

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. VI.]

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[No. 187.]

BOSTON, JULY 26, 1879.

Entered at the Post Office at Boston as second-class matter.

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A FORCE of workmen from the Leighton Bridge Works, of Rochester, was on the afternoon of the 19th inst. engaged in erecting the iron roof-trusses of the great round-house of the New York, Lake Erie, and Western Railroad Company at Buffalo, when, for some cause as yet unassigned, the portion already in place fell, mortally injuring several men, and inflicting painful bruises and contusions upon many others. The building is intended to accommodate forty-four engines, and must have been large. One section of the roof was already in place, and another was nearly completed, when the accident occurred. There are various suggestions made as to the cause, but we shall await the verdict of the coroner's jury with interest. If, as seems probable, there was carelessness in the arrangement of the temporary shoring and braces required in the process of placing the trusses, or if, as is not unfrequently the case, the trusses were in this process exposed to strains which were not provided for in the permanent construction, and not sufficiently guarded against by temporary contrivances, and so failed in an unfortunate moment, it is to be hoped that the verdict will clearly set the matter forth, so that the case may serve as a timely warning. The raising and placing of a complicated roof-truss is not a matter to be left to riggers and to handy foremen merely.

THE final opening of the Mississippi to the commerce of the world, as declared in the reports from Washington, seems to be an event of first-rate importance both from a commercial and from an engineering point of view. Captain Eads, by obstructing the flow of water through the secondary mouths of the river so as to give greater volume to that passing through the South Pass, and by sinking his mattresses in two parallel jetties three miles long towards deep water on either side of this pass, has changed the depth of this mouth from six feet to thirty, and thus the maximum channel required by the Jetty Act is said to have been secured. It is to be observed that the act would not allow the engineer to operate on South-West Pass, through which flowed by far the greatest volume of water, fearing to expose the only ship channel, insufficient as it was, to injury by what was regarded as an experiment of engineering. This difficult feat has been accomplished in the face of innumerable obstacles, and with no encouragement from the best engineers in the army and in civil life; and even if, as is claimed by some of them, the deepening of the channel is not permanent on account of the facility with which the detritus washed down by the currents of the great river accumulates in bars at the outlets, sooner or later rendering necessary costly extensions and repairs of the jetty system, or the continued maintenance of an expensive system of dredging, — even if his operations have not secured lasting results, he has indicated a practical way of making the great river scour out its own channels. Moreover, it is said in New Orleans that the saving on freight in cotton, which can now be sent abroad directly from its wharves in heavy ships, without transshipment, is sufficient to pay the entire cost of the jetty work in a single year. We have referred to this interesting under-

taking in these columns from time to time, and now that the immediate result aimed at seems to have been successfully achieved, and the lower Mississippi opened to the commerce of the world, mainly by the courage, skill, and persistent effort of one man, the undertaking must, on the whole, take rank with the most important engineering efforts of the century.

IN the discussion on the question of the construction of libraries which took place at the late National Convention of Librarians in Boston, there was exhibited the same tendency to undervalue the services of architects that we are accustomed to see among mill owners, railroad directors, real estate speculators, and in short among all those classes of men who demand in their building operations the most economical and most direct adaptation of means to ends. In fact, a line seems to be sharply drawn between fitness and beauty; on the one side of this line the services of the engineer or builder alone are in demand; on the other the architect has won for himself what may be considered as a due consideration; so that the same gentlemen who deny the fitness of architects to build their factories, their grain-elevators, their storehouses, and their speculative blocks, will readily recognize the value of such professional assistance in the construction, and possibly in the decoration, of their own dwellings, or when serving upon building committees for churches or town-halls. This prejudice found fair expression in the discussion to which we have alluded, when one librarian of eminence gave utterance to a remark which apparently found acceptance among most of his brethren, that in building the ideal library it is necessary to forget all that architects have hitherto done for them, and to begin anew upon what he called a practical basis, without any embarrassments from the traditions of architectural practice; as if ideas of beauty and style, which seemed to be considered the whole stock in trade of architecture, could only be expressed at the expense of some practical requirement of convenience and necessity. The ideal structures proposed at the meeting to fulfil these practical requirements were simply impossible and extravagant, as might have been expected, — productions of Wonderful Lamps, — but the sound common sense and the valuable fruits of experience, which were their inspiration, were of course under proper treatment capable of expression in buildings which would have economy, fitness, and the beauty which comes of fitness, — buildings which would be works of architecture as well as works of convenience. Doubtless architects themselves are in part responsible for this vital misunderstanding regarding their functions; but the difficulty mainly lies in the public, who have not been taught that beauty and perfect fitness are to a great extent synonymous terms, and that the former is the natural outgrowth or flowering of necessity, and is never at variance with it. An engineer, however, — nay, even Professor Huxley's practical bricklayer, — may produce a work of fitness, a work admirably suited to fulfil every essential requirement, but without any expression of beauty. It is the business of the architect to obtain this expression of beauty without any unnecessary sacrifice of the fitness and economy which are the fundamental basis of all sound building. If this result is not often attained by the profession, it is because there are architects and architects, just as there are doctors and doctors, among whom, by the bye, obvious interests have taught the public to exercise a discriminating choice.

WE regret to have to record the death on the 16th inst. of Mr. Henry T. Brush, architect, of Detroit, and a representative of the most conscientious professional thought in the West. He had a good practice and was responsible for some of the best work in his neighborhood. While in this city a year ago he gave evidence of ardent aspirations towards the establishment of a higher grade of professional practice in the West, and with many expressions of regret as to what he modestly conceived to be the limits of his own attainments, he exhibited an unusual degree of sensitiveness as to some high artistic ideal which seemed to be beyond his reach, but which, as a student still in the midst of a remunerative practice, he aimed to realize in his future work. He came eastward, he said, the better to equip himself by observation for an improved career, and to obtain advice as to studies in architectural aesthetics. It may be that, though from a business point of view he was a successful practitioner, he became morbid and discouraged at some real or fancied inability

to give adequate expression to these aspirations, and this, combined with physical causes perhaps, as he was an invalid, was sufficient to prompt him with curious deliberation to solve the complication by a most deplorable act of suicide. As yet his neighbors and friends have been able to assign no distinct cause for it. He left a wife and two children.

LONDON bridge is fifty-three feet eight inches wide, and allows four lines of vehicular traffic, while its approaches on one side admit of six lines and on the other of eight lines. This condition of affairs causes an overcrowding of this monumental thoroughfare at certain parts of the day, and an annual expenditure on the part of the city of \$3,750 for the maintenance of a special police force to preserve the necessary order and regularity of movement. A proposition has been introduced into Parliament to remedy this evil by increasing the width of the bridge to seventy-six feet two inches by removing the present stone parapet and substituting a structure of iron, in the form of heavy corbelled balconies, apparently, which must project some ten or eleven feet on either side of the roadway over the sides of the bridge. The Royal Institute of British Architects as a body, and several leading architects personally, have protested against this desecration of a famous monument, and the conservative spirit thus aroused has been sufficient to arrest the progress of the bill through the House of Lords at so late a stage as its third reading. What may be the final fate of the bill does not appear. The council of the Institute expresses its unanimous conviction that if the width of the bridge must be increased, the right way to do it is by adding what may be required in masonry of exactly the same design as at present. The *Builder* draws attention to the fact that when the bridge was constructed the margin of stability was so narrow that after the fifth arch was keyed, not only did the crown of it subside four inches, but it was found that the down-stream side of the bridge settled from ten to fourteen inches more than the upper side before it reached the final bearings of the structure as designed and built by Sir John Rennie. From this it is argued that the imposition upon the original foundations of a mass of supplementary iron-work, added for the express purpose of allowing a heavier moving load to come where never contemplated by the engineer, would endanger the stability of the whole structure. We as Americans can contemplate the economical and practical questions involved in this controversy with great equanimity, if not with indifference, but as regards the preservation of this noble monument in its familiar shape (though in its present form not more than half a century old), it is so associated with the most characteristic aspects of the city that we are disposed to be more conservative even than the English architects themselves; we instinctively rank it with the Tower of London and the Dome of St. Paul's, and cannot but regret the prospect of a change which from a sentimental and from an artistic point of view seems to be of exceedingly doubtful expediency. It is a curious fact, by the way, that this proposed disfigurement of one of the finest structures of its kind in the world seems to be regarded by the general public of London with complete indifference; even the Society for the Protection of Ancient Buildings, so jealous of any interference with the old churches, which may or may not be connected with local history, does not lift a finger to preserve this, the most conspicuous monument of them all, from being overlaid with some unspeakable apparatus of cast-iron.

SCENES upon London Bridge, both in its ancient and in its modern form, are so picturesquely associated with the social and political history of the metropolis, and with English literature in general, that this great thoroughfare may be accepted as the centre of life in the metropolis of the modern world, as upon the Via Sacra was concentrated all that was most characteristic in the life of ancient Rome. Every day between eight A. M. and eight P. M. more than twenty thousand vehicles and more than one hundred and six thousand pedestrians crowd over the bridge with a continuous roar of traffic. The picture of this multitudinous but steady and well-ordered torrent of human life, with all its suggestions of complicated and world-wide interests, flowing over a causeway which, though more than fifty feet wide, is insufficient for its convenient progress, is very characteristic. No less so, but in curious contrast, is that presented in Mr. Edward I'Anson's interesting paper read before the Royal Institute of British Architects, on the 9th of June, on the Roman Forum, the focus of the metropolis of the ancient world. "The Via Sacra," he says, "through which we are told the Emperors of Rome

passed, followed by captive potentates, with the trophies of victory, and long trains of armed warriors and slaves; where, on their way to the capitol, the victorious emperors proceeded to solemnize their triumphs with religious rites, and the captive kings were led to their prisons; where the great annual religious processions of the people, carrying their images and their gods, passed on their way to the Palatine Hill; this great thoroughfare of Imperial Rome was *only twelve feet wide.*" How long the ædiles of modern London or of still more modern Boston, with its inheritance of narrow streets, would have suffered such a constriction of travel as this implies may be easily imagined: the arch of Septimius Severus would have fallen at the edict of the Common Council of the time, just as that of Temple Bar has fallen, and the Basilica Julia would have been pared off with as little compunction as the architectural blocks that stood in the way of New Washington Street, in Boston, or obstructed the passage of the great thoroughfares of modern Paris.

If a society for the preservation of ancient buildings has an existence in Venice, its deliberations must long have been embarrassed by the amount, importance, and character of the dilapidations among the historic buildings of that city; and now Mr. Ruskin should certainly be summoned to assist them, as the authorities have been lately impelled by the dangerous condition of the southwest angle of the Doge's palace—that towards the columns of St. Mark—to put into execution plans long since arranged for the rebuilding of the façade towards the Giudecca, which we believe is the most ancient part of the structure. It is said that the process of decay was proceeding so rapidly that no half-way measures could save it. The columns were out of the perpendicular, and the arch-stones slipping from their places. We learn that at the point named the arcades of the first and second stories have already been taken down, but that the famous group of Adam and Eve on the corner has been carefully preserved. Certainly here is an opportunity, if ever there was one, for the most patient exercise of all the virtues which can be demanded of the restorer. To what extent respect for antiquity will permit the insertion of new material, new facings, possibly new carvings, to make good the obliterations of time in the details of this edifice so hallowed in the service of art, is a question which the modern conscientiousness in such matters has rendered exceedingly delicate. The Italians have hitherto not exhibited much of this quality in the treatment of their antiquities, and it is to be feared that at least English sensitiveness is destined to receive a shock. It is worthy of remark, by the bye, that the character of these dilapidations and the fact that the most imminent danger exists at the corners amply demonstrate the fundamental structural weakness of this famous monument, and the absence of due consideration of statics in the designing of it. No modern architect, with a proper knowledge of the necessary relationship existing between structure and design, would venture to superimpose a great unbroken mass of wall upon two open arcades, of which the upper, though very beautiful, is singularly ill-adapted to withstand an accidental strain, without a strong and visible expression of abutment at the angles. But such an expression would have deprived the Ducal Palace of its most picturesque and characteristic feature.

THE Royal Gold Medal for the present year, the highest honor in the power of the Royal Institute of British Architects to bestow, was, on the 23d ultimo, presented to the Marquis de Vogüé, Ambassador of France at Vienna, the distinguished archaeologist, whose contributions to the knowledge of the remains of Greco-Roman architecture in Syria and Asia Minor are of inestimable value. His most famous work, *La Syrie Centrale*, is illustrated by a remarkable series of plates setting forth with admirable exactness and distinctness a chain of monuments of early Christian architecture of elegant and curious stone construction, which have the rare merit of being novel, instructive, and interesting alike to the architect and the antiquary. The cosmopolitan spirit with which this distinction has been conferred by the Institute may be inferred from a list of the medalists: among the English recipients are Sir Henry Layard, and Messrs. Cockerell, Barry, Smirke, Pennethorne, Wyatt, and Fergusson; the French are MM. Hittorf, Texier, Duc, Leseur, Viollet-le-Duc, and the Marquis de Vogüé; and Herr Lepsius represents the German element. We understand that it is the custom of the Institute to bestow the medal upon a foreigner every third year.

AMERICAN DRAMATIC THEATRES. II.

At the very beginning in theatre planning one is confronted by the fact that the buildings, audiences, and entertainments with which he has to deal are, from a combination of conditions, subject to greater danger from fire and panic than under ordinary circumstances. The general reasons for this danger lie in the amount of temporary, changeable, and necessarily combustible material used for scenic effects; the powerful and general illumination required; and the stimulated and excitable condition of audience and performers. To intensify these a very marked factor in the estimate of hazard is found in the general and not unreasonable belief that the theatres of to-day are more or less unsafe. At the dedication of one of these, about two years ago, it was said by a prominent public man that he had spoken in about one hundred opera-houses in various parts of the country, and had never done so without first looking to his means of escape. The statement was entirely just; for until recently, and with a few prominent exceptions, the American fashion has been to gain all the show, convenience, and even luxury, attainable, with little regard to security. To reform this altogether is the missionary duty of the architect; and the chance of doing so is better than might be supposed; for the projectors of theatres and their managers are often liberal as well as shrewd and practical men.

The spasmodic and intermittent demand of the public for absolute security requires guidance in the light of reason. There is no such thing as absolute security to frail humanity; and in a new country rapid progress and intense activity multiply the dangers to life and limb. The requirement then in theatre-building must be a reasonable approximation to safety, in keeping with other good building of the time, and equivalent to what is demanded in other public works; and in all practice a steady advance towards perfection.

In the choice of a site, or rather in the use of a site,—for the architect seldom has a voice in the selection of the lot for this purpose,—is found the first serious obstacle to perfect safety, elegance of design, and even convenience. The enterprise must be a paying one. Where the ground is valuable, rear land must be utilized, or the lower floor must be devoted to shops. Neither of these conditions is conducive to the greatest measure of security. But the law allows them, and is likely to; and a condition of things many times worse is permitted by the authorities of most American cities in places of the kind already established. To make and enforce a law compelling theatres to be isolated would simply result at present in the prohibition of nine tenths of the theatre building. If the walls against other structures and on narrow courts and passages are made solid, of brick, sufficiently thick and with high parapets; if entrances, either by passage or by staircase, are absolutely proof against fire and smoke for a reasonable length of time, we have, with other common precautions, as safe a condition of things as can be expected immediately. But the simplest way to safety lies in the reduction of the size of the hall. A great crowd on a prairie may in a sudden rush knock down and trample some of its number to death; it is in the combination and concentration of many forces that the danger arises. The safety lies in the limitation of numbers, and in division and diffusion of hazardous energies. A free, level passage-way for exit may, under some circumstances, prove worse than several narrow and circuitous ones of equivalent width.

In the majority of American theatres the architecture of the exterior is conspicuous by its absence; or, if the building is in a position to be seen, the difficulty of fitting outside to inside lines, where the former are expected to be somewhat regular, is much increased by the lack of intervening lobbies, vestibules, and ante-rooms, which in foreign practice conveniently assist in marrying façade to plan without help from shams in the shape of false windows and the like. Although the requirements of the interior may remain unchanged, in many cases the restrictions imposed by want of room and irregularity of contour of the proposed site necessitate fresh expedients in each new case. It is very easy to plan a good stage and auditorium with ample land and equally ample expenditure; but where both are closely restricted, it becomes one of the most intricate problems with which one has to deal.

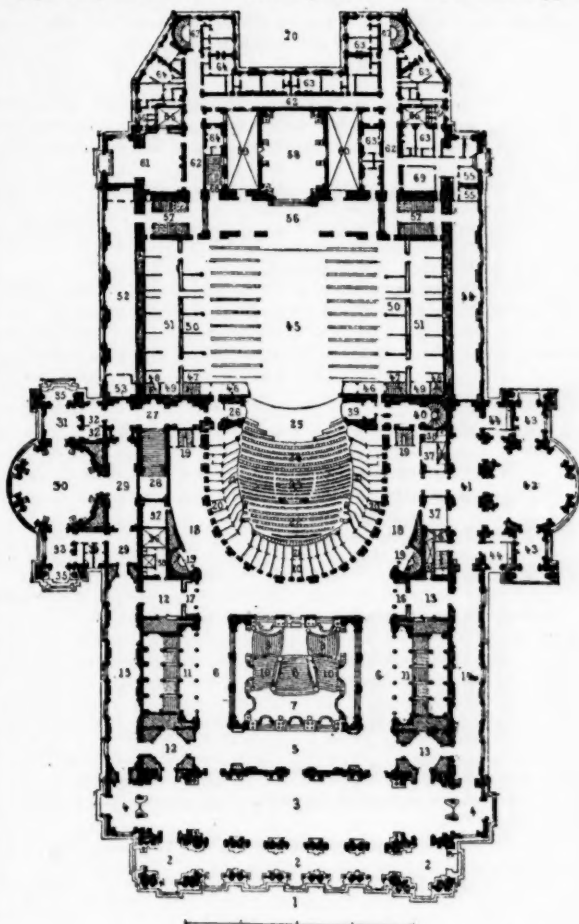
It will be seen by reference to the accompanying plan of the New Opera-House, Paris, that the theatre proper does not occupy one half of the building; the remainder being devoted to grand vestibules, halls, etc., the whole constituting a palace for musical and other festivals, rather than a lyric theatre.

A theatre, more than most other buildings, depends on fitness for success. No amount of elaboration of parts or excess of decoration can compensate for lack of practical qualities. No building is more difficult to understand from the drawings, and the inexpert can form no conception of the final effect of a work of this nature from any amount of pictorial illustration.

Theatre building has generally been stigmatized as sham; the permanent parts being often confused with the temporary machinery for scenic effect. But although there undoubtedly has been some very bad work done and many blunders made, as a class such structures are little if any worse than the average of buildings. In a late and famous example of church building, one may find the massive brick piers, disguised by lath and plaster screens, made by the help of bronze paint to stand for clustered metallic shafts. If the Lord's houses are fruitful in such misleading examples, what can be expected of the temples of amusement?

Small theatres have been found to pay better, in the long run,

than larger ones. They require less scenery, a smaller ballet, orchestra, and mechanical force, less gas, fewer ushers and doorkeepers, and the general reduction of expenses is very considerable. When only partially filled the auditorium presents a more cheerful appear-



2, Loggia; 3, 4, Foyer; 5, 6, Stair-well; 7-10, Grand stairway; 11, Stairway to upper boxes; 14, Refreshment-rooms; 15, Smoking-room; 18, Box-Corridor; 19, Secondary stairways; 20, 21, First tier of boxes; 22-25, Auditorium; 26, State-box; 27-35, State apartments; 36-44, Restaurant; 45, Stage; 58, Foyer de la danse; 61, Foyer du chant.

The New Opera-House, Paris.

ance; and, though the money gains are somewhat reduced, the chances of loss are lessened in a greater measure. More than this, they are more suitable for the comedies and light pieces most in vogue, and their audiences are enabled to see many fine points of make-up and acting either lost or necessarily burlesqued in a larger house. But, added to these considerations, they may be made in every way much safer. By small is meant with an auditorium to seat not over 1500 persons, or still better not over 1200, and a curtain opening about thirty feet wide. Assuming that the size does not vary materially from this standard, the natural division of the building is into entrances,—under which head would be included lobbies, stairways, retiring-rooms, and all the space outside the hall proper intended for the convenience and safety of the public,—then the hall, or auditorium (the shorter word seems preferable, and will be hereafter employed), with its divisions of floor, galleries, and boxes, and lastly the stage, with rooms for assembly, administration, dressing, storage, and mechanical departments. In the late French examples these divisions are plainly indicated in the design of the exterior, which really seems made up of three buildings, in the same general style, set together for convenience of use. It would be difficult for the intelligent observer to mistake the character of the New Opera-House at Paris. The uses of the three great divisions are so distinct, and their absolute separation so necessary, that there seems to be no room to cavil at the propriety of such a treatment, no matter in what style the building may be designed.

The same general combination of parts was shown in several modes in the competitive designs for the new Shakespeare Memorial Theatre at Stratford-on-Avon, England.

J. A. F.

RECENT MODIFICATIONS IN SANITARY DRAINAGE.¹ I.

It is only about four years since I published in these pages a series of papers on The Sanitary Drainage of Houses and Towns. So far as possible, I therein stated fairly the condition of the art at

¹ A paper by Col. George E. Waring, Jr., published in the *Atlantic* for July.

that time. Viewed in the light of present knowledge on the subject, those papers are already, in many respects, quite out of date. Knowledge has increased, experience has multiplied, and invention has been most fertile. The illustrations then given of the arrangement of house-drainage represented a soil-pipe and drain running in an unbroken course from the sewer in the street, under the basement floor, and up through the roof of the house. Connected with it were several water-closets, a sink, and, the overflow-pipes of the tank in the attic and of the service-cisterns of the closets. In all cases the different vessels were separated from the soil-pipe only by water-sealed traps, and only the same protection was afforded in the case of the main tank. The system thus represented is defective in several particulars.

(a.) The water of the tank is liable to dangerous contamination through the overflow-pipe which leads into the soil-pipe, with only the insufficient protection of a water-seal, — especially insufficient as it has no certain means of renewal, and may by evaporation give direct access to the air of the soil-pipe.

(b.) The overflow-pipes of the service-cisterns may readily become channels for the introduction of drain air to the apartments.

(c.) The unprotected traps of the sink and the water-closets are inadequate for the work they are intended to perform, and all of them are susceptible, under certain conditions, of becoming empty by evaporation or by siphoning.

(d.) Although the soil-pipe is continued through the roof, full-bore, and is open at the top, it has no provision for the admission of fresh air at its foot, which is now regarded as a matter of imperative necessity. These defects are sufficient, in the opinion of those instructed in such matters, to condemn this whole arrangement, which only four years ago was regarded as the best yet devised.¹

All this indicates that the art under consideration is undergoing rapid development, and that it is by no means to be assumed that we have yet arrived at ultimate perfection in the matter.

Were I called upon to-day to specify the essential features of perfect house-drainage, I should include the following items: —

The establishment of a complete circulation in the main line of soil-pipe and drain, allowing a free movement of atmospheric air through the whole system from end to end, together with as complete a circulation through minor pipes as could conveniently be secured.

The complete separation of the over-flow of every tank or cistern delivering water for the general supply of the house from any soil-pipe or drain containing a foul atmosphere.

The supplementing of every water-trap with a suitable mechanical valve, to prevent the water of the trap from coming in contact with the air of the drain.

The reduction of the size of all waste-pipes, and especially of all traps, to the smallest diameter adequate to their work.

The abolition of all brick or earthen-ware drains within the walls of the house, using in their stead the best quality of iron pipe, with securely caulked lead joints.

The substitution, so far as practicable, of wrought-iron pipes for lead pipes, in the case of all minor wastes.

The coating of all iron pipes, both cast and wrought, inside and out, with "American" enamel, a glossy black coating which withstands in the most complete manner the chemical action and changes of temperature to which it is subjected in such use.

The iron pipes should be extended so far beyond the foundation of the house as to obviate the opening of joints by settlement, so common where earthen-ware drains are subjected to a slight movement of the foundation, or of the new filling about it.

The object to be sought is the provision of a permanent drainage channel for the removal of all wastes, offering little asperity for the adhesion of foul matter, swept from end to end by fresh air, absolutely separated by mechanical obstructions from the interior atmosphere of the house, and literally a section of out-of-doors brought for convenience within the walls of the house, open to receive the contents of the various waste-pipes leading to it, but securely closed against the return of its air. I believe that the next step in advance will be the establishment of means by which the whole length of this drainage channel may be thoroughly flushed with clean water at least once in twenty-four hours.

As a prominent detail of house-drainage work, the long-accepted water-closet is being made the object of important modifications. The stereotyped article, the "pan" closet, has little to recommend it beyond the fact of its general adoption. It is faulty in principle, in arrangement, and in construction. While it is cleanly to look at, and lends itself readily to ornamental joinery, it has defects which should drive it out of existence. Deep down in its dark and hidden recesses, where only the ken of the plumber ever reaches, a large and sluggish trap — they call it a "cess-pool" in Scotland — is generally holding the filthiest filth in a state of offensive putrefaction. The iron chamber above this is lined with the foulest smear and slime, constantly producing fetid and dangerous gases. The earthen-ware bowl which surmounts this is set in putty, which yields to corrosion and to the jar of frequent use, until it leaks foul air, often in perceptible quantity. The panful of sealing water soon becomes saturated with foul gases, which exhale thence into the house. The whole apparatus is inclosed in tight-fitting carpentry, which shuts in the leakings and the splatterings and their vapors from the free

access of air, boxing up in the interior of the house, and generally in free communication with the spaces between the walls and under the floors, an atmosphere heavy with the products of organic decomposition, and faintly suggestive to the unwonted nostril of the *mus decumanus defunctus*.

Some of these defects were recognized and pointed out in my earlier papers. I then believed that the difficulties of the case had been solved in great measure by the Jennings closet. It now seems that this closet and the whole class to which it belongs are seriously defective; and, in the absence of anything better, I am disposed to go back to the simple "hopper" closet, such as is used in the cheapest work, and to depend on frequent and copious flushing to keep it clean. This closet has the great advantage that its only trap is in sight at the bottom of its pot. There is no inner "chamber of horrors" concealed by a cleanly exterior. I have recently used a number of these closets supplied with various sorts of apparatus for periodical flushing, and I find that wherever a half-gallon flush can be given every ten



The Hopper Closet.

or fifteen minutes they are kept perfectly clean. I have no doubt that flushing every twenty minutes, or perhaps at longer intervals, would keep them free from all sanitary objection. This would require a supply of about fifty gallons *per diem*.

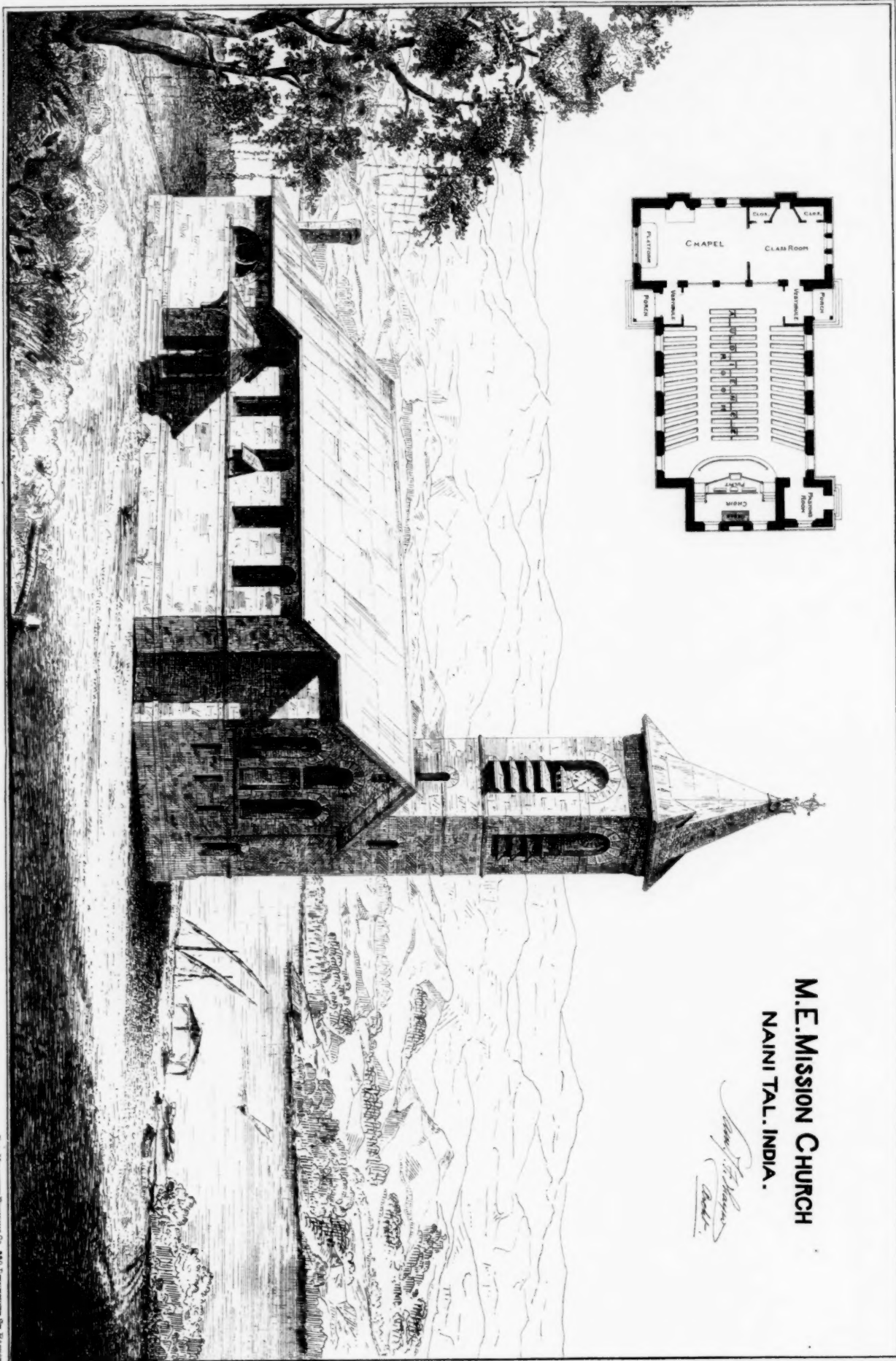
Recent invention has been turned in the direction of the provision of mechanical appliances for separating the trapping water from the air of the soil-pipe or drain. There are several devices which accomplish this purpose, — one of them my own, and more than one of them constituting a very great improvement upon, and indeed an absolute step in advance of, anything in use five years ago.

Another most important matter of recent development is the through-and-through ventilation of soil-pipes. Formerly the soil-pipe invariably stopped at the highest closet of the house. When the danger of pressure came to be understood, it was considered imperative in all work of the best class to carry a vent-pipe out through the top of the house. As this pipe, from the smallness of its size and from the irregularities of its course, had but limited capacity of discharge, the necessity was quite generally recognized for carrying up the soil-pipe itself, full-bore, through and above the roof. This was the point reached at the time of my earlier writing. It soon became evident that even this large extension of the pipe afforded no real ventilation. A deep mine shaft cannot be ventilated by simply uncovering its top. No complete frequent change of air can be effected in a soil-pipe by merely opening its upper end. Air must be introduced at the bottom to take the place of that which is discharged at the top. It is now considered imperative in all good work to open the soil-pipe at both ends, or at least to furnish the lower part of the pipe with a sufficient fresh-air inlet to effect a thorough ventilation of the whole channel.

We have heard so much of "sewer-gas" that we were in danger of ascribing the production of this foul air only to the sewer and cess-pool. Indeed, the majority of sanitarians to this day seem to believe that if they can effect a thorough disconnection between the sewer or drain and the waste-pipes of the house they have gained a sufficient protection against sewer-gas. The fact is that that combination of the gaseous products of organic decomposition which is known by the generic name of sewer-gas is very largely produced by the contents of the house-pipes themselves. Not only in the traps, where the coarser matters accumulate, but all along the walls of the smeared pipes, where filth has attached itself in its passage, there is a constant decomposition going on, which is producing its constant results. The character of this decomposition and the character of the produced gases are greatly influenced by the degree to which access is given to atmospheric air. The more complete the ventilation, the greater the dilution of the gases formed and the more complete their removal, and also the more innocuous their character. Under the most favorable circumstances, the contained air of a soil-pipe must be offensive, and is likely to become dangerous; so that, however thorough the ventilation, we must still adopt every safeguard against its admission into the house. The facility with which foul gases penetrate water and escape from it makes the water-seal trap, which is now our almost universal reliance, an extremely inefficient protection. There can be no real safety short of the adoption of some appliance which shall keep every outlet securely closed against the possible return of drain air.

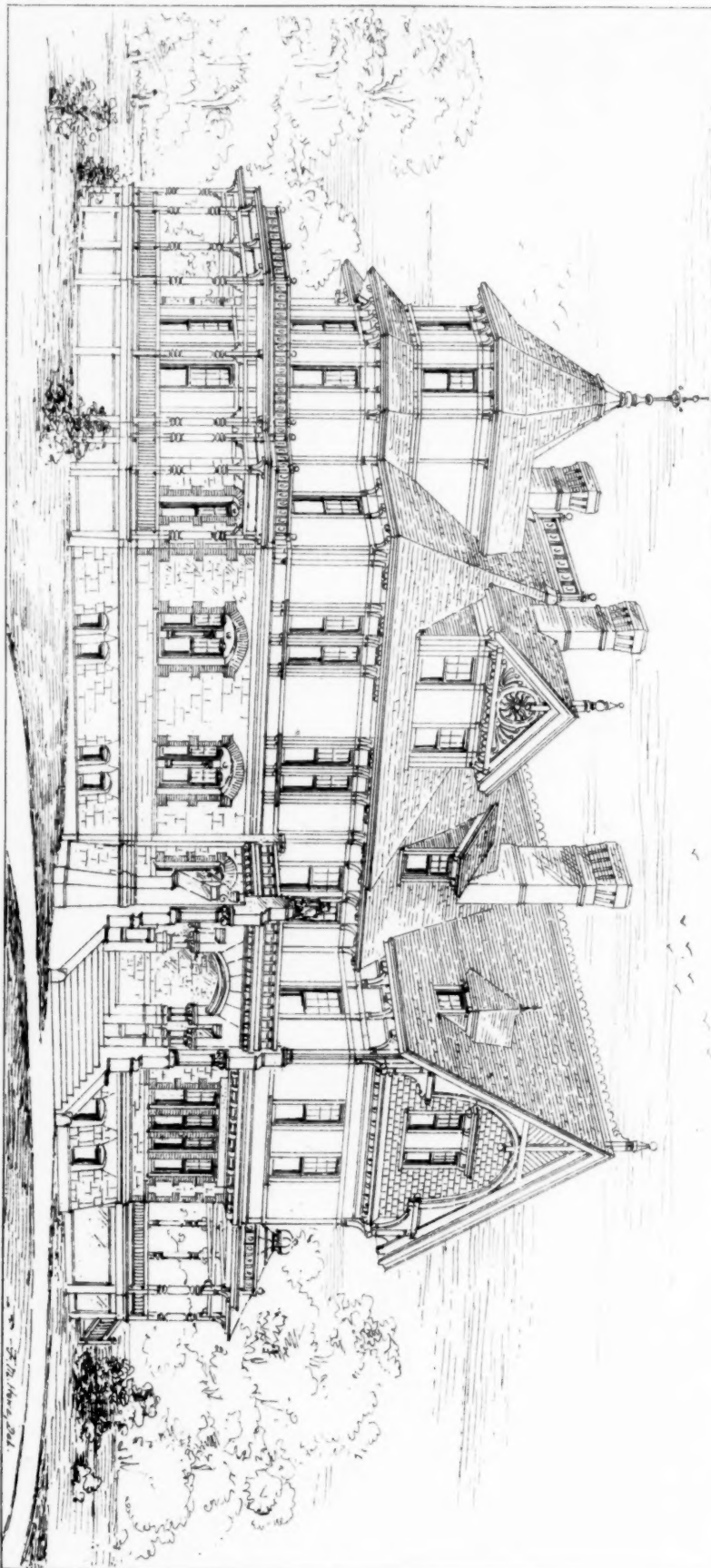
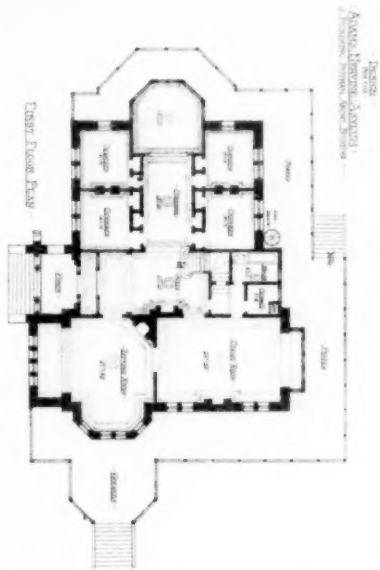
Mr. Elliot C. Clarke, the principal assistant engineer in charge of the improved sewerage work of Boston, in a paper entitled *Common Defects in House Drains*, contributed to the Tenth Annual Report of the Massachusetts State Board of Health, says on the subject of sewer-gas: "The writer has no wish to be an alarmist. The risk from sewer-gas is probably not so great as many suppose; it is a slight risk, but a slight risk of a terrible danger. If a man thinks there is no need of insuring his house because his father lived in it for fifty years without a conflagration, he has a right to his opinion." Professor Fleeming Jenkin, in his *Healthy Houses*, says, "Simple sewer-gas is little worse than a bad smell. Tainted sewer-gas may be so poisonous that a very little introduced into a bedroom — so little as to be quite imperceptible to the nose — shall certainly give typhoid fever to a person sleeping there. The germ is a spark, the effects of which may be unlimited. We do not content ourselves with excluding the great majority of sparks from a powder magazine; we do our best that not one may enter."

¹ This illustration was taken from the latest accepted English authority on such subjects.



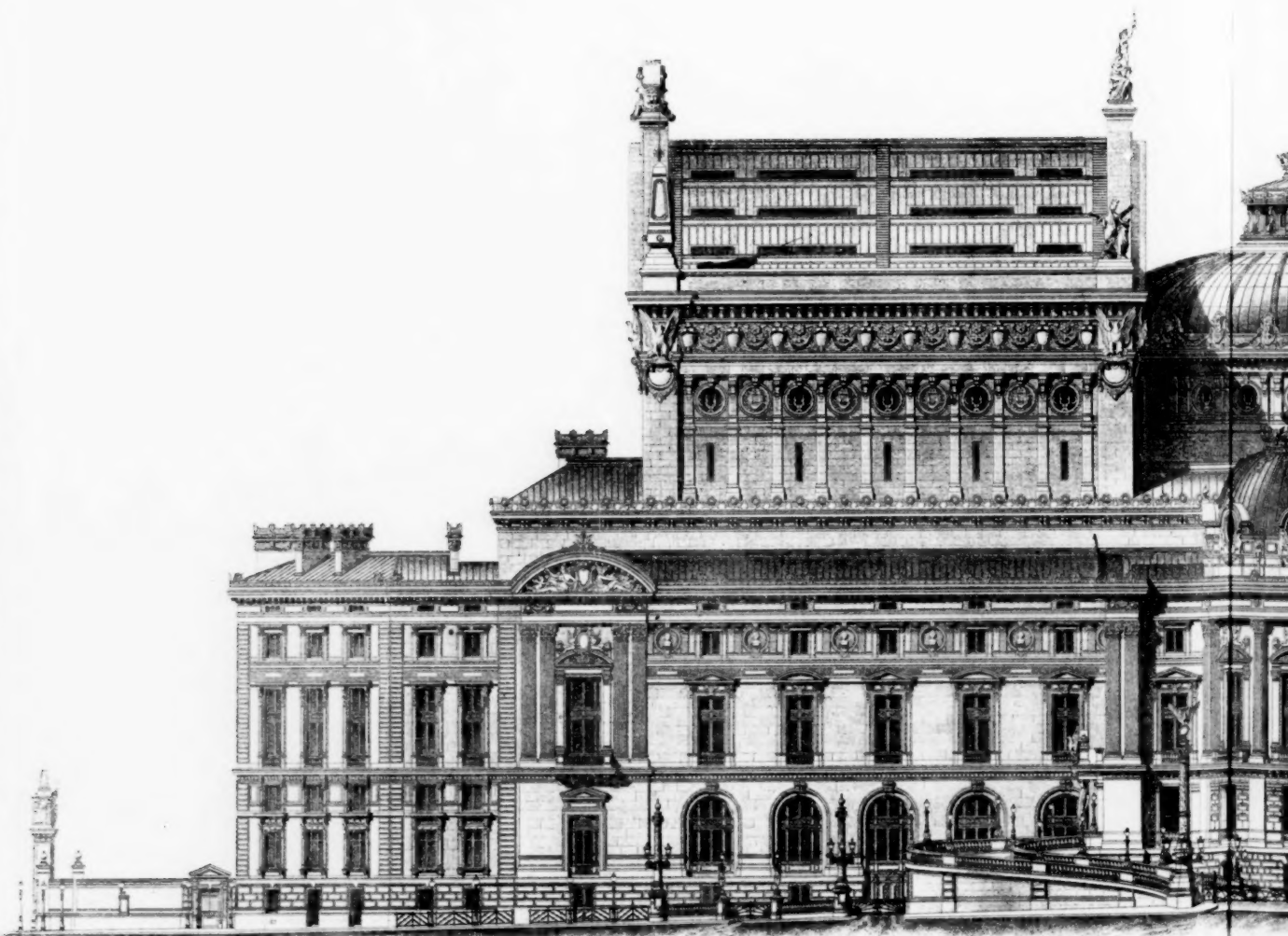
M.E. MISSION CHURCH
NAINI TAL, INDIA.

Samuel J. May
Arch.



DESIGN FOR ADAMS NERVINE ASYLUM, 1ST PERSPECTIVE VIEW, J. PICKERING PUTNAM, ARCHT. BOSTON.

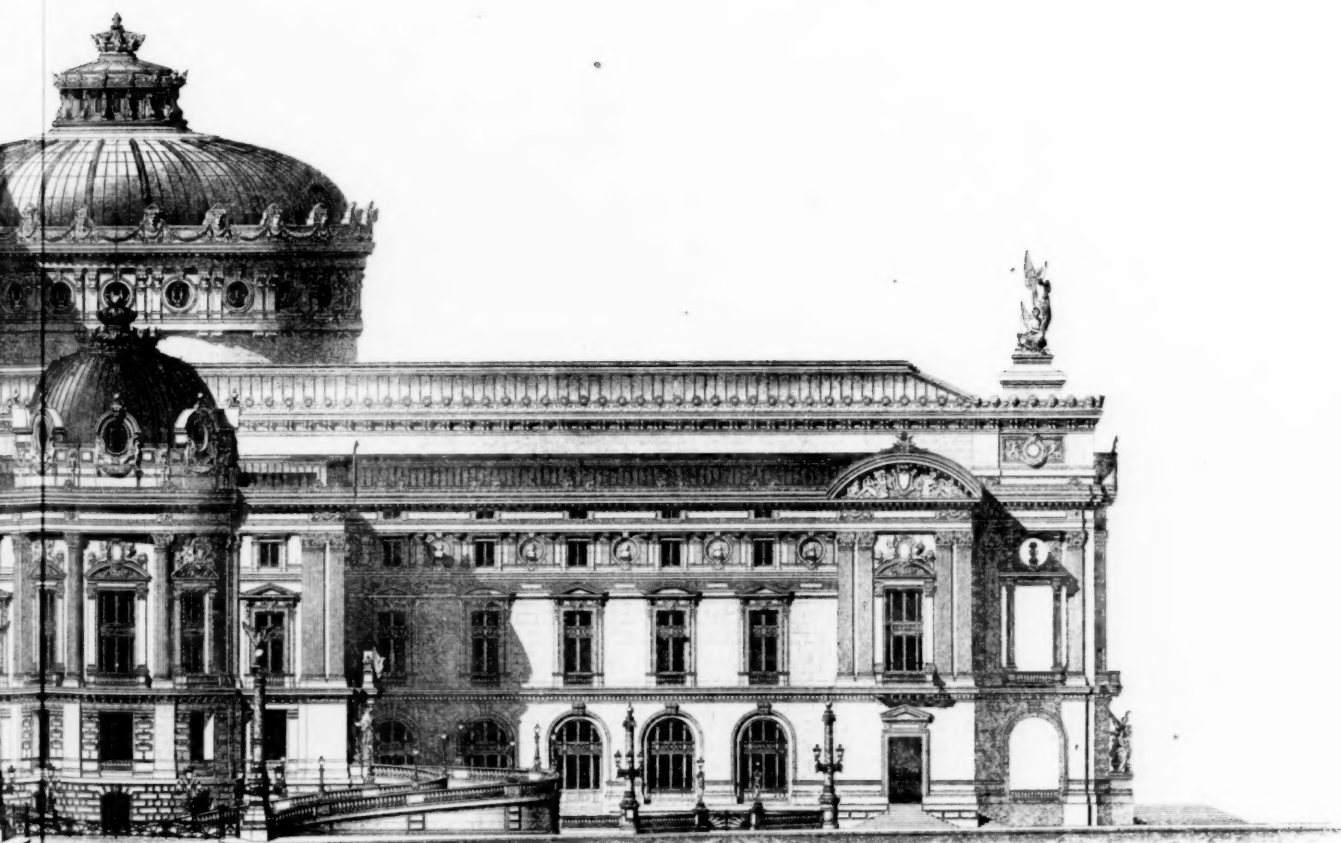
THE NEW OPERA-HOUSE
PARIS



J. SULPIS DEL.

CHARLES LAMNER ARCHT.

LATERAL FAC



ED TANNER ARCHT

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NATUREL DEL.
THE HELIOTYPIC PRINTING CO. 220 DEVEREUX ST. BOSTON

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While the water-seal is very defective in itself, it is a very important adjunct to any mechanical means of separation that may be adopted, and all necessary precautions should be taken to prevent its removal by "siphoning,"—the sucking out of the water by the partial vacuum caused by the flow of water in the main pipe, to which its outlet leads. To prevent this siphoning action often taxes the ingenuity of the engineer more than any other part of house-draining work; and until special devices are made to meet the exigency this must remain the most difficult and intricate part of the house-drainer's task.

Any one whose attention is given to sanitary work must be more and more struck with that peculiarity of human nature which assures us of the exceptional excellence of our own belongings. I have rarely been called to examine the drainage of a house without being told that I was sent for merely as a matter of *extra* precaution. I have never completed any examination without discovering serious sanitary defects,—not merely such errors of arrangement as were universal until a short time ago, but actual, palpable bad condition, which the owner and his plumber at once acknowledged as of a grave character. Leaks in drains under the cellar floor, or in or near the foundation; lead waste-pipes eaten through by rats, and spilling their flow under the house; lead soil-pipes perforated by corrosion; imperfect joints leaking drain air within the partitions; the accumulation of dirty sloppings under the bench of the water-closet; and even untrapped connection between some room and the soil-pipe, or the direct pollution of the air over the tank through its overflow-pipe,—these are most common faults, and some one of them I have found to exist wherever I have looked for them in a "first-class" house, where it was naturally supposed that the most perfect conditions prevailed.

THE ILLUSTRATIONS.

THE LATERAL FAÇADE OF THE NEW OPERA-HOUSE, PARIS, FRANCE. M. CHARLES GARNIER, ARCHITECT.

* THANKS to the courtesy of the well-known publishers, Messrs. Ducher & Co., we are able to reproduce as an illustration of the foregoing article, "American Dramatic Theatres, II," the lateral façade of the Paris Opera-House, which is copied from the magnificent monograph, *Le Nouvel Opéra de Paris*, which is as yet incomplete. In examining our illustration it should be borne in mind that the reproduction is somewhat less than one fourth the size of the steel engraving from which it is copied.

M. E. MISSION CHURCH AT NAINI TAL, INDIA. MR. S. J. F. THAYER, ARCHITECT, BOSTON.

This church is now building at Naini Tal, in the province of Kumaou, India, about one thousand miles north of Bombay, on the slope of the Himalaya Mountains, a popular resort of civilians and the officers of the British army in India during about eight months in the year. The walls of the building are of a gray limestone, the interior furred and plastered, with an open-timbered tie-beam roof, covered with corrugated iron, the only available material. The cost of the building will be about 18,000 rupees. The mission is conducted by the M. E. Church of America.

THE ADAMS NERVINE ASYLUM, DORCHESTER, MASS. MR. J. P. PUTNAM, ARCHITECT, BOSTON.

This design was accepted in a small, close competition. The endeavor has been to make the building look as little like a hospital as possible, in order that the inmates may not be unnecessarily depressed by their surroundings.

CORRESPONDENCE.

THE GROSVENOR GALLERY.

LONDON, July 1, 1879.

IN spite of all that has from time to time been urged against it, the Grosvenor Gallery has honorably won the distinguished position it now holds among the art exhibitions of the metropolis; Sir Coutts Lindsay's enterprise has gained a well deserved success. It is all very well to declare it the exhibition of a particular school,—on the contrary, nearly all schools are represented on its walls,—and represented in such a manner, too, as affords some slight chance of their characteristics being studied. It is quite a relief to come from the bustle and the crowd of Burlington House to the quieter, and, shall we say, more refined, atmosphere of the rooms in Bond Street. Then, but for the Grosvenor and its promoters, the works of the particular school referred to would never be publicly seen at all; and whatever opinions may be held as to the merits of Mr. Burne Jones and his followers, they represent a phase of the English art of the day; and even as such, they are worth that attention which all such movements deserve, even from an historical point of view; nowhere, also, are they likely to be so freely criticised as in a public exhibition. If they are good and true as works of art, they will come safely through the ordeal, and flourish on it; if they are simply a sentimental craze, as their enemies assert them to be, then the exhibition will have rendered good service to art in exposing what was false, and teaching us what to avoid.

For the benefit of any of our readers who may not be acquainted with the system on which the Grosvenor is conducted, it may be briefly stated that all pictures admitted to the gallery are there solely on the invitation of Sir Coutts Lindsay; care is taken that

just sufficient works are received to cover the walls without any crowding,—none being hung too high or too low to prevent them being well seen. If possible, also, all the works of an artist are hung together, so that they may not suffer from the juxtaposition of pictures in antagonistic styles or scales of coloring. The principal room has its walls divided into compartments or panels by pilasters in low relief; so we often find some artist has a compartment all to himself, or it is shared by the works of a kindred spirit. The pictures are not hung close together, but show portions of the silk-covered walls between them. Marble tables, tapestry-covered chairs, china, and other decorative articles are disposed about the rooms, and help to give them more the air of the apartments of a private house; thus the pictures are seen under more favorable circumstances in regard to hanging and accessories than is at all usual in public galleries,—and this, with the principle of selection by invitation, forms the distinguishing feature of the system. It may be said all this only goes to favor a particular clique of artists and amateurs, that invitation goes by favor; perhaps it does; but the favor is becoming more coveted every day, almost more so than a good place at the Academy. Granted there is a good deal of amateurish work in the exhibition, the fact remains we have here works of the highest merit, but which still would have little or no chance of ever being seen at the Royal Academy; this, then, is one of the chief attractions of the Grosvenor, we are sure to find highly artistic work, much of it belonging to a school which goes for little in any other public gallery.

The present is the third annual exhibition, and contains some two hundred and ninety paintings, and about twenty works in sculpture or terra-cotta, in three galleries and a vestibule. The numbers begin in the West, or principal Gallery; and the first to attract notice are a couple of small pictures by the President of the Royal Academy, Sir F. Leighton,—No. 3, *Via Bianca*, Capri, and No. 4, *Archway in Algiers*; clever, classic looking studies, broadly and boldly treated, as are also some other similar studies by Sir Frederick further on in the same room, the latter being notable for the donkeys therein, true specimens of the race as they are to be seen in the East. After some portraits of children and others by Mr. W. B. Richmond, of small interest to any one but their families, the new Oxford Slade professor gives us two classical subjects in No. 8, *Phidyle*, and No. 22, *Sarpedon*. The former, a beautiful nude figure offering a sacrifice to Athena, is most charmingly treated; the figure is well drawn, and the color of the whole picture is most harmonious; the altar is in a grove, and Phidyle stands before it with up-lifted hands. *Sarpedon* is a large decorative work; at first sight it looks stiff in drawing, and somewhat hard in treatment, but a little study shows it to be most impressive. The scene is in mid-air at night. *Sarpedon* having been slain before Troy by *Patroclus*, his body is being carried by the figures of *Sleep* and *Death*—

"To the soft arms of silent Sleep and Death;
They to his friends the mournful charge shall bear."

The color is in tones of blue and has a subdued moonlight effect,—the light falling softly on the three figures brings them well out from the background of sky behind and above them, and the Trojan plain and sea below them. *Sleep* bears *Sarpedon* on her shoulders, while *Death* supports the upper part of his body; we might take exception to the unpleasant position of his legs as they come across the shoulders of *Sleep*, but the latter figure is most powerfully drawn; indeed, the whole composition is most poetical,—by far the finest work we have seen of Mr. Richmond's for some years.

We can only notice the principal works as we pass on. No. 17, *Psyche's Toil in Venus's Garden*, by Mr. Matthew Hall, is another classical subject; scenes from classic story abound at the Grosvenor,—this is a bit from one of the most beautiful of them. *Psyche* toils on at the hopeless task set her as a punishment by the jealous and envious *Venus*. The garden looks like an old English one, with its trim cut hedge, fruit trees, and smooth velvety turf. *Psyche* kneeling in the foreground over her small heap of seeds is mocked at by the attendants of *Venus*, as with a sweep of their flowing robes they scatter her work to the winds again. The figures are charmingly drawn, their light draperies contrasting well against the rich foliage of the garden. *Psyche*, however, has not much "soul" in her face, and looks rather an inane sort of person; still the picture is very poetic in treatment, and successful in coloring.

Two landscapes by Mr. Cecil Lawson are very fine,—No. 18, *'Twixt Sun and Moon*, an evening effect, and No. 19, *Kent*, a view of the hop gardens near Sevenoaks. This latter is truly a magnificent landscape; the time, the afternoon of a bright autumn day. The view is most extensive. The coloring of foliage, red-tiled roofs, fruit trees, hops, and corn is glowing to extreme, so rich are its varied tones, while the vigorous treatment throughout marks it as one of the most powerful landscapes of the year. It is full of work and most artistic work too; there is also no fear of making any mistake about the locality: it is a thoroughly characteristic stretch of English country, recognizable at a glance.

Another vigorous work is No. 24, *Light, Life, and Melody*, by Mr. H. Herkomer, a scene in a bierhaus in the Bavarian Highlands. The "light" is evening, the "life" is peasants, and the "melody" is being played on the zither by one of the peasants while the others sit listening. This picture is in tempera, but on such a scale that it does not suffer in any way by comparison with the oil pictures alongside. It is well drawn, and the grouping excellent, very powerful in color, and masterly in handling.

In No. 28, *The Sirens*, by Mr. Walter Crane, we get back to the classics again. It is not by any means up to what we expect from Mr. Crane. The three sirens are dancing on the sea-shore, while a ship sails past. They look very woe-begone and not at all enticing; perhaps the ship is the *Argo* with Orpheus on board, and the three beauties, feeling themselves outdone, are about to throw up the whole business, and themselves into the sea, which we know was their ultimate fate. They look as if they knew what was coming and did not like the prospect.

Nos. 35, *My Beloved*, from the Song of Solomon, and 36, *Isabella*, from Keats's poem of that name, by Mr. J. M. Strudivick, belong to the Burne Jones school, and are merely imitations of his work, and therefore weak and unsatisfactory.

No. 43, *Shipbuilding*, by Mr. P. R. Morris, A. R. A., is a bright, sunny picture of a number of workmen round the sides of a small vessel. They are nearly all working on a staging about half-way up the ship's side, and are chiefly remarkable as a study of the division of labor, or a solution of the problem as to the number of men that can be actually employed on one job without getting in each other's way. As the figures are nearly all on the same level they suggest a study also for a frieze.

The works of Mr. J. M. Whistler form one of the features of the exhibition, and we have two "harmonies" and an "arrangement" in this room; the latter is a powerfully painted portrait of Miss Rosa Corder, in "brown and black;" No. 54, one of the harmonies, is in "green and gold," and is a view of the bay of San Francisco with ships at anchor; No. 56 is a very clever work in Mr. Whistler's best manner; the other "harmony" (No. 55) is in "yellow and gold;" it is called *The Gold Girl* and is a portrait of Miss Connie Gilchrist, the "very well known" actress, in tights, stage boots, and close-fitting vest, going through a performance with a skipping rope, as large as life and twice as natural; the whole picture suggests some practical joke. One wonders not only why Mr. Whistler should waste his undoubted talents in such a manner, but that he should have the coolness to send such a picture to a public gallery, or having been sent, that Sir Coutts Lindsay should so far forget what is due to the dignity of art as to waste nearly three square yards of his valuable wall-space on its exhibition. Mr. Whistler also sends a couple of "nocturnes" (Nos. 192 and 193), but as they are only the usual thing, they call for no special remark. In the same panel with the Whistlers is a most exquisite *Study of Drapery* by Mr. Albert Moore (No. 59), a single figure of a girl in a yellow dress with an orange head-dress; this is a true "harmony," composed in a most melodious key — quite a relief after the other "yellow" one above mentioned. It is also drawn as Mr. Moore can draw figures, which is nearly perfectly.

Two large pictures by Mr. G. F. Watts, R. A., are hung on the end wall of the gallery. — No. 73, *Paolo and Francesca*, and No. 74, *Orpheus and Eurydice*. In the former the tones of color are low, the figures, enveloped in draperies, float in each other's arms, the background being clouds and fiery rain; *Orpheus and Eurydice* are at the mouth of Hades. Just as they are about to be separated forever, through his fatal error in turning to look at her, his arms are thrown round her in a vain attempt to save her, ere she is swept back into the infernal regions. The treatment is more vigorous and the color more powerful than in the *Paolo*, but yet neither composition can be said to be altogether satisfactory, the attitude of the figures in the *Orpheus* group is most unhappy, and the low tone of the colors not by any means pleasing. If the great object of art be to elevate the mind, then we are afraid it will not be much exalted by a contemplation of these two pictures. Strong though they be they fall far short of the ideal treatment of the beautiful legends.

The last works calling for special mention in this room are those of Mr. J. D. Linton and Mr. James Tissot; the former sends six and the latter eight pictures. Mr. Linton has hitherto been known as a water-color painter; here his pictures are in oil, and are remarkable for their power and quality, and in all the costume of the figures forms an important element, showing that Mr. Linton must be well up in matters of dress. No. 79, *Les Emigrés*, is perhaps the best of the lot, and a replica of a well-known water-color by the same author, depicting one of the old French nobility, in disguise, bargaining with a fisherman for the means of escape to a safer shore. *Valentine* (No. 81), a figure in armor, and *A Trumpeter* (No. 78) are also very fine in both color and drawing. As Mr. Linton seems to be an authority on costume old and picturesque, so Mr. James Tissot is evidently the same on what is modern and fashionable; all his works are of the present day, and are remarkable for the dexterity and skill which he brings to bear on "bits" from the every-day life of the better classes. His pictures all hung together make up a splendid show. "Hot clever," is the general remark as the visitors come up to them, and this "cleverness" describes them very accurately. Mr. Tissot is evidently very fond of the English young lady, for we find her in all manner of subjects. There she is swinging in a Hammock, here she is sitting under a Chestnut Tree; here again she is entertaining two Rivals with gossip and afternoon tea in the conservatory adjoining the artist's own studio. She is always most fashionably dressed, and this "fashion" is painted as only a Frenchman can paint dress, — while all the accessories, such as the plants and garniture of the conservatory just mentioned, the tea-table therein, the hammocks, the hansom cab in which the father, we will suppose, of the young lady is *Going to Business*, are portrayed

with the most wonderful attention to detail. Mr. Tissot is also a very clever draughtsman; his drawing is almost always strictly correct. One of the best pieces of architectural painting we have seen is the view of St. Paul's, in the *Going to Business*. The hansom is driving through St. Paul's churchyard, and the cathedral forms a great feature in the picture; it is a most careful study, much more so than we usually find in many painters' works, when they have to delineate a building. Here it is not only well drawn but carefully detailed, the perspective being admirably managed; as was also a view of the spire of St. Martin's Church in a picture Mr. Tissot exhibited a few years ago.

Here we must leave the Grosvenor for the present, reserving some remarks on Mr. Burne Jones's works for another occasion.

THE DISCOVERIES IN THE FARNESINA GARDENS.

In a letter to the *Athenæum*, Signor Lanciani says: "The discoveries at La Farnesina are assuming unforeseen proportions. Within that noble palace of the time of Augustus, which I have mentioned in my preceding letter, room after room is entered every day, all ornamented with frescoes by the same masterly hand. Our men have become so skilful in removing the pictures, that the other day they succeeded in bringing safely to their atelier near the Palatine one of them 144 feet square, 24 feet long, and weighing several tons. It seems as if the Farnesina grounds have been the field in which the best artists of successive ages have competed for the championship of fresco painting. The names of Raphael, Baldassarre Peruzzi, Il Sodoma, Giulio Romano, have been coupled with those grounds. We are now sanguine of adding another name to the wonderful list by discovering that of the artist who painted the Roman house on which Agostino Chigi built his own. Another problem is raised by the present discovery. The floor of the house is but a few feet above the low-water mark of the Tiber, which flows along its side. So trifling is the difference of level that during the month of May the river has overflowed the house and washed the frescoes no less than seven times. The researches of Professors Secchi, Canevari, Betocchi, and others prove that if there is any difference in the level of the stream between the age of Augustus and the present age, that difference cannot exceed, at any rate, two or three feet. Consequently we ought to assume as a fact beyond doubt that since the house was built and the frescoes painted the Tiber must have entered the apartments several thousand times. This cannot possibly be the case, as the paintings are in a wonderful state of preservation. There is one way only of escaping such contradiction. We must suppose that the Tiber in ancient times did not overflow its banks as often and as completely as it does now. The astonishment expressed by Horace when he saw the inundation reach the Temple of Vesta and the Regia would not be justified if the event was not of an extraordinary character. With us it is a very common occurrence, the ruins of the temple and of the adjoining Regia being inundated several times a year.

"Two striking instances of the wanton destruction of works of art after the fall of the Empire have been obtained in the last days. A few yards from the so-called Temple of Minerva Medica a wall was discovered built with statues. Seven have already been put together, as I mentioned in my last letter. Not far from the same place we are exploring a foundation wall, eight feet square, built with the same materials. The upper strata contain slabs of marble, stripped from pavements and from walls, steps, lintels, thresholds, etc. The middle strata contain columns, pedestals, capitals, all split into fragments. Finally, at the bottom of the wall, statues begin to appear of exquisite workmanship, together with busts, hermæ, bas-reliefs, etc. The stratification of these marbles shows that at the time when the foundation wall was being constructed there was in the neighborhood a shrine, a temple, or some such monument, in good preservation, and profusely ornamented. The masons first took advantage of whatever was movable without difficulty, and accordingly we find the statues at the bottom of the trench. Then they put their hands on what was half movable, and this is the reason why columns, capitals, etc., are found in the middle strata. A further want of materials obliged them to attack at last the building itself, its steps, thresholds, etc."

ST. MARY'S CATHEDRAL, EDINBURGH.

THE erection of the spire of St. Mary's Cathedral, Edinburgh, has been formally completed by the adjustment of the cope-stone. Springing from the tower of the cathedral, which itself is 142 ft. high, the spire, a stone structure of octagonal form, is carried up till the height of 275 ft. is attained, and above the cope-stone there is to be placed an iron cross 15 ft. high. In the junction of tower and spire a somewhat unusual arrangement has been followed, the tower being changed from the square to the octagonal form at the bottom of the belfry, a stage lower than that at which the spire proper commences. At the point where the change of form is effected, stone pinnacles, each 50 ft. in height and about 9 ft. 6 in. in diameter, are reared over the four corners of the tower. At the base of the spire richness is given to the design by the introduction of four niches, each containing a sculptured archangel, 9 ft. 6 in. in height, and alternating with these as many Gothic windows, artistically treated with gables surmounted by crosses. Over these the stone-work is carried up, in the ordinary

way, till it terminates in a large carved finial supporting the crowning iron cross. The work in this part of the cathedral has occupied eight months, but of course, had the winter been less severe, it would have been completed some time ago. The scaffolding is itself a work of some interest. It is constructed of Norway fir, specially imported for the purpose, and, while remarkably light, in comparison with the cumbersome erections often seen round similar buildings, is at the same time perfectly secure.

A RETROSPECTIVE EXHIBITION AT FLORENCE.

THE municipality of Florence has resolved to hold in November next a great "retrospective exhibition," which shall bring under public observation in the most representative manner possible all the portable art treasures of Tuscany from the remotest times down to the seventeenth century inclusive. The exhibition will be held in the Pitti Palace. It will include not only pictures, statues, drawings, ancient and modern coins and medals, intaglios, cameos, etc., but also paintings on glass, goldsmiths' work, glass, enamels, mosaics, furniture, marquetry, wax models, ivory carving, objects in terra-cotta, enamelled pottery by Luca della Robbia, majolica ware, silks and velvets, brocades, carpets, and laces. There will also be musical instruments, books, manuscripts, bookbinders' work; finally, embroidered cushions, carriages, litters, painted cabinets, optical and other physical instruments, watches, snuff-boxes, objects in niello—in fact, objects of every kind remarkable in the history of art. One thing only will be missed in this representative exhibition—the frescoes which since the fourteenth century have been painted so profusely in all the cities and little towns of Tuscany. But an effort will be made to remedy this blank. Sketches representing those frescoes, with inscriptions indicating the places where they are to be found, will be placed upon the walls, so as to remind the visitors of their existence. There will be Etruscan antiquities from Volterra, Cortona, Arezzo, Pisa, Fiesole, and other places. As to the Middle Ages, it is expected that a valuable collection will be exhibited; and Tuscany possesses such an amazing quantity of art treasures from the fourteenth, fifteenth, and sixteenth centuries, that it is not easy to imagine how even the spacious rooms and corridors of the Pitti Palace itself will be able to contain even a goodly selection of them.

SCHOOL-HOUSE VENTILATION.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir,—Being a constant reader of your excellent journal, and being specially interested in the subject of ventilation of buildings, among which I look upon the school-building as of major importance, I watched with interest for the appearance of the paper on School-House Ventilation by Dr. H. T. Legler, announced in your issue of the 28th of June, and published on the 5th of July, under the comprehensive heading of "Plans and Calculations for a System of Forced Ventilation for School-Houses."

Dr. Legler premises with the conceded fact that "the ventilation of school-houses and other large buildings where a large number assemble is bad." He makes several quotations from the reports of school superintendents of different States to the United States Commissioners of Education, each and all sustaining him in the assertion in the quoted paragraph. He copies from the report of a committee of the New York Board of Education the following: "Of the school-buildings under the charge of this Board, there are not ten which are thoroughly healthy. In several, during the winter, the cold has been so intense at times as to render the dismissal of the classes a necessity. The obstacles presented by school-buildings to ventilation, the great quantity of fresh air required, and the difficulty of obtaining it, without unpleasant draughts, have been so serious and so formidable, that in comparatively few of the school-buildings has any attempt been made to secure a good ventilation." The report contains a description of a number of the direful and fatal results of "bad ventilation" and of "no ventilation;" but I will only quote one common influence that a personal experience of forty years with schools and school-buildings enables me to fully corroborate: "To breathe this foul air tends to produce irritability in teachers and peevishness in pupils. If long continued, the rottenness of the air is communicated to the lungs, and lung diseases are generated. The enormous mortality from diseases of the lungs is in great part attributable to the foul air breathed daily by the children in our schools."

The ventilation used in these buildings, where any is used, is what is called "draught" exhaust. The most common is the draught produced by opening opposite windows, though heated exhaust shafts are used to some extent; and some examples of this system of exhausting air from a building operate, if well arranged, tolerably well in cold weather, when the building is heated, and when the relative density of the out-of-door air and that in the building is greatest. I have found that it requires at least threefold more fuel for heating an exhaust shaft so as to draw out a given volume of air in a given time from an ordinary building in hot weather, than in extreme cold weather. An experience of three years with a building ventilated by a heated exhaust shaft, in which I have personally experimented and carefully noted the results attained at both extremes, i. e., when the temperature was 98° above and 26° below, Fahrenheit, the building being ventilated by a supply of air drawn through a subterranean air-duct, which delivers it in the coldest weather at 40° above zero, and in the opposite at 55°, has satisfied

me that the draught-exhaust in ventilating buildings is impracticable except on a very limited scale. It is defective and unreliable at best, under all circumstances, except a steam-jet-exhaust can be availed of perpetually.

I have recently executed a job of ventilation, where a low temperature and thorough ventilation, or constant change of the air of the building, were very important conditions; these have been satisfactorily secured, but the scale or extent of the work was very limited compared with supplying a school-house for six hundred pupils, requiring for each, say, fifteen cubic feet of air per minute,—total, 9,000 cubic feet per minute.

The steam-jet-exhaust which I used was from a nozzle with only an eight-inch orifice, worked with 40 pounds pressure per square inch, with which I exhausted 417 cubic feet per minute, and drew the air through a subterranean air-duct, 420 feet in length and about two square feet in transverse section. I should state that the walls of the duct were very uneven, and unfavorable to a rapid transmission of air. The duct was blasted mainly in granite rock and the walls and bottom are very rough, thus occasioning great friction and retardation of the air. Air drawn through the duct described, and at the velocity named, is delivered into the building at about 50°, varying from 48° to 53°. This difference in the temperature of the air discharged by the duct is no doubt much increased by the air being drawn through the duct so rapidly that it had not sufficient time *in transitu* to acquire the temperature of the stratum of earth in which the duct lies—it being about 50° degrees uniformly.

I fully concur in the premises taken by Dr. Legler, that, "if we wish to have an effective ventilation under all circumstances and at all seasons of the year, no other plan is left but forced or plenum ventilation," or supply; but I cannot indorse his recommendation of a "hot-air furnace," and the use of other than steam power with which to run a fan by which to supply air to the building. I would heat by steam by all means, and would use either a Root's air-pump, or a Cameron steam air-pump, for drawing the air through a subterranean air-duct for supplying and exhausting air at all times, which would be at about 50°, and would only require to be warmed 18° or 20° in the coldest weather. In warm weather, say for four months of the twelve, solar heat absorbed by the walls, both above and below the surface of the ground, will warm the air sufficiently. Then, by having in the heating chamber a plurality of radiators, and of varied capacity, the air may be heated as desired before it enters the rooms, and with great nicety and equal economy. The economy of obtaining the air-supply through a subterranean duct for cold weather is so great and so apparent that comment on it would be a reflection on the intelligence of the reader. The salubrity and delightful temperature of a building properly tempered and ventilated on the plenum system, when the air is obtained through a subterranean duct, during the heated term, is so superior to all other systems known, that there is no comparison between it and other methods of air-supply.

An experience extending over an area of fourteen States and twelve degrees of latitude, and from New Jersey to Missouri, and in a great variety of buildings, since 1874, has established the fact that air transmitted by a subterranean duct to a building is sufficiently anhydrous, and is tempered as described; all dust, moths, or pollen it may contain are arrested by contact with the walls and bottom of the duct, which are moistened by condensed vapor; offensive odors it may contain are absorbed by contact with the clay bottom of the duct with which it is surfaced; the air is so purified that it is proof against the influences of mugginess and of frequent and violent electric discharges, so dreaded by dairymen and those who have the charge of substances which are affected by precipitate fermentation and acidification; and, in fact, it is given a degree of purity and adaptability to respiration rarely found in nature. It was my purpose to explain how such air may be most economically obtained, circulated in and exhausted from large buildings, but I shall be obliged to make these important matters the subject of another paper.

J. WILKINSON.

AN INSANITARY BUILDING SITE.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir,—I notice in your Building Intelligence for June 7 that the "cellar for the Arms Academy has been dug in the old graveyard" at Shelburne Falls, Mass. Does the State Board of Health have any jurisdiction in such matters? C.

PUBLICATION RECEIVED.

TANAGRA FIGURINES. Boston: Houghton, Osgood & Co. 1879.

NOTES OF EXPERIENCE AND INEXPERIENCE.

30. ARCHITECTURE AT THE UNIVERSITY OF SYRACUSE.—Can you, or any of your readers, give through the columns of this paper any information in regard to the architectural course of the University of Syracuse? Is the course a thorough one and such as you would recommend to an architectural student? Who is the proper party to address? I have written to the professor of architecture twice within the last six months, and have received no reply. By answering any of the above questions, you will greatly oblige,

STUDENT.

[We understand that Professor Comfort, who has charge of the architectural department, is in Europe. Chancellor Haven would very likely be able to answer such questions as "Student" may wish to ask.—Eds.]

NOTES AND CLIPPINGS.

THE FRESCOES FOUND IN THE FARNESINA GARDENS.—With the exception of the two largest ones, each of which covered the whole wall of a room, the frescoes which were lately discovered in a building unearthed in the Farnesina Gardens, in consequence of the Tiber improvements, have been carefully and successfully removed by two experienced artists who were summoned from Pompeii, where they had had experience in such work. In all there are thirty-two of these frescoes, which are executed in the best style of Græco-Roman art, the drawing being remarkably accurate, while the coloring of the graceful figures in the compartments of the friezes is said to resemble that of Dutch sketches. The condition of the frescoes is wonderfully good considering that they have not seen the light for nearly twenty centuries. At present they are stored away, each in its separate case, so that the plaster on which they were painted may not be broken, in a hall attached to the Church of SS. Cosmo and Damiano. Here they are to be framed so that they can suffer no deterioration, and will then be placed in such museum as the authorities may determine.

DISCOVERIES AT THE SITE OF SYBARIS.—A correspondent at Naples writes as follows to an exchange:—

"An important discovery has been made on the site of the ancient Sybaris. It consists of two 'laminette' of gold with Greek inscriptions upon them. They are now under the examination of the Director of the Excavations throughout Italy, the Senator Fiorelli, and precise details will not be known until he has drawn up his report. Hereafter the laminette will be deposited in the National Museum of Naples. That much of great artistic value yet remains to be discovered in Magna Græcia can admit of no doubt. Within my memory great success has attended excavations made on the other side of the Apennines, and if the interest of the archaeologist were less absorbed by Pompeii and other places nearer home, Magna Græcia might be compelled to give up vast treasures. The government allowance, however, for these works is necessarily limited, and it is honorable to Fiorelli that so much has been done under his direction. A word about Sybaris; it was situated on the river Cochile—now the Coscile, emptying itself into the Gulf of Taranto—and contained, it is said, 300,000 men capable of bearing arms. The country round about it is now a comparative desert. Spezzano-Albanese, which is built, if not on, at least near, the site of ancient Sybaris, has a population of a little over 1,000; Roscignano, now Rossam, has somewhere over 7,000 souls; whilst Croton, now Cotrone, which once sent out an army of 100,000 men to reinstate the exiles of Sybaris, has only a small population of about 4,000 persons. All that the financial state of the country permits is being done to disinter the wealth of these old Greek colonies, and more will be done as the prosperity of the country advances."

THE CHANNEL TUNNEL.—It appears that the boring that is making at Sangatte, in France, is not the beginning of the shaft from which the tunnel is to be bored, but is merely an experimental bore-hole, some five or six hundred yards above the village and about one hundred yards from the shore, so that it is small wonder that for three months the work has been suspended, because of the too rapid infiltration of water, while a new pump of double the capacity of the present one is building, that is, one which can raise about six hundred and seventy-five gallons a minute. The shaft for the tunnel when it is begun is to be sunk in the village itself, and will be sunk to such a depth as the experiments now making shall show to be necessary. The experimental shaft, which is at present only one hundred and twenty-three feet deep, is to be sunk to a depth of two hundred and sixty feet, the diameter of the bore being eleven feet. As the excavation proceeds the walls of the shaft are lined with concrete which is filled in behind a movable case of wood. In spite of the nearness of the sea, the water which filters into the pit is fairly fresh and potable.

THE SIGNIFICANCE OF SALT IN WELL-WATER.—In Professor Lattimore's report on the analysis of well-water, which was proved to be the cause of a serious epidemic of typhoid fever in Rochester, he lays special stress on the significance of the presence of common salt in well-water in general. No single indication, he holds, is of so great sanitary importance in judging of the purity or impurity, and consequently of the safety or danger, of any water. He proceeds then to show that, though from the universal diffusion of this substance in the air and in the soil, we should expect to find it in all waters, whether from rain, springs, or wells, because of its extreme solubility, nevertheless, he argues, the quantity of salt that should be found normally from the causes named in well-water is extremely small, and therefore, whenever "it rises above a very few grains per gallon, it becomes certain that it comes from some other source than the soil;" and he concludes with the logical inference that, as nearly all the salt used for domestic purposes escapes by the way of two channels, the water-closet and the house-drain, we should therefore expect, "what is always found on examination to be true, that, whatever sewage may or may not contain, it always contains salt." A fuller abstract of this portion of Professor Lattimore's report will be found in the *Popular Science Monthly* for July. In this connection it may be stated that Professor Nichols, who makes most of the water analyses for the Massachusetts State Board of Health, recommends the use of common salt in cases where a well is supposed to be contaminated by sewage. The water is first tested quantitatively for sodic chloride, then after the amount present in solution has been determined, common salt is thrown into the suspected cesspool or drain, and subsequent quantitative analyses taken at intervals attest the fact of the purity or the contamination of the water, as well as, in the latter case, the degree.

TRIANGULAR BLAST-HOLES.—The plan is favorably received, in an English mechanical journal, of drilling triangular holes for blasting,—that is, holes of a triangular section, instead of circular, as by the ordinary method. To effect this the boring bar or jumper is partly turned on each side of its cutting alternately. No difficulty is experienced in boring the holes to this shape, and they are found more effective than round holes,—the corners forming points at which the fracture of the material operated on appears to commence, the line of fracture usually forming a prolongation of the sides of the triangle.

THE ROYAL ACADEMY AND FEMALE ARTISTS.—At the late election of associates to the Royal Academy, Mrs. Butler, better known as Miss Elizabeth Thompson, closely contested the second chair with Mr. Herkomer, the final vote standing twenty-seven to twenty-five in favor of Mr. Herkomer. We believe that there has never been but one female member of the academy, Angelica Kauffman.

AN ARCHITECT'S MEMOIRS.—M. Charles Monselet has discovered in the shop of a bookseller on the Quai Voltaire one of the most singular monuments of human idiosyncrasy yet brought to light. It consists of no fewer than forty-five manuscript volumes—quite modern—written in utterly unknown characters. An assembly of *savants*, having been convoked to pass an opinion on the hieroglyphics, declared that they were quite beyond their ken. The form of the letters, we are told, bears, when looked at from some distance, some resemblance to Oriental calligraphy, but this is the only description vouchsafed. Several pages are framed by borders executed with the pen in the most marvelously delicate style—flowers, animals, heraldic shields, angels, landscapes, ruins, etc.; the illuminators of missals produced nothing superior to them. M. Monselet proceeds: "And now what do these forty-five volumes contain? Everything tends to the supposition that they are memoirs, of which the author was so morbidly jealous that he created a writing peculiar to himself for the purpose of transcribing them. And this author is known; he died but a little while ago. He was an architect, very skilful in his profession, and much consulted, M. H. Legrand, to whose pen are due some important works—not in manuscript—that indicate a man of perfectly serious tastes. How, then, can we find an explanation of these many volumes in which are deposited the secrets of his inmost thoughts, destined to die with himself? And in the first place, where did he find time for writing them? I do not exaggerate in saying that by the perfection of its calligraphy, this collection represents more than two years' labor. If it be a mystification, we must allow that it has been carried out with rare patience, but for my part, I prefer to attribute it to a wild and pleasing mania. I feel convinced that M. H. Legrand owed the best moments of his life to his solitary and mysterious occupation. The most surprising thing that could happen now would be to see these forty-five volumes bought up by somebody desirous to decipher the enigma they contain. The bookseller does not despair of coming across such a purchaser."—*Galignani's Messenger*.

THE INVENTOR OF PORTLAND CEMENT.—In 1824 Joseph Aspdin, a bricklayer of Leeds, England, took out a patent for making an artificial stone which he called "Portland Cement," the process being essentially the same that is now used in making Portland cement.

DRYING DAMP BUILDINGS.—It is sometimes of considerable importance that the drying of a new building should be effected in a brief space of time, and sometimes even more so that the means should be at hand for rendering healthy old constructions impregnated by dampness from the soil. M. Ligny has invented an apparatus for this purpose, which is being used in France, and an agency has been established in England. The apparatus for drying includes an ash-pan; a hearth, with rectangular iron fender, about 0.70m. long, by 0.40m. wide and 0.40m. high (the hearth is filled with coke and furnished with an iron plate, which serves as reflector); and ten tubes of iron plate, of about 1m. to 1.25m. long, capable of being lengthened at will, which are placed vertically in the fire in such a way that the lower extremities, extended in the shape of a funnel, cover the hearth almost entirely. These tubes are held by iron props fixed to the fender of the hearth, and are bent in any direction that may be required by means of a screw-compass. When the apparatus is once heated, the cold and damp air passing across the fire is discharged of its dampness and projected very hot against the walls. A small blower may, in case of need, be attached to one of the tubes in order to convey more hot air to a given point, and also to reach certain parts to which the apparatus could not be brought near. For drying old buildings impregnated with damp from the soil, M. Ligny adopts the following plan: First, to take off all plaster on the walls which are damp and full of saltpetre of the room which is to be done; then carefully to remove all joints to half the thickness of the walls, which is done bit by bit, to prevent any risk of shaking the walls. Wet the walls thus cleared several times, and each time dry them by means of the apparatus, in order to dissolve all the saltpetre existing in the materials, then cleanse the walls with rough brushes. After this clearing, drying, and cleansing has been carefully done, the brickwork not containing any more dampness or saltpetre, it is again heated, and in every part (by means of a brush) covered with a boiling liquid hydrofuge, which is rapidly absorbed.—*The Builder*.

WHITE BRICK MANUFACTURE.—A process has been patented, and is now being carried out, by Clarke & Pickwell, civil engineers, Lowgate, Hull, for the manufacture of white pressed-bricks from common red clays. Red clays abound in and around Hull, but the white clay which yields the white brick is scarce, and situated at considerable distances from the town. This process consists in mixing or grinding into the common clay a cheap material,—chiefly magnesian limestone,—which has been reduced to an impalpable and harmless powder by being burned and slacked. This mixture is passed through a series of mixing and grinding mills, and so completely ground that each particle of each ingredient is brought into close contact with each other. This mixture is then acted upon as it leaves the last mill by an apparatus which reduces it to a fine grain almost like running soil, in which state it falls through the feeder into the moulds of a powerful steam-pressing machine, is subjected to a heavy pressure, and is delivered at the delivery-table a complete and almost dry-pressed brick, which, when burnt in the kiln, produces a white brick of good quality. The ingredients added to the clay at once absorb about forty per cent of the moisture found in the natural clay, and the grinding is so close and complete that the mixture is thoroughly and evenly amalgamated. The change effected in the color of the red clay on being burnt is due to the presence of the mixture. We understand the bricks can be made at a cost of 20s. to 22s. per 1,000, the sale price of similar bricks being at the present time 50s. to 52s. 6d. per 1,000 in Hull, and in London 75s. per 1,000. The process is said to be applicable to common red clays in any part of the country.—*The Builder*.