which vessels of the greatest tonnage will be able to seek shelter from the storms so frequent in the strait which separates England from France. Both for the construction of this port and for reducing the depth of the water to 20 metres in those places where he will be obliged to construct his columns, M. De Sainte Anne proposes to adopt the method employed in the construction of the Cherbourg breakwater, which consists in dropping huge masses of rock into the sea, and in consolidating them by means of Roman cement. Knowing, however, how continually the Cherbourg Breakwater was destroyed by the force of the waves, it may be permissible to doubt whether M. De Sainte Anne will find it so easy as he imagines to carry out the construction of his port of refuge in mid-channel; but the objections which apply to the superstructure of the breakwater for the port do not, however, hold good when the same system is employed to reduce the depth of water. On the foundations thus established it is intended to raise solid masses of masonry to some 40 metres above the level of the sea. This is, of course, a gigantic work, the immensity of which will be seen at a glance when it is remembered that M. De Sainte Anne does not contemplate attempting in his viaduct any span exceeding 200 metres. The distance from Folkestone to Cape Grisnez being 35 kilometres, it will, therefore, be necessary to construct at the very least 175 immense blocks of masonry on which to place the superstructure. The details of the scheme are not yet decided upon. At the present moment M. De Sainte Anne confines himself to the assertion that it is practically demonstrated by the Cherbourg breakwater that it is possible to find a solid foundation for as many columns as it may be ultimately found necessary to erect to support the viaduct. As to the superstructure itself, he proposes to employ three systems. On the Varne Rock and at the two extremities, where the water is shallow and the exigencies of navigation permit, he proposes to erect solid stone arches which will have nothing to fear from the fiercest tempest. This massive masonry is to be followed by the girder-bridge system, such as is employed in the Charing-Cross Railway Bridge. But to span the deep water he has recourse to the tubular-bridge system as applied by Sir Robert Stephenson in the erection of the Menai Bridge. With these three systems combined, the eminent originator of this gigantic scheme believes that he is not only certain to succeed in crossing the Channel, but also in satisfying the demands of every government concerning the precautions to be taken to prevent the navigation of the English Channel being rendered even more dangerous than it is at present. Taking the Bretagne, which bears higher masts than any other vessel in the world, he has already applied to the French Admiralty to know if it considered that this vessel would experience any inconvenience in having to pass under his viaduct raised to 35 metres above the level of the sea. The answer he received was, that with 150 metres between the pillars and the platform of the viaduct raised to the altitude of 35 metres, neither the Bretagne nor any other vessel would be impeded in its passage. Supposing this scheme to be practicable, there still remains much to be done before the works can be even commenced. M. De Sainte Anne promises, however, to commence operations without delay. He informs us that he will not require more than six or seven months for the scientific experiments and the thorough elaboration of his project, and that a sum of 1,000,000 francs will suffice to pay the preliminary expenses. To raise these funds he has already laid his project before the Chambers of Commerce of France and Belgium, from eighty-four of which he has already received adhesions. M. De Sainte Anne, nevertheless, wishing to give England the option of participating in the honor attached to the achievement of his project, intends shortly to visit our shores, in order to lay the matter before the Government, and to submit his plan to the approbation of the technical societies. — *London Standard*.

**FACTS ABOUT LIGHTNING RODS.** — In an interesting article in the *Building World*, it is stated that there is in Carinthia a church which was so often struck by lightning that at length it became the custom to close it during the summer months: this continued until in 1778 the church was rebuilt, and provided with a suitable lightning-conductor, since which time the building has been struck but few times and has suffered but little damage. It was at one time held that the best way to protect a building was to repel the lightning from it, and as glass is one of the best non-conductors, a thick glass ball was placed upon the top of the spire of Christ Church, Doncaster, England, but in 1836 lightning struck the church, shattering the ball and seriously damaging the spire. The carrying out of a theory which in this case proved so disastrous has had a happier result in the Houses of Parliament, London, where Sir W. Snow Harris, who was charged with protecting the building, carried the flat copper bands which were used for lightning-conductors behind the plastering of the walls; and Faraday caused a spiral channel, following the course of the stairs from top to bottom, to be cut in the granite of the light-house on Plymouth breakwater, in which was laid the massive copper lightning-rod. One of the best instances of what may be called natural protection is afforded by the London Monument. This column, some two hundred feet high, is crowned by a bronze flame, which typifies the great fire of London, this flame is in contact with the bars of the iron cage in which it was found necessary to enclose the balcony at the top, to prevent persons from throwing themselves over, and the bars in their turn connect with the rail of the balcony and the hand-rail of the staircase which descends to the ground. It is useless to try to insulate the vane spindle or finial upon a tower or spire by using glass rings; it is better to make this rod the upper part of the lightning-conductor. The earth end of a lightning-conductor should be carried to continually damp earth, or running water, but not to a stone-lined well or cistern, because serious damage is known to have been done by return shocks in cases where the dissemination of the fluid was so checked.

**AREA AFFECTED BY LIGHTNING.** — Prof. Alfred M. Mayer of the Stevens Institute, writing to the *Scientific American*, gives the following account of an experiment made by him at Baltimore many years since, to show the extent of the earth's surface affected by lightning. One wire of a galvanometer was connected with the water pipes of Baltimore, while the other end of the wire coil was joined to a gas-pipe of the house, situated in the northwestern part of the city. Thus a vast system of metallic wires stretched away three miles to the northwest to the reservoir, and also extended to the gas works, distant two or three miles to the southeast. A thunder-storm was raging at the time at so great a distance in the north that only the illumination of the clouds told when a flash occurred. Yet, whenever that flash took place the needle of the galvanometer was instantly deflected through 10 to 20 degrees. The two occurrences were simultaneous apparently, for no difference in the instant of their manifestation could be detected. Indeed, so sure an indicator of the flash was the galvanometer, that when Professor Mayer shut himself up in a dark room, signaling to an observer of the storm when the needle moved, and receiving from him a signal when a flash of lightning occurred, the signals were simultaneous. The next day it was ascertained that the storm was twelve miles distant to the north; therefore, at least five hundred square miles of the earth's surface had its electrical condition changed at each flash of the lightning.

**A CONCRETE HOTEL.** — One of the effects of the panic of 1873 was to defeat certain railroad projects in Virginia, and suddenly check the growth in its infancy of a grandly laid-out city near Quantico, in Prince William County, in that State, about thirty miles down the Potomac. New York capitalists purchased there a tract of land — about seven thousand acres. This tract they laid out in streets, avenues, and squares, and named it Potomac City. Mr. Bangs was so confident of the success of the enterprise that he immediately had erected, near the intersection of Potomac Avenue and the railroad, a large hotel. This is a concrete building of four stories, containing one hundred and twenty-two rooms, and cost \$68,000. It is well arranged and finely finished. This building, now occupied only by some one to care for it, has long been a wonder to those who have caught sight of it from passing cars or steamers. The enclosure surrounding it having once or twice been cultivated in corn, gave it a still more singular appearance — a hotel in a cornfield. — *Washington Star*.

**THE BLACK MILDEW OF WALLS.** — Apropos of an observation by Professor Paley, regarding the cause of the blackness of St. Paul's, which he attributed mainly to the growth of a lichen, Professor Leidy recently stated to the Philadelphia Academy that his attention was called a number of years ago to a similar black appearance on the brick walls and granite work of houses in narrow, shaded streets, especially in the vicinity of the Delaware River. Noticing a similar blackness on the bricks above the windows of a brewery, from which there was a constant escape of watery vapor, in a more central portion of the city, he was led to suspect it was of vegetable nature. On examination, the black mildew proved to be an alga, closely allied to what he supposed to be the *Protococcus viridis*, which gives the bright green color to the trunks of trees, fences, and walls, mostly on the more shaded and northern side, everywhere in that neighborhood. Professor Leidy thinks it may be the same plant in a different state, but, until proved to be so, he proposes to distinguish it by the name of *Protococcus lugubris*. — *Exchange*.

**THE DENSITY OF MOLTEN IRON.** — An exchange says that some experiments on the relative density of liquid and solid iron show that pieces of pig-iron placed in melted metal at first sink, but in a few seconds rise again and float on the surface. Flat bars of cast-iron carefully laid on the surface continue to float. A solid ball, two and three fourths inches in diameter, lowered into the metal by a fine wire, disappeared completely at first, but rose in a few seconds and floated, with a portion about half an inch in diameter exposed. Since, therefore, in foundry practice, one ninety-sixth is allowed for linear contraction of cast-iron, it is concluded that the finally cooled solid is denser than the molten metal; but, as the sharpness of iron castings points to an expansion of solidification, it is also believed that the contraction that takes place in cooling more than counterbalances the degree of expansion during solidification.