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WE can make a suggestion for facilitating rapid transit in the "congested district" in Boston, by a measure which we will warrant to be extremely effective, and which will involve no expense, to the city or any one else. A person accustomed to New York streets, and, still more, to the streets of foreign cities, cannot fail to be struck, in visiting Boston, first, with the narrowness of the sidewalks, and, next, with the incredible number of teams which are allowed to stand, often for hours, in the roadway, reducing the space for traffic to the room which their proprietors condescend to allow between them. Perhaps the very heart of the "congested district" may be taken to lie in the region extending from the Post-office to Tremont Street. The most direct, and most crowded thoroughfare through this region is by the way of Water, Washington and School Streets, yet in the busiest part of the day, between twelve and two o'clock, there are always to be seen, in the sixty-five rods of street between Tremont Street and Post-office Square, from twenty to forty teams, drawn up on each side of School Street, Washington Street and Water Street, deserted by their drivers, with the horses anchored to the sidewalk by a weight, or, perhaps, munching oats out of a nose-bag, if, indeed, they have not been taken out of the shafts altogether, and led away for refreshment, as often happens. If these were wide streets, or if there were no open places near where team-horses could be fed, some apology might be made for this abuse of the public highway, but they are all narrow, and crowded with foot-passengers, who jostle each other off the sidewalk, for want of the room which is taken away from them, to be utilized for the refreshment of the team-horses, who might just as well enjoy their Nirvana in the neighboring Post-office Square, or Court Square, or Adams Square, where they would not be in anybody's way. There is, possibly, something to be said in favor of allowing carriages to stand in front of the Parker House, although no carriage is allowed to stand in the public street in front of a London or Paris hotel in the business region; but the half-dozen carriages in front of the Parker House would give comparatively little trouble if they were not supplemented by a stationary row of vehicles of all sorts in the shade of King's Chapel, on the opposite side of the street, which reduce the available roadway to the space between them, and the example which is set at the Tremont-Street end is followed by teamsters through all the rest of the street. In Water Street the case is worse still. The street is narrow, at best, and the space left between the two rows of sleepy team-horses is not rendered any more navigable by the continual arrival at the Journal building of wagons loaded with paper or beer, which are coolly stationed across the roadway, while their contents are rolled over the sidewalk into the cellar. As this street forms the principal access from Washington Street to the Post-

office, the people among whose legs the beer barrels and paper packages are rolled or slid are counted by myriads, and as the blockade of teams in the roadway makes it difficult to escape from the sidewalk into the busy Boston-man's ordinary thoroughfare—the gutter—there has been for many years a chronic demand on the part of the public for the widening of the street, apparently with a dim idea that this would in some way help the matter. Not long ago, the Mayor had to interpose to prevent the city from taking land for this widening, at a cost of something like a million dollars, the abutting land being the most valuable in the city. It is a curious illustration of Boston methods of dealing with streets that, at the very time that the City Council was discussing the question of paying two hundred dollars per square foot for land to widen the Water-Street roadway, a certain teamster is said to have held a license to keep two teams standing in the street through business hours. As we have not yet heard of the revocation of the license, it may be interesting to consider the value of the concession which this teamster enjoys. If his wagons are small, the length of each entire team may not be more than eighteen feet, so that, if he conscientiously backs up one of his wagons until its tail-board touches the nose of the horse of his other team, the united length may not be over thirty-six feet. Supposing the width occupied to be six feet, which is also a scanty allowance, the total area granted to the teamster amounts, as a minimum, to two hundred and sixteen square feet. At two hundred dollars a square foot, which is said to have been the price actually paid for the abutting land, the value of the teamster's concession is forty-three thousand two hundred dollars, as measured by the sum which the city was ready to pay to buy additional land for street purposes, in order not to have to disturb him; or, reckoning in another way, at five per cent interest the city pays twenty-one hundred and sixty dollars a year for the privilege of having the teamster's wagons obstruct its street. By either method of reckoning, the city, in our judgment, pays too much for the advantage that it derives from the transaction, and it would be decidedly the part of economy and common-sense to revoke the license, and oblige the favored teamster, as well as all other teamsters, to refrain from using "congested" streets as places of pasturage and recreation for their horses. If the teams in the "congested" streets could be kept moving, the sidewalks might easily be increased in width to the proportion adopted in other cities, to the immense relief of the foot-passengers, who enjoy a disproportionately small share of the privileges of the Boston streets.

THE *Deutsche Bauzeitung* devotes one of its charming biographical notices to the late Antoine Nicolas Bailly, who, it will be remembered, died a year or two ago, mourned by the whole profession, of which, by reason of his great attainments, his noble independence of character, his venerable age, and his countless kindnesses to his younger brethren, he was, in France, justly regarded as the head. Bailly, it seems, had a singularly varied and interesting career. His father was courier to the Cabinet under the First Empire. He lost his place on the fall of Napoleon, but, after the Restoration, found employment in a humble capacity in the postal service. Antoine, who was born in 1810, was the eldest of eleven children. His father's modest circumstances only allowed him to send his son to the public schools, and, at the age of seventeen, he was placed as a pupil in the office of an architect at Versailles. From his first master he does not seem to have learned much, but he was soon transferred to the atelier of Debret, in Paris. In 1829, Duban succeeded to Debret's practice, and, a year later, young Bailly was admitted to the School of Fine-Arts. Like many other pupils of the school who have subsequently risen to great distinction, Bailly was obliged to earn his living by outside work at the same time that he carried on his school studies. He took, naturally, such employment as offered, and, besides working as draughtsman in various offices, he found time to assist Létarouilly in the preparation of his splendid volumes of engravings of the Italian Renaissance. In 1834, his father was retired, with a small pension, and from that time the elder brother was the main support of the family. He could no longer think of a school course, every moment of his time being required for the work by which he must earn bread-and-butter for his brothers and sisters. To add to the demands upon him, he was drawn

for the National Guard, and was obliged to spend a considerable part of his time in drilling and marching. As it happened, however, this hard necessity turned out a benefit. Not only was the regular military exercise probably the means of establishing that robust vigor which characterized him during all the rest of his life, but his new associates, humble as they were, found means to give him practical proofs of their regard. One of his comrades was an Auvergnat, who had a little business in charcoal and firewood. In their long hours of guard-duty the two became intimate, and the Auvergnat entrusted the young architect with his first commission, a little building for his business. In 1835, Bailly, who had not been forgotten by his former school companions and teachers, received a small appointment as *sous-inspecteur* in the service of the city, and was afterwards advanced to the rank of *inspecteur*. In this capacity he was engaged on the Hôtel-de-Ville, and, later, under Visconti, on the Molière fountain. He was soon taken permanently into the city service, and was promoted with what seems, to a Frenchman, tolerable rapidity. In 1854, when he was forty-four years old, he was made section-architect, and, six years later, architect-in-chief, and designed for the city various octroi-houses, the Mairie of the Fourth Arrondissement, the new portions of the Lycée St. Louis, and, finally, the Tribunal of Commerce, his greatest work.

IT is hardly necessary to say that the emoluments of a subaltern in the architectural service of the City of Paris are not adapted for the comfortable support of eleven young people, and the kind elder brother had to look about for additions to his income. The experience which his active life brought him, as well as his cool, sensible judgment, earned for him an appointment as expert to the courts, which helped out his income, besides increasing his reputation; and his archaeological acquirements becoming known, he was made diocesan architect to small provincial bishoprics, and in that capacity restored portions of the cathedrals of Digne, Valence and Limoges, besides remodelling the well-known house of Jacques Cœur, at Bourges, for a court-house, and restoring the palace of the archbishop. During all this time, he continued his connection with the National Guard, which suited his energetic physique, and, as before, he received unexpected help from his military service. Another comrade in guard-duty turned out to be a manufacturer of marble tombstones, who was glad to employ his new friend to design some of his more important monuments. This brought Bailly into relations with some well-to-do people, and, among others, with a connection of the banker Frémy. This last introduced him to Frémy himself, and, through this introduction, the young architect was employed to enlarge and remodel the building of the Crédit-Foncier, of which Frémy was president. By these new acquaintances he was introduced to Isaac Péreire, who gave him an important commission, and introduced him in his turn to Baron Haussmann. These introductions gave him a footing among the financiers, and a similar sequence of events launched him among the rich aristocracy. Being a handsome man, and a good soldier, he was, in course of time, selected as captain of his company, and made the acquaintance of the major and colonel of his regiment. The major was a great manufacturer, and soon found an important piece of work for his new friend, while the colonel, who belonged to the highest nobility, introduced him to a most aristocratic circle. For the members of this distinguished society he did a good deal of building, including the restoration of the castles of Theuville and Cany, the enlargement of that of Orme-du-Pont, and new work for the Prince of Montmorency-Luxembourg, the Marquis de Ganay and M. Schneider, the President of the Chamber of Deputies. Notwithstanding his anxiety to obtain employment, and the aristocratic character of his clients, Bailly preserved his artistic conscientiousness to a remarkable degree. The Count Pourtalès, who had taken a fancy to him, asked him to make designs for the addition of a third story to the mansion which Duban had built for him in the Rue Tronchet. The building was a beautiful one, artistically complete as it stood, and Bailly absolutely refused to have anything to do with making a change in it. He even made an enemy of the Emperor in much the same way. Just before the Italian War, the Emperor was in Brescia. It happened that some of the local archaeologists were at work, excavating in front of the town-hall, and, by a coincidence which the archaeologists could perhaps explain, just as the august visitor approached, a beautiful antique bronze statue of Victory was dug out of the excavation. The Emperor

was pleased to see in this occurrence an augury of his approaching triumph over the Austrians, and on his return to Paris, with the statue, finding that Bailly was about to undertake the designing of the Tribunal of Commerce, he requested that the new building might recall the little town-hall of Brescia, in front of which the happy omen of his good fortune had been revealed. He could not remember anything about the building, except that it was arcaded underneath, and had handsome pilasters above, and, he thought, a large dome on top. Bailly sent for drawings and photographs, which were duly laid before the Emperor. They showed, indeed, a charming little town-hall, with arcades and pilasters, but nothing even remotely resembling a dome. The Emperor, however, could not get the idea of the dome out of his mind, and directed that the new building should be made to resemble the Brescia town-hall as closely as possible, considering the difference in dimensions, but that a dome should be put on top. Bailly was not the man to put a dome over nothing. He arranged his plan with a dome, to be sure, but he made the dome the crown of a beautiful staircase-tower, which was quite unlike anything in the Brescia building, and interfered so with the Emperor's reminiscences that he never forgave the architect. Other people, who cared more for art than reminiscences, took a different view of the matter, and Bailly, soon after the completion of his work, was elected a member of the Institute, President of the Academy, a member of the Superior Council of the School of Fine-Arts, President of the Société Centrale des Architectes, and President of the Society of French Artists.

A CORRESPONDENT of *Fire and Water* gives an amusing account of the Roman fire-brigade. It is not often that a fire occurs in the Eternal City, but one destroyed the Palazzo Negroni a few weeks ago, and such buildings will occasionally burn down. So far as the fire-brigade is concerned, the conflagration meets with little opposition in its course. Although there is a corps of officers, these, it seems, are by no means always present at fires, and would not be of much use if they were, half of them, at least, having no experience in such matters. As for the worthy chief-commander of the brigade, it appears that he resides in a villa, outside the gates, some miles from the centre of the town, and has no telephone or other quick communication with the fire-stations, so that he could hardly be expected to reach the scene of a conflagration in time to be of much use. Under these circumstances, it is, naturally, undesirable to wake him up in the night, or otherwise disturb him, to notify him of fires, and we are told that he usually learns of them, if at all, by accident. The officers being thus more or less unavailable, the privates of the corps discharge their duties as suits themselves. Personally, the firemen are said to be bold and energetic, but their efforts are not aided by the ample provision of modern machinery that we are accustomed to in America. There is, to be sure, a steam fire-engine, but it is of so ponderous a design that it cannot be dragged up any of the hilly streets which are so common in Rome, and even in the circumscribed territory in which it can be manoeuvred at all, it generally arrives too late to be of any service. The other machines belonging to the brigade are hand-engines. One of these has its usefulness somewhat restricted by being kept in a house with a narrow door. In order to get the engine out, in case of an alarm, it is necessary to tip it up on edge, like a piano, haul it through the door, and right it again outside, before the horses or boys can be harnessed to it, and the fire is generally out before this operation is accomplished.

IN external appearance, however, the Italian firemen compare favorably with any in the world. In Rome, they are provided not only with polished brass helmets, but with sabres, which certainly have an elegant effect, and, if not extremely useful for extinguishing fire, or convenient in climbing ladders, are, of course, valuable for cutting down brigands, if any should be met with on the way to the conflagration. In Turin, the firemen are supplied with carbines, no doubt with a similar object. The system of ascertaining the location of fires when an alarm is given, corresponds with the other details of the service. Not long ago, according to the correspondent, fire broke out, from a gas-explosion, in the Associated Press Office, opposite a fire-brigade station. The alarm was given, and the fire-brigade turned out with such energy that the men rushed with their engine directly by the place where the fire was, and never stopped until they reached the outskirts of the city.

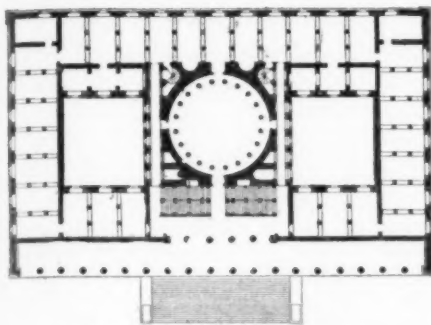
MUSEUMS.¹ — I.

Fig. 1. Plan of the Museum of Berlin.

specimens, and scientific or industrial models. The idea of gathering together and grouping types of works, or remarkable objects, for the amusement, or instruction of the public hardly antedates the middle of the last century. Up to that time, pictures and statuary were all included in royal or private galleries, to which the masses had no access.

When steps were first taken to form public collections of such works, they were placed in edifices already built, and which were more or less favorably arranged for exposing them. But it soon became evident that in order to exhibit paintings to advantage, they must be shown in a special light, that is, they required a distribution of the light which was incompatible with the ordinary methods of admitting it into buildings. Hence it would be necessary to reconstruct wholly the rooms

IN antiquity, the word museum was used to designate a place dedicated to the muses. At the present day, the term is applied to the monumental structures built for permanent collections of works of art, natural history

sculpture is on the ground-floor, the paintings in the first story. For pictures, side lighting is absolutely proscribed: the light must come from above, through a glass roof. The Louvre contains a most complete collection of the art of all countries. Here Babylon and Memphis, ancient Persia and Phœnicia

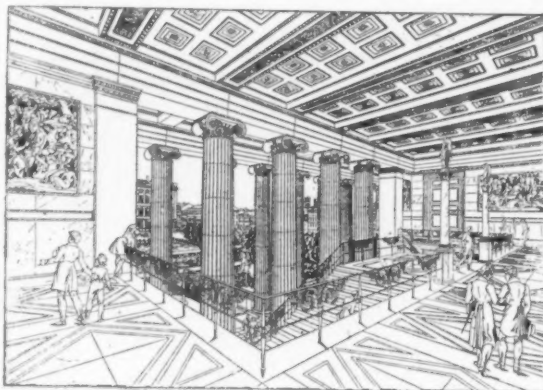


Fig. 2. Berlin Museum (Vestibule of the first story).

jostle against Rome and Athens. The terra-cottas of Etruria and the frescoes of Pompeii are seen side by side with the graceful specimens from Tanagra; the jewels of Roman ladies, the sword of Charlemagne and the crown diamonds adorn the glass cases in the Gallery of Apollo and the adjoining rooms. Near the pottery of Bernard Palissy, eighteenth-century minia-

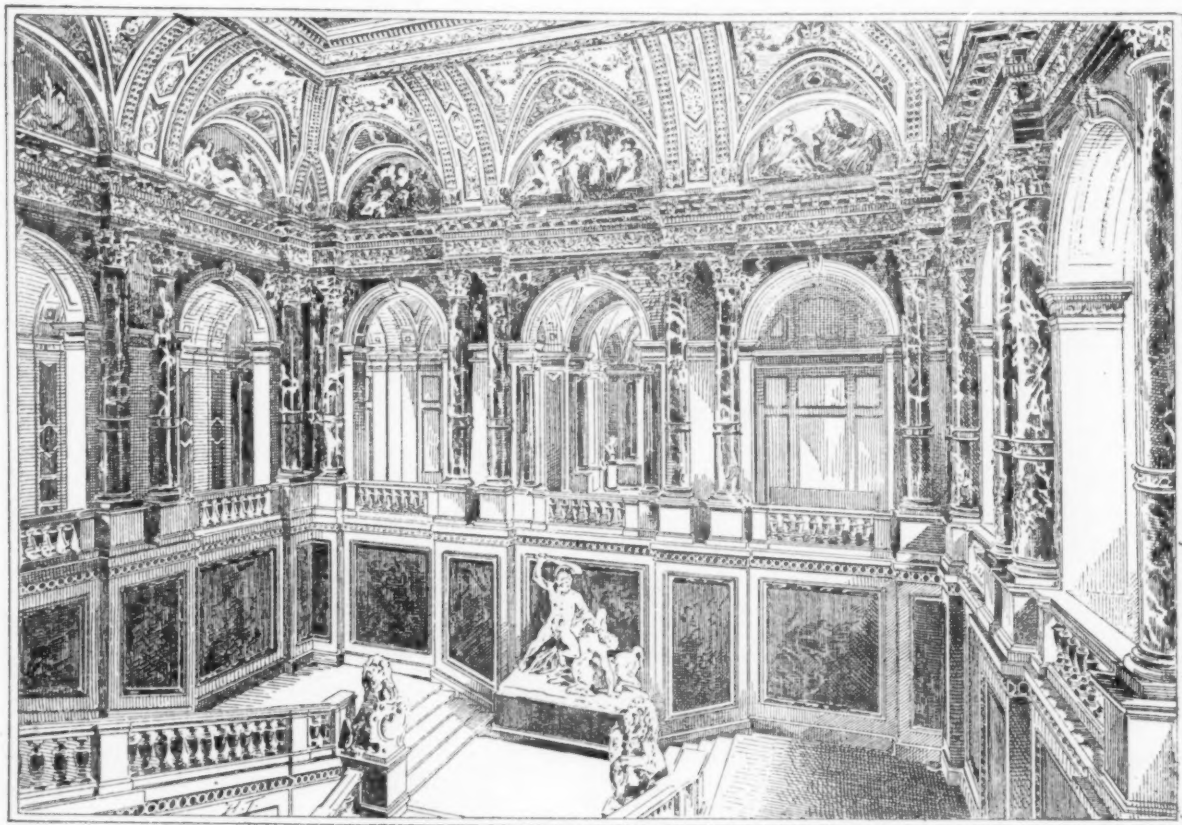


Fig. 3. Staircase of the Vienna Museum.

of existing buildings in order to adapt them to their new purposes. Something better was done in most cases: special edifices were erected to receive the collections, and it is only of these that we shall present plans or views.

The two most complete and most beautiful museums in the world are the Louvre at Paris and the British Museum at London. In Paris, the most varied collections of art have been placed in the palace of the kings of France. The

tures may be found and the *bibelots* of the Sauvageot collection. Architecture is also represented; and even Chinese knick-knacks have a place in the vast edifice. Plans and views of the Louvre have been given in detail in an article on the palace itself.

The British Museum stands next to the Paris Museum in the variety and importance of its collections. It includes, in addition to its art galleries, an immense library. The plan is rectangular and very symmetrical [See *American Architect* for October 17, 1891, "Libraries," Figure 5].

¹ From the French of E. Rümpler, in Planat's *Encyclopédie de l'Architecture et de la Construction*.

The Italians, who possess the noblest masterpieces, have not succeeded in exposing them advantageously. Almost always, as in the Pitti Palace at Florence, the light is admitted

makes it impossible to see others on account of the glitter and reflection.

One of the oldest structures built expressly for the exhibi-



Fig. 4. Museum of Madrid.

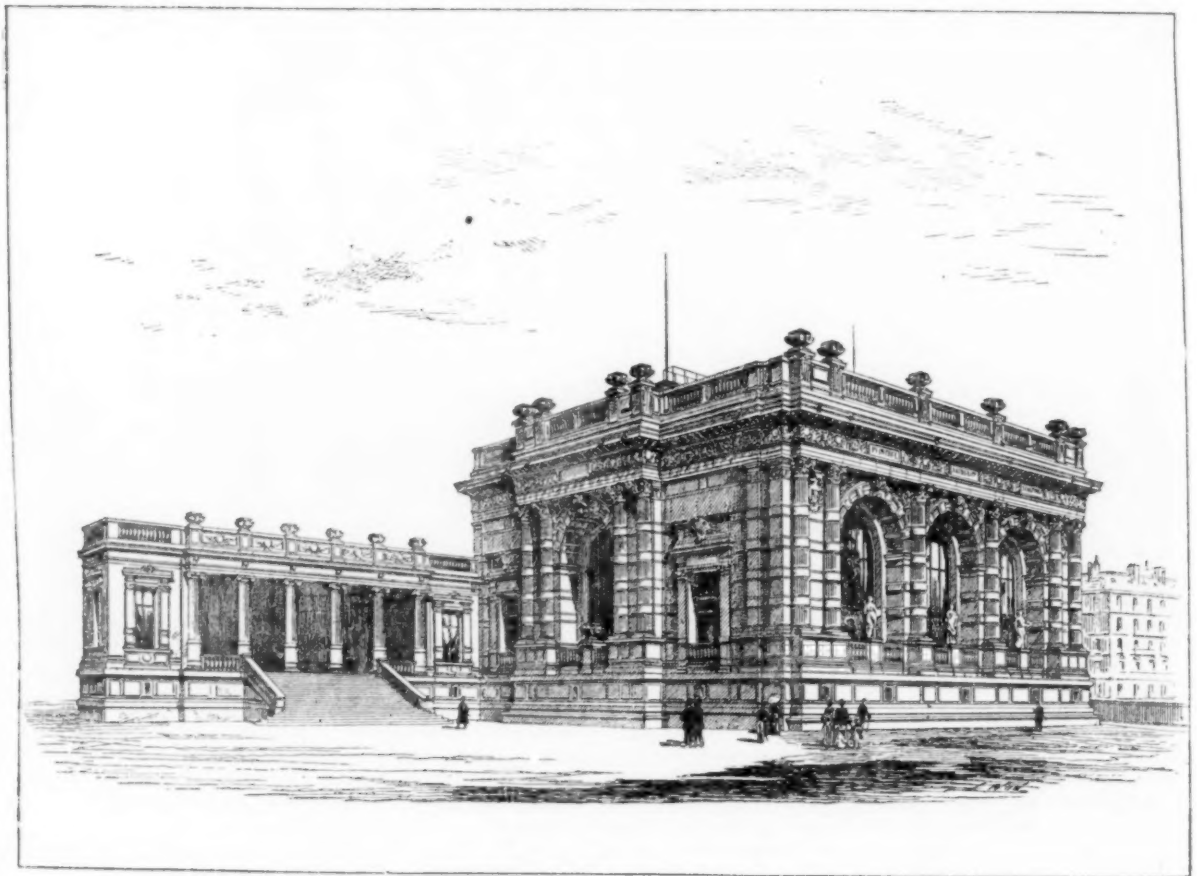


Fig. 6. Musée de Galliera, Paris.

through lateral bays; this favors, it is true, one or two canvases, but the light does not reach most of the works, and

tion of works of art is the Museum of Berlin. It was begun in 1825, by Schinkel, on a rectangular plan of 92 metres by

57 metres. It encloses two nearly square courts. In the high basement are the administration services, the store-rooms, etc. The ground-floor is devoted to sculpture, the first story to painting (Fig. 1). On the main façade, the two upper stories are spanned by a grand colonnade of eighteen Ionic columns. In the interior, a spacious staircase gives access to a large vestibule, open on one side, toward the square and the public garden (Fig. 2). A circular apartment, recalling the Pantheon of Rome, forms the centre of the edifice.

Among the museums of capital cities we call attention to those of Vienna (Fig. 3) and of Madrid (Fig. 4). At Vienna the buildings are grouped on an immense square, wholly surrounded by monumental constructions and conceived with due decorative effects, like the Paris Place de la Concorde. The Art Museum and the Museum of Natural History face each other [See "Austrian Architecture," *American Architect* for February 7, 1891, Figure 30]. Each forms a rectangle 95 metres by 49 metres. On the ground-floor of the Art Museum are the quarters of the directors and attendants; in the entresol is the sculpture gallery; in the first story, the picture gallery; and on the floor above, the collection of engravings. The architecture of the two museums is identical. A general view will be found under "Austrian Architecture" (Fig. 13) in the *American Architect* for January 24, 1891, and the details of the central pavilion may be studied under "Modern Architecture" Figure 32, *American Architect* for August 6, 1892.

Passing to less important art museums, we find a good representative of these in the new Museum of the Luxembourg.

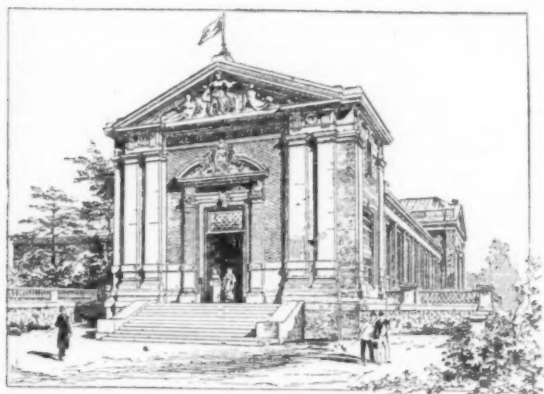


Fig. 5. The Luxembourg Museum, Paris.

It comprises two rectangles at right angles to each other. We enter first the administration pavilion (Fig. 5). On the ground-floor are the apartments of the chief guard and the cloak-room, as well as public water-closets and urinals. In the first story is the office of the curator. Just back of this pavilion is the gallery of sculpture, a vast rectangle lighted from above, with the statues disposed in four rows. It contains 430 square metres.

In addition to this, there is an extensive terrace outside, surrounded by stone balustrades, which is designed for the reception in the open air of certain sculptures for which the site is better suited. The area of the terrace is 280 square metres.

The part of the museum reserved for painting comprises a large hall opening into the sculpture gallery and at the angle of the two main buildings; then follow four large rooms and six small ones, the whole making up the subdivisions of the great rectangle. Owing to this subdividing of the interior space, there is a vertical surface of 2,200 square metres, which provides for nearly seven hundred canvases, allowing 3 or 4 square metres to a picture. The light is admitted from above through ground-glass.

It is probable that the City of Paris will at some future day possess a sort of branch of the Luxembourg in the Musée de Galliera. This museum, not yet finished, is the munificent gift of the Duchesse de Galliera. It comprises a grand central pavilion, with two small wings adjoining, forming porticos (Fig. 6).

[To be continued.]

MODERN ASYLUMS FOR THE INSANE.¹—VII.

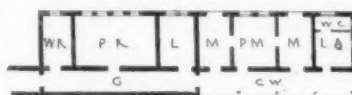


Fig. 1.

- | | |
|-------------------|-------------------------|
| C. Corridor. | P.R. Pathological Room. |
| C.W. Covered Way. | P.M. Post-mortem Room. |
| L. Laboratory. | W.R. Waiting-room. |
| L.A. Lavatory. | W.C. Water-closet. |
| M. Mortuary. | |

THE mortuaries for an asylum should be placed in a detached position, and as much out of view of the patients and attendants as practicable, but yet not too far from the main buildings, for it is desirable that the post-mortem room should be in conjunction with these,

and the convenience of the medical men and pathologist must, therefore, be kept in view.

The arrangement which is shown in Figure 1 is one which has been found in England the most convenient and economical: the diagram shows the post-mortem room, P.M., placed between the two mortuaries, M.M., with doors connecting the rooms, one mortuary being reserved for females and one for males.

The post-mortem room should be provided with a fireplace and a water-supply laid on to the room. Lavatory accommodation, L.A., should be also provided with water-closets, etc., attached. A waiting-room, W.R., is necessary for jurymen or such others as may have to attend inquests, when it is required to hold these on the asylum premises.

In many new asylums it has become the custom to provide a pathological museum, P.R., as shown in Figure 1, and indeed of such great importance do medical men value the provision of a special apartment for the purposes of pathological investigation, that it is frequently added to old asylums, and no asylum of the future is likely to be considered complete without a pathological museum.

We have already quoted the opinion of authorities on the medical staff attached to an asylum, and thereby drawn the attention of our readers to the fact that assistant medical officers are in many asylums too few in number for the work which is absolutely necessary, and for the careful scientific investigation which is now expected in County asylums the medical assistance is often wholly inadequate. A pathologist of great experience, not of necessity a resident medical officer of the asylum, should be attached to all first-class institutions of this kind, and it has indeed been suggested that he would be more useful if not withdrawn from his fellow-scientists outside, and to facilitate the inquiries of this officer, he should be provided with a laboratory fully equipped.

Prevalent causes of death in the patients' wards have been: exhaustion after mania and melancholia; general brain disease and epilepsy; diseases of the lungs, heart disease, etc.; and deaths are accelerated by fractures of the limbs and sundry accidents, difficult to avoid considering the condition of the patients.

We find that in the Colney Hatch Asylum there were 2,250 patients resident on the 31st of December, 1891, and that during that year there were no less than two hundred and twenty-six deaths (134 males and 92 females), more than four deaths weekly, being at the rate of 10.04 per cent on the average number resident. During that year we understand that post-mortem examinations were made in no less than 198 instances, but inquests were only held in the cases of three men and three women: of the men, one died suddenly while seated in the ward, from rupture of the heart; the second case was that of an elderly man suffering from general paralysis who was pushed off his seat by another patient, two ribs being fractured in the fall; the third man died from syncope and a weak heart; the three women were old and feeble and died from the results of accidents which befell them—for these reasons inquests were held. Owing to the extreme vigilance of the nurses, no cases of suicide occurred that year. We give these few particulars to indicate the utility of the mortuaries and as a general suggestion of what is required. It will be perceived at once that the death-rate of most asylums being high, the mortuary accommodation must be sufficient not for the average deaths per week, but for the highest probable number that may die in any one week. Although the number of females resident in the above-mentioned asylum was greatly in excess of the males, yet the number of deaths in 1891 was less among that sex.

For the architect to design and plan any portion of an asylum building no larger or smaller than it should be is often a somewhat difficult problem. There are so many points to consider and, even in so simple a matter as a mortuary may appear to be, it is difficult to provide a building to meet the requirements of every contingency.

We have already referred to the detached fever-hospital requisite in all large asylums and now give a plan of an arrangement for six females and six males (see Fig. 2). Other offices than those indicated would be required for laundry and disinfecting purposes, etc.: these, of course, must be independent of the general asylum laundry and offices, and everything must, as far as practicable, be isolated. Great care must be exercised in placing the disinfecting-apparatus in a suitable position, having regard to those engaged upon the disinfecting operations and their connection with the hospital and the outside public.

The necessity for a simple and economical arrangement by means

¹ By George H. Bibby, F. R. I. B. A., F. R. Hist. S., and Ernest A. E. Woodrow, A. R. I. B. A. Continued from No. 933, page 72.

of which bedding, carpets, linen, clothing, etc., may be effectually disinfected, is one that presses frequently on local authorities and other public bodies; the problem to be solved is how the disinfection of articles of various kinds can be completely effected at the cost of a not unreasonable preliminary outlay, and at a moderate expense



Fig. 2.

B.E. Attendants' Bedrooms.
B.A. Bath-rooms.
C. Corridors.
D. Dormitory.
D.L. Soiled Linen.
D.A. Patients' Day-room.
H.M. Hospital-Matron's Room.
K. Kitchen.
L. Lavatory.

N. Nurses' Rooms.
N.S. Nurses' Sitting-room.
P. Pantry.
S. Single Rooms.
S.C. Scully.
S.L. Slops.
S.T. Store.
W.K. Ward Kitchen.
W.C. Water-closets.

when the disinfecting-chamber has been constructed and is in working order. A good disinfecting-chamber should be provided with separate rooms for receiving and delivering the articles to be dealt with so as to avoid all risk of reinfection.

The heat for disinfection should be generated by means of a multiple stove or stage furnace, the fuel—say cinders—being placed on each of the shelves and gradually worked down till the whole is completely consumed. The air, which is previously highly heated by passing through a number of flues surrounding the furnace, should be admitted at the bottom of the stove and pass over the various stages of shelves of burning fuel and by the time the air has arrived at the top shelf it will have gathered an intense heat, which should, however, be subject to regulation in temperature by the admission of cold air, for which due provision should be made.

From the furnace the super-heated air should then be made to pass, by a series of flues round the chamber to be heated, rising rapidly to any required temperature, under control and regulation. When fresh fuel is required it should be placed on the top shelf of the furnace, but before putting on the new fuel, the top stage should be raked onto the second, the second onto the third, and so on until the bottom stage or shelf is reached. The advantage of this form of stove will be readily seen, as it is capable of using all classes of waste carboniferous vegetable substance or refuse and cinders, which are frequently thrown away and yet form a good fuel for this purpose, thus making the cost of the heating practically nil.

Economy is also materially assisted by the infected clothing, furniture, etc., being thoroughly cleansed and purified ready for use without any risk, thus avoiding the necessity of destruction and saving the cost of replacement.

An arrangement should be made for the insertion of a coil in the furnace by which steam should be generated in the boiler, and injected at will, as circumstances may demand, into the chamber. Some goods require this special and exclusive treatment, for instance pillows, mattresses, made-up goods and upholstered work, which are very difficult to deal with and need a penetrative force, which is only to be found in the highly saturated heat of steam. The risk of damaging articles operated on by this process is very slight, and thus a decided advantage is gained over the old system of dry heat, which until quite lately was generally adopted in England for this purpose, but it is, of course, most essential that the heat in the chamber should be under complete control, so that the articles may not be damaged by an excessive temperature. In order to obtain this desired control a damper of air louvres should be provided to open automatically, so that whenever the required temperature for thorough disinfection is exceeded, a stream of cold air may be admitted into the chamber, preventing the temperature from rising above the safe limit. At the same time the vitiated air should be forced through a tube into the furnace, being there purified and passed away into the chimney. The damper must be arranged to close automatically as soon as the cold-air supply is sufficient to prevent the temperature from increasing. This arrangement, as has been found, can be easily and readily adjusted to operate at any required temperature, thereby rendering any close attention on the part of the attendant unnecessary.

The articles required to be disinfected are taken first into the

receiving-room and then transferred to the chamber, where they can be left with perfect safety until the process of purification is completed. Provision should be made for passing the vitiated air in the chamber through a furnace so that, when the attendant proceeds to remove the goods it contains pure air and is at a low temperature. The chambers should be fitted-up with wrought-iron fittings on which mattresses, pillows and other goods could be placed during the process of disinfecting. It is found that the cost of such a chamber as we have described, nine feet by six feet, including expenses of erection, fittings and materials, would be a little over one hundred pounds (\$500).

The general rules for water-supply and drainage apply to asylums, but there are many special points to consider, having regard to the isolated position in which an asylum is frequently erected and the large number of the resident population. The provision for every inmate must not be less than fifteen gallons of water per day, and for each horse sixteen gallons, four of which are consumed with the food. For a rainfall source, tankage must be provided capable of holding a three-days' supply—in England the average rainfall from roofs is estimated at eighteen inches per annum.

Two feet per second is the least velocity which will keep sewers clear of all ordinary obstructions, but the smaller pipes require a velocity of three feet per second to keep them clear.

It is quite inadmissible that either main sewers or drains should be laid beneath any inhabited portion of any asylum; these must always be external and should be adapted to special requirements of each building, but exclude the surface water; the roof water should be stored in tanks for use. Surface channels and special drain-pipes should be provided for subsoil water as well as excesses of roof and other surface waters so as to reduce the volumes of fluids to be dealt with by land irrigation.

Automatic flushing-tanks should be placed at the head of sewers and drains to receive waste-water from baths and lavatories, etc., to be used for drain flushing; the main sewers should be laid out in straight lines with true gradients from point to point, with man-holes at each principal change of line and gradient. Small chambers should also be formed at intermediate changes of line, having movable covers to allow for inspection, which should be easily removable. Earthenware pipes with asphalt sockets make good sewers and drains up to their capacity, which for the large asylums may be twelve inches in diameter but never need be more; these must be truly laid and securely jointed with Portland cement so as to be quite watertight, and in all cases should be tested with water before being covered in. Pipes of unequal sectional diameters should not join with level inverts, but the lesser or tributary drain should have a fall into the main at least equal to the difference in the sectional diameters.

Earthenware pipes of equal diameter should not as a rule, be laid as branch and tributary drains, that is a nine inch should not lead into a nine inch drain or a six inch into a six inch, but a lesser should be joined to a greater diameter. The drain should not pass directly from the sewers to the inside of basement walls, but should end on the outside of the walls, and should be ventilated or have a siphon trap beneath an inspection-shaft covered by a grating. Sewers or drains should not be ventilated by flues constructed in the body of the walls of the inhabited buildings, as such flues would become foul and could not be cleaned.

The soil-pipes from the water-closets should be of cast-iron, not less than four inches in diameter, fixed externally to the wall and carried up above the roof, full bore, for ventilation. To fully test the joints the bottom of the soil-pipe should be plugged and the pipes filled with water and left for a day or two. The surface inlets to all pipe-drains should be properly protected so as to prevent large substances being passed in and choking the drains; the inlet should be less in diameter than the drain-pipe below. Side junctions should be effectually made good and their positions marked upon the drain plan which should be always kept upon the premises.

Tall chimneys, such as steam-boiler chimneys, may be used with advantage for sewer ventilation. The English Commissioners in Lunacy have laid great stress upon the necessity for carrying out all works of sewage in the best possible manner and have issued many practical suggestions in reference to the whole subject, in which they have been aided by Sir Robert Rawlinson, C. B., the Government Engineer, who has also given valuable suggestions in reference to water-supply and irrigation in connection with asylums.

In building sewers and drains, danger may be anticipated from several conditions, as when the trenches are deep and the substrata consists of made ground, loose earth, bog, silt, quicksand or any combination of such strata. Quicksand is most difficult to deal with, and as a rule such ground should only be opened in short lengths; the ground may require to be close-timbered, and in such cases stable litter and ashes will be found useful to pack behind and between the "polling boards." On quicksand, pipes of cast-iron, with watertight joints, should alone be used. Ground working clay or marl will also require careful timbering to prevent heavy breakings from the sides of the trenches, as when such ground "sets" heavily the earthenware pipes may be destroyed by cracking, crushing, or by distorting the line of sewer or drain.

Trenches should in all cases be carefully timbered, and such timbering in bad ground must either be left in or be removed with great caution as the trenches are filled-in with concrete. Sewers and drains should be capable of conveying sewage to some common

outlet, without retaining sediment, they should have arrangement for ventilation at all the highest points, and at intermediate intervals of not more than a hundred feet apart.

Defective work in main sewerage and draining, producing leaking joints or fractured pipes are, of course, most injurious, and will be both difficult and costly to repair; the greatest care should, therefore, be taken in the first instance to make good sound work and to fully test the sewers and drains before the trenches are filled-in.

Sewer and drain pipes of earthenware may be rendered inefficient by the joint stopping and so allowing the sewage to leak into the subsoil; it is almost impossible to prevent earthenware pipes having leaking joints in loose ground; the safest and soundest sewers and drains may, therefore, be made with pipes of cast-iron, properly black-varnished, with the socket joints turned and bored or made with lead, as for water-supply. The largest main sewer for an asylum, if of iron, need not exceed nine inches in diameter, as it may be effectually flushed under pressure.

Few asylums are erected without trouble and anxiety respecting the water-supply and the whole subject is frequently surrounded with difficulties—the following points are worthy of attention:

The reservoir for the pure-water service must be carefully covered-in, and at the same time fully ventilated. Filters of any kind to purify water must be clean, and must be kept so, or they will become polluters; there is no exception to this rule, and filters, large or small for public use or for domestic purposes, must be cleansed effectually at frequent intervals. Cast-iron pipes properly varnished should alone be used for water-mains, and it is not advisable to use any pipes for the mains less in internal diameter than four inches; lead should not be used for drinking-water cisterns, but slate, boiler-plate, or, for large elevated tanks, cast-iron. Wrought-iron service-pipes are cheaper, stronger and more easily fitted than lead pipes. When, however, wrought-iron pipes are used in the ground externally, as from the main building, the pipes should rest in a casing of wood and be protected by asphalt.

Earthenware pipes, with asphalt joints supplemented by Portland cement, may be used for water conduits to bring the water from springs or reservoirs situated at a distance, provided the joints are not placed under pressure, that is to say, there must be an even graduated fall with the open lower-end delivery.

Shallow wells are liable to pollution from infiltration of solutions of vegetable and animal matter, unless, indeed, the brick lining is rendered absolutely watertight, down to the water-bearing strata, by rendering in cement, or better still, by having a lining of cast-iron cylinders to exclude the surrounding subsoil water.

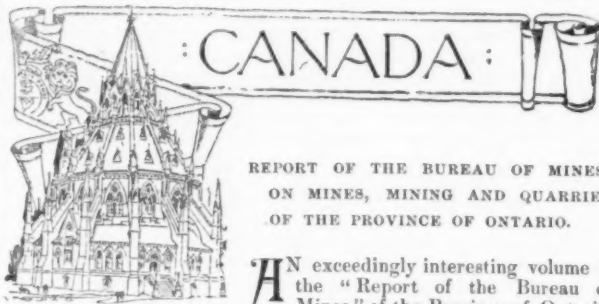
Natural springs may be utilized by storing the water in a covered and ventilated brick or cement concrete reservoir, a capacity of contents of not less than the flow of one entire day. Springs of water at a distance may be conducted in pipes laid so as to span the intervening distance. The fall of a conduit may vary according to circumstances, but should not be less than one in a thousand, nor greater than one in three hundred, unless cast-iron pipes are used.

In forming an earthenware-pipe conduit, great care must be taken, first to make the trench watertight, and then to lay asphalt jointed pipes embedded in cement, so as to secure a sound and watertight conduit throughout its entire length. In forming an aqueduct the pipes should be laid in well defined lines, and there should be means of ventilating and inspecting in each quarter of a mile: there should also be means of washing out at convenient points. A valley line should be crossed by means of a cast-iron siphon, which should have sufficient head, and there should be a sluice valve provided at the lowest point to wash out and cleanse out the siphon. Tanks for storing water should either be of stone, brick or cement concrete and be roofed or arched over so as to allow protection from the direct action of the sun and from any possibility of fouling. Ample means of ventilation should also be provided.

A more important illustration of the care that should be taken in determining the source of a water-supply, could not be cited than that which is, at the time we write this paper, engaging the attention of the English Press. On the south coast of England a terrible outbreak of typhoid fever has attacked one of our favorite seaside summer health resorts in the height of the season. The hospitals, as well as other buildings that have been brought into requisition as temporary hospitals, are full, a special staff of nurses have been imported into the town and the doctors of the town have placed their time at the service of the sanitary authority. A general panic has taken possession of the inhabitants of the town and the usual summer visitors naturally keep aloof. The source of the epidemic is believed to have been definitely traced to the impure water-supply. The supply is a well, or spring, which is fed by a water-course travelling under some fields, which have been hitherto used by the municipal authorities as a sewage-farm, and it is presumed that a percolation of the sewage through the soil has infected the water. We read that the source of the water-supply has now been condemned, and that the town is supplied by water-carts and tanks from the water company of a neighboring locality. With all the knowledge of the need of sanitary precautions, this case in a seaside health-resort, above all places, strikes one with alarm at the neglect shown of the primary principles of hygiene.

The question of sewage irrigation as applied to asylum estates is of great importance and in our next paper we propose to consider some points in connection therewith.

[To be continued.]



REPORT OF THE BUREAU OF MINES,
ON MINES, MINING AND QUARRIES
OF THE PROVINCE OF ONTARIO.

AN exceedingly interesting volume is the "Report of the Bureau of Mines" of the Province of Ontario, just published for the year 1892. According to the Mines Act, 1892, the owner or agent of every mine to which the Act applies is required to send to the Bureau of Mines on or before December 1st of each year, the statistics of his mine for the year ending on the preceding 31st day of October.

The information required to be so furnished is very full, and includes the numbers of persons employed over and under seventeen years of age, the average wages earned, together with the quantity in statute weight of the mineral, dressed and undressed, which has been sold, treated or used during the year and the value or estimated value of it. Failure on the part of owners or agents to furnish these particulars, or false representation by them of these particulars renders them liable to penalty. The Act being new the reports furnished for this first year of its operation are not altogether satisfactory, but doubtless they will improve when the requirements of the Act are better understood, and the value of statistics better appreciated by mining men.

The best known mineral regions of the Province are the districts of Algoma and Nipissing. Algoma being situated at the western extremity of the Province north of Lake Huron and east of Lake Superior, and Nipissing about the centre of the north of the Province to the east of Lake Huron or rather the Georgian Bay, an arm of the Lake from which Nipissing is separated by the Parry Sound district. Algoma has an area of 43,132 square miles and Nipissing 3,722 square miles. The most valuable minerals are found within their limits including gold, silver, nickel and copper. Until recently it was supposed that gold only existed in workable quantities in the County of Hastings, Ontario, and in the Lake-of-the-Woods District in Manitoba. But within the last two years promising leads have been discovered in the valley of the Thessalon and Vermilion Rivers in Algoma and in the vicinity of Lake Wauquapital in Nipissing and a number of "locations" have been taken up in these regions. Important discoveries of silver, copper and antimony ores are also reported in other regions. During the year 1892 the areas for which mining patents were issued under the Act equalled 6,200 acres and the amounts paid, therefore, \$15,373.00.

The Report states that "about one hundred quarries were worked during the year for building-stone material, chiefly limestone and sandstone." Returns from all the quarries could not be obtained but a careful estimate has been compiled which gives the following statistics of quantity and value of the different classes of material:

Dimension stone.....	2,600,000 cu. ft....	\$680,000
Heads and sills.....	50,000 " ".....	26,000
Coursing stone.....	64,000 sq. yds....	42,000
Rubble, etc.....	730,000 cu. "	132,000

Making a total value of \$880,000. The amount of wages paid to workmen was \$730,000.

Much the greater portion of the cement made in Ontario is the product of natural rock, but although the quantity was 7,977 barrels more than in the preceding year, the value was \$839 less. Portland cement began to be made in 1891, when the output was 2,033 barrels valued at \$5,082. The quantity and value of both classes produced last year was:

Natural rock.....	54,155 bbls....	\$38,580
Portland.....	20,247 "	47,417

Making a total of \$85,997 for 74,402 barrels. The amount of wages paid being \$53,151.

The returns received of the quantity of lime burned last year are not complete; an estimate placed it at 2,600,000 bushels valued at \$350,000, with wages amounting to \$120,000.

The following table gives the quantity and value of material, other than as above, for building purposes:

Drain tile.....	10,000,000....	\$100,000
Common brick.....	175,000,000....	980,000
Pressed-brick, plain.....	20,342,000....	138,350
Pressed-brick, fancy.....	1,323,000....	32,253
Roofing-tile.....	383,000....	8,613
Terra-cotta.....		20,119

The pressed-brick works have added largely to the output of 1891, the increase in the number of pieces being 8,431,000 valued at \$102,636. Pressed-brick companies paid in wages during the year, \$88,865, and for the making of common brick and drain tile, wages were paid to the amount of \$445,000.

The quantity of nickel and copper ore raised was 72,349 tons and the quantity smelted 61,924 tons. Some of the companies engaged in mining these ores have erected Bessemerizing plants in connection with their works, employed to enrich the matte, but only a portion of the matte is treated in this way. The quantity of ordinary matte produced at all the furnaces was 6,278 tons and of Bessemerized matte 1,880 tons. The following table gives the estimated metal contents of these mattes and their values at the works:

Nickel.....	2,082 tons		\$590,902
Copper.....	1,936 "		232,136
Cobalt.....	8½ "		3,713

The total value, therefore, was \$826,750, the nickel being calculated at \$284 per ton or 14.2 cents per pound—the copper at \$120 per ton or 6 cents per pound and the cobalt at \$437 per ton or 21.84 cents per pound. It should be noted that these values are computed on the selling-price of mattes at the works and not on the price of the metals after they have been refined in Great Britain, the United States and elsewhere. London quotations for nickel ruled steadily at 42 cents per pound and New York quotations at 48 to 50 cents per pound during the latter half of the year, the higher price in the United States being maintained by the protection of the customs duty.

At the mines there was employed underground an average of 197 men and above ground of 243 men over seventeen years of age, while of boys under seventeen there was employed an average of only 10, all above ground. The average of men employed at roasting and smelting was 240, the average of all classes of workers being 690. The aggregate time of labor in the mines was 105,890 days and at roasting and smelting 52,420 days, making a grand total working time of 158,318 days for the 690 employes. The amount of wages paid was \$339,821, the average wage per day would, therefore, be \$2.14½. These are the calculations of the four mining companies in operation. Gold mining has been comparatively active during the year, but the work carried on has been mostly of development character. Mine companies have made returns of work done during the year ending 31st of October, which show that 3,710 tons of gold ore was mined, the value of which is estimated at \$36,900. The wages paid amounted to \$22,750. Mills for treating the ore were being erected when this Report was drawn up, several of which are now in operation. New processes of treating ore are being adopted and interesting results may be expected when the next report is drawn up.

Nearly all the silver mines in the Lake Superior district were idle during the year, and the work done on five or six locations was chiefly the opening and proving of veins.

No iron mining is reported for the year but several properties were prospected with a view of improving the quantity and value of their ores.

Summarizing the mineral production, the Report remarks that the total value exceeds the value of last year by \$668,466, but the principal increase is in nickel and copper in which there is a different basis of values for the two years.

In a chapter on "Iron-making in Ontario" the Report says that "the Province of Ontario is singular in being almost alone among the great commonwealths of our continent without a blast-furnace for the production of metallic iron." Iron-making has been undertaken at different times and in various places, in the Province, but in almost every instance by men without skill or experience and with only very limited means.

The first blast-furnace in Ontario was built about the year 1800 at the falls of the Gananoque River, an old-fashioned stack and with it was a forge for the manufacture of bar-iron. But the location was too far from the ore deposits and the ore was of inferior quality and after two years this venture was abandoned.

The next furnace was started twenty years later at Charlotteville, Norfolk County, to smelt the bog-iron ore in that district and was carried on successfully for a quarter of a century, or until the supply of ore in the locality became exhausted.

In 1820, steps were taken for making iron at Marmora, Hastings County, a furnace was erected for the purpose of smelting hard magnetic ores, but this ill-fated furnace ruined or crippled three or four successive owners in the course of forty years, although the greater part of the time it was out of blast. In 1837, Commissioners reported on a scheme to acquire by the Government, the "Marmora Ironworks," for the purpose of utilizing convict labor in the production and manufacture of iron. The Report was very favorable to the scheme and the commissioners seemed to think they had struck a bonanza for the Government, particularly as the owners had a contract with the Government for the delivery of pig-iron ballast into the naval yard at Kingston at a full remunerative price of £13,000 sterling. They estimated the value of the works to be at that time £23,770 sterling, with a total yearly revenue of £9,145,178. One member of the Commission, however, presented a minority report, and his views together with the representations of the Warden of the Kingston Penitentiary, of the difficulty of maintaining discipline over the convicts if so employed, of the extra cost of additional guards, of the inability for physical reasons of so many of the convicts to perform the work, and so on, appear to have convinced the Government that the project could not be carried out. Operations at the mine came to an end in 1883, when the whole property that had accumulated including railways and rolling stock, mines, furnaces

and works were sold by order of the Court, on account of the misuse of the then proprietors of the grants obtained from the Government. It was bought at the nominal price of \$32,000, but though the purchaser is still the owner, the "Big Ore Bed" at Blairton is filled with water and furnaces and works are tumbling into ruins. Several of the blast-furnaces were built and started in various places but all came to grief, one from one cause, another from another. In one case, the failure resulted from the necessity of making costly experiments with an ore the nature of which was not fully understood; another from "want of funds"; others found the cost of transport of material too heavy or that local fields became exhausted sooner than expected, but from whatever cause every attempt has been abandoned. The Report of the Bureau of Mines proceeds to show the advantages that exist for producing iron and the advisability of the work being undertaken by competent men not afraid to put a considerable amount of capital into the work for the purpose of starting it fairly.

The Report then reviews at large the qualities of the ores to be found in the Province and forms an estimate of the quantity which it gives in round numbers as "1,000,000,000 tons, a quantity sufficient to yield 1,000 tons of iron a day for 3,000 years."

AN ARCHITECT'S LIBRARY.¹

BOOKS on architecture may be grouped—first, comprehensive books; secondly, special books; thirdly, hand-books. Before we begin to name and consider a few of the most useful examples of each class, there are some general matters to be noticed. First, as regards architects' books, note that they are of little value unless they are illustrated—nay, some of the best consist of illustrations only, and have no letter-press. It is through our eyes that we take in our knowledge of architecture and of architectural construction also. This is best done by seeing buildings, and next best by seeing them or parts of them represented; accordingly, an architect's books are mostly picture-books. Curiously enough, the Continental publishers—Italian, German, French, and even Spaniards—much more readily incur the expense of elaborate illustrations of a large size than do English ones. Almost all our English illustrated books are octavos with cuts in the text and but few plates, while the publication of a folio, or even a quarto, with such sumptuous engravings as the Continental books habitually include, is quite an exceptional thing here. Now and then, of course, we do a big book, and, on the other hand, both French and German publishers now and then bring out a small one with cuts; but still the broad difference remains. The great changes that have been introduced into the methods of illustrating, both by photography and by the new process for reproducing photographs and also drawings, will make the illustrated books of the future differ from those of the past. Photographs of buildings will often take the place of drawings, though they are no doubt less useful. Fortunately the means of reproducing drawings will afford such facilities as will stimulate the publication of them also. To return to letter-press, however. In studying any great subject you will usually find out that there exists one book out of which most of the others dealing with the theme are made—that is to say, that one man of good powers will have gone into the subject thoroughly—construed it completely, and written what he knows—and in doing so will have produced the standard work. Many others will subsequently interest themselves in the subject, and will in many cases carry it farther; but what they write will in the main be the contents of the standard work over again, with some additions and illustrations. And, as a general rule, any subject about which no standard book exists is systematically left alone by ordinary book-makers. Obviously it is of great importance to know which these standard books are, and study them thoroughly. As examples, Pasley on brickwork and Tredgold on carpentry may be named; but perhaps the best instance of a standard book on an architectural subject is Rickman's "Analysis of Gothic Architecture." Before him no one had lucid orderly ideas upon the subject, though attention had been long directed to it. He personally studied the Gothic buildings of all periods of England. He established a simple classification on so reasonable and sound a basis that no one has sensibly added to our stock of knowledge—or (with the exception of Sharpe) has seriously proposed a modification of Rickman's periods; while Continental students of architecture have arranged the sequence of their examples on the same lines, if under false names; and many other subsequent books have only rewritten Rickman or condensed him, or expanded him.

Again, with regard to every book, it is of great advantage to know what are the characteristics—i. e., the merits, the defects and the peculiarities of the author, or at any rate of his work. One writer is brilliant, but not always accurate, another is original, but not lucid nor is his work always well arranged, and so on. It is of especial importance to know how far you can trust an author, and what sort of information you can hope to get from his writings and what not. It is useful to go to more than one sort of book, for if an accurate painstaking writer be the most trustworthy when you are seeking for information, he may be so dry that you are glad as a change to take up some author of more genius, if perhaps with less knowledge. It is not easy to give much useful advice upon "how to

¹ By Prof. T. Roger Smith, F. R. I. B. A. An opening address delivered on Tuesday, October 10, 1893, at University College, Gower Street, W. C.

read." Most readers are helped by the habit of making notes as they go along. If well done, this practice leads to something valuable if it results in something like a condensed record of the contents of a book; but that circumstance is of small importance compared with the question, Does it or does it not aid you to concentrate your attention on what you read, and help to fix it securely in the memory? If you find it does, practice it. If otherwise, only use it occasionally. I have, however, no hesitation in recommending the practice. As you read, if you take notes, illustrate them with free sketches from the pictures in the book, and when you are not taking written notes it is still desirable to do the same thing. I do not suggest laborious copies of cuts in a book (still less tracings), but pencil sketches, freely done, of those portions of the illustrations which bear most closely on the subject under consideration. For beginners in the reading of an art, as well as for beginners in the art of reading, it is of great importance that the books first taken up should be attractive ones, and on this account some part of the history of architecture is a better starting-point than any portion of the study of materials or construction. It is in the greater possibility of their being made interesting that lies the secret of the superiority of a course of lectures over a course of reading. The lectures may not be able to convey much information that could not be got at by a sufficient amount of severe study in a library; but if a man knows anything of how to lecture he will manage to make the same information ten times more telling than it will be felt to be by a student depending solely on books. It is much more useful to possess a few good books, and to use them thoroughly well at home, than it is to have access to a large library, and to glance in a superficial way at a great many.

I hope that all my hearers will accumulate, or are accumulating, a little store of books, and will take some pride in having good ones and in good condition. It is not throwing money away, if you have a little to spare, when you now and then get a favorite volume bound, or at least half-bound, and in London it is very desirable to keep your books from dust. The most complete way of doing this is to have a glass-fronted book-case. A more modest substitute, but a useful one, is to nail a strip of leather or cloth to the front edge of each shelf wide enough to protect the tops of the contents of the shelf below. Though one's own books are one's best friends, even a well-stocked series of volumes will not suffice, and recourse must be had to a library, and nowhere are a little guidance and a little previous knowledge of writers and of the subjects they treat more useful than when one first attempts to make use of the accumulated store of a large library. For this purpose you require to get a knowledge of names of writers to enable you to consult the catalogue with success. In some libraries no attempt at all is made to classify the subjects of books in the catalogue, and the names of the authors given in alphabetical order are the only clues to the books, and everywhere they are of importance. And so almost the first preliminary for any one who wants to use a large library is to know who has written about what. That information is not easy to get at, and it is one of the advantages of the excellent "Dictionary" of the Publication Society that it bristles with references to books. The same thing is true to a considerable extent of the laborious and learned, but unequal, compilations of Perrot and Chipiez. In most libraries the librarians will be able to give some information as to the books dealing with any special subject, but it is not always safe to count upon that help, and, as the student must find out a good deal for himself, he should treasure up references to books as he happens upon them. A series of three lists, each of one hundred books, has been pointed out to me by Mr. Batsford, to which I beg to draw your attention. They appear in the *American Architect* for July 30, 1887, and two of them were the two best of a considerable number sent in in competition for a prize. The third list is one drawn up, not in competition, by Mr. Batsford himself, and shows a much better knowledge of books than the two others. Between them they will furnish the titles and authors' names of a very excellent series of books on our art. As regards working in libraries, it is worth while to make use of the most accessible, if possible. Among the many public libraries now established, there are some which contain many of the books we want to consult, and most of them contain some. The best and best organized collection of books both on architecture and on construction, beyond doubt, is that of the Institute of Architects—it is readily accessible without payment to all architectural students.

Next to it is the extremely extensive Art Library at South Kensington. Admission there is obtainable at a very moderate fee, and almost every published book on fine art (including architecture) can be consulted there; but, of course, books on construction are absent, and the catalogue is not in as perfect a condition as it will be when the revision now in hand is complete. The library of the Architectural Association has been hitherto exclusively a lending library, and it is only recently that it has come to have a reading-room for members at all. It has now a good collection of valuable books, and it has an excellent system by which country members may borrow books as well as London ones. A library formed many years ago exists at Sir John Soane's Museum in Lincoln's Inn-fields. It is now under the care of Mr. Wyatt Papworth. It includes, with books of general literature, a good many books on architecture. Any student desiring to make use of it should apply personally to the librarian. The London Institution and the London Library in

St. James's Square, nay, even Smith's and Mudie's, each lending libraries, all include a proportion of architectural books. To students of the Royal Academy there is a splendid collection of books on fine art open in the library of that rich institution, and last and greatest, there is the enormous British Museum Library. This vast collection is readily accessible to any reader known as a genuine student. In the reading-room there are about 20,000 very carefully-selected books of reference, and these one consults easily enough. Any book not in the reading-room, and of which you know the title correctly, can be brought to you, but the delays are unavoidably great, and as a rule, it would be better for any student wishing to consult books about architectural subjects to go to the Institute library or to the one at South Kensington. There is a good and increasing library of technical books, chiefly relating to construction, but embracing some on architecture as a fine art, at Carpenters' Hall, in the City of London. It is accessible on very easy terms, and books can be borrowed under suitable conditions, and there is also a reading-room, but it is as a lending library that it is likely to be of most service to any students of this college. It is now time to turn to the question of buying a library—a student's one, that is. To form a small collection of useful books is one of the objects which an intending architect should early propose to himself. It may hereafter grow into a library, or it may never expand very greatly; but whatever it may lead to, the shape of the collection at first will usually be a modest number of books, chiefly manuals, many of them bought second-hand, usually a few at a time, and often out of but slender resources, with here and there a more expensive volume obtained as a prize or a present, or out of some windfall. Let us imagine a collection of this sort, started by a student, and with access to a good reference-library for such books as he cannot afford to buy, or does not need to possess, but only to consult. If the course begins with Egyptian architecture, he may buy as a manual "*The Monuments of Upper Egypt*," by Mariette; and he will find for reference an excellent account of Egyptian art in the "*History of Art in the Ancient Egypt*," by Perrot and Chipiez, the first, and by far the best volumes of a work on ancient art published in French, but accessible in an English translation. For Greek architecture it is not easy to name a manual, but small condensed editions of Stuart and Revett's "*Athens*" will be the best. There is a somewhat full chapter on Greek in the "*Manual of Architecture: Classic and Early Christian*," prepared by Mr. Slater and myself. For reference the central and best book is the "*Athenian Architecture*" of Mr. Penrose, and there is the folio edition of Stuart and Revett's book. For those who read German there is an excellent book by Bötticher. There is also one by Fergusson. For Archaic Greek architecture the books of Dr. Schliemann must be consulted. Something of Roman architecture and of Greek also will be found in "*Leeds on the Orders*," one of the series of elementary green-books known as "Weale's Series." Apsodious's account has been published about Roman art. Perhaps the best recent book to refer you to is Middleton's "*Ancient Rome in 1885*," and the most fully illustrated works of reference are by the Italian antiquary, Cassina, who also has fully illustrated Etrusca. For Assyrian and Persian art I can name no good English manual, though I believe there is a good French one. The books of reference include further volumes of Perrot and Chipiez, and the splendidly-illustrated works of M. Place and of Sir H. A. Layard. On Mohammedan architecture there exists an admirable manual by Stanley Lane Poole. It is one of a series published by the Department of Science and Art, and is entitled the "*Art of the Saracens in Egypt*." It is the best book of the series to which it belongs, and is extremely good. Of books of reference they issue the "*Alhambra*," by Owen Jones, "*Arabian Architecture*," by Coste and "*Arabian Art*," by Prisse d'Avennes, all three superbly-illustrated books. It is difficult to recommend an English manual dealing with Renaissance and modern work. But the student perhaps by this time may have succeeded in adding Fergusson to his shelves, who devotes a whole volume of the history to Renaissance. He will also find a good account of Renaissance work in Rosengarten's "*Architectural Styles*," a smaller work of the same sort as Fergusson's. Lastly, among small books, some very little volumes long since out of print must be mentioned. These are the hand-books to the "art courts" of the Crystal Palace by Digby Wyatt, Owen Jones, Waring and others. Occasionally, an odd copy turns up at a second-hand shop, and it should be secured as a prize if one can be found, and the little volumes are well worth consulting in reference-libraries when studying the subjects of which they treat. Suppose the student to be working at construction and materials, the first manuals to collect would probably be Dobson's "*Rudiments of the Art of Building*" (Weale's Series), "*Anderson on Materials*," Tarn's "*Science of Building*," his edition of "*Tredgold's Carpentry*" and his volume on "*Roofs*." Mitchell's handy volume, with its many clear engravings, is an elementary manual from which a good deal is to be learned; and with Seddon's "*Builder's Work*," or some similar book, the student would find that he had made, at any rate, a good beginning of a library on building. In French there is an excellent manual on building construction by Ramée—"*L'Architecture et la Construction Pratique*." All these are more or less comprehensive books. The various articles in the dictionaries, especially the Publication Society's one, and that of Viollet-le-Duc, give treatises more or less complete on the separate subjects which go to make up a complete knowledge of materials and construction.

There are not a few special books on these subjects which should be added one by one to the collection, if the dictionaries cannot. For example, on individual materials, "*Laslett on Timber*" is an excellent book.

There is also an admirable French book on the same subject by Dupont and La Grye, called "*Les Bois*." On stone there is a good book by Hull, "*Ornamental and Building-stones*." On concrete there is a useful volume by Potter, and there is one on foundations and concrete works by Dobson in Weale's Series, and so on for each branch of knowledge. These books are for the most part well known. You will find some of them enumerated in the *American Architect* lists already alluded to — and others in the series of lists — increasing in extent one after another, published in the *Calendar* of the Institute as a guide to students preparing for the examinations held there. You will be able to consult in the libraries the books themselves, and by degrees to buy them, one after another, as you get the means or feel the use of them. Supposing a student to have begun to collect books, and to have arranged for his admission to a reference-library, it may be worth while to consider a little more closely when he has these methods at his disposal how he can make the best use of them; and we must suppose that he does his evening work partly at home and partly at a library, and that his own collection begins with manuals and not much more, is gradually enriched by the addition to his shelves of a certain number of special books, and ultimately of some comprehensive one, probably beginning with "*Gwilt's Dictionary*." We will thus assume that all the architectural books he wants are open to him, but that some, mainly those on his shelves, are the easiest to reach. It is not, as a rule, the case that the manuals give the best information, unless they are restricted to a narrow section of a subject. Manuals of a limited scope may contain enough information to be thoroughly useful; but if they cover a great extent of ground every word has to be measured out by the writer and to be weighed by the reader, and there is no room for the necessary explanations and no allowance for one's inevitable forgetfulness. The best service that such books can render is to refresh the memory and remind the reader of what he has learned in books that are more full; and where a book can be found dealing at some length with the topic which you want to study, it is more useful than either a manual on the one hand or a chapter out of a dictionary of the art on the other hand. Unfortunately, there is not always a good, clear, full book to be met with treating the subject adequately every time the student desires, so to speak, to take a fresh step, and he must therefore welcome them when he finds them, and when he cannot make the best use of either the very little books or the very large ones.

And here we may inquire briefly what are the names and what is the scope of those comprehensive books of reference to which allusion has been more than once made. Of general books the foremost undoubtedly is "*Gwilt's Dictionary*," an extremely complete book of reference and a very mine of useful knowledge. The original, by the late Joseph Gwilt, has been greatly increased, both in bulk and in completeness, by additions by Mr. Wyatt Papworth, who has revised the whole and brought it up to a modern date. On the whole, the portions relating to materials and construction are the best, though a great deal of valuable matter relating to Classic architecture, and some relating to other phases of the art, is included. It is not to be supposed that you will set to work to read "*Gwilt's Dictionary*" through — you might almost as well read the "*London Directory*," or at any rate "*Johnson's Dictionary*," — but there are many parts of it which it will be very advantageous to read in default of special treatises, and the book is one that, as it contains something about everything architectural, ought to be one of the earliest purchases of a student. You can often get a second-hand "*Gwilt*," but do not buy a very early edition or you will miss Mr. Papworth's many and most valuable additions and corrections. Another book of universal scope and of the greatest excellence is the "*Dictionary of Architecture*," produced by the Architectural Publication Society. This is a costly book in several volumes, of small folio size, with plates and cuts. It is alphabetically arranged like an encyclopedia, and the articles in the earlier volumes were contributed by many different architects and others. The latest ones are almost entirely from the pen of Mr. Papworth. Few subjects on which you will require information are absent from these pages. The articles are full of useful matter: they form condensed, detached, short treatises, they are extremely trustworthy, and, what is of very great importance, they almost invariably give references to the books where fuller accounts of each subject is to be got. This book can, of course, be consulted in all architectural libraries, and there is a copy in the library of this college and many architects have it. Not a little of the information you require can be found in any good general encyclopedia. The reissue of the "*Encyclopædia Britannica*" has many first-rate articles on detached subjects, and it has an excellent article on architecture, of which half is by my predecessor in this chair, Professor Hayter Lewis, and half by the late Mr. G. E. Street.

Lastly, let me recommend the back volumes of the professional journals and the *Transactions* of the Royal Institute of British Architects containing papers on, and illustrations of, almost every subject that you can think of. In the course of years all sorts of architectural topics come up in the public press and before the professional societies, and if you hunt through the indexes of these publications when you are seeking for information which eludes you

in books, you will often be rewarded. Of general books which have a more limited range the most important is Fergusson's "*History of Architecture*." This is a book in four large octavo volumes, profusely illustrated with wood-cuts. Two of these volumes treat of the history of the art in the Western world down to the Renaissance. A third treats of Modern Architecture, and the remaining one of Oriental. It may be worth while to point out that this work is an enlargement of an earlier book by the same author, "*The Handbook of Architecture*" — a very valuable work, almost, to my mind, more useful for a student to possess than these larger books, and one that I advise you to buy if you meet with it. Mr. Fergusson gives references to the sources from which his illustrations are obtained, and occasionally to his authorities, and you are, generally speaking, quite safe in accepting any statement of fact that he makes as trustworthy; but his opinions — which, by the bye, he often puts forth as if they were facts, may or may not be correct. He was a man of wide and deep knowledge, but not of equally well-balanced judgment, and now and then he jumped to conclusions which a mature judgment ought to have induced him to reconsider; but to reconsider an opinion was not in his nature.

For those who read French, there is the wonderful dictionary of Viollet-le-Duc, and which, within the limits that the author has set himself, is almost exhaustive both as to construction and as to art. On the constructional side, the most comprehensive book is that by Percy Smith, known as the "*South Kensington Notes on Building Construction*." These are in four large volumes, of which all are useful; but the third volume (on materials) and fourth on difficult construction, including iron structures, are more valuable than the earlier ones, which are elementary and a little diffuse. A condensation of these into one handy volume has been made by the author, and will be enough for most students' purposes. Very little has been passed over by the learned and indefatigable engineer officer, who has given many years of labor to this work and any volume of it will be a valuable possession if you can acquire it. "*Builder's Work*," by Seddon, is a condensed treatise, with the same sort of scope, but less minute. A condensed book on construction is about to appear, which aims at compressing into one volume, to be sold at a reasonable price, a very wide extent of information indeed. I allude to Allen's "*Practical Building Construction*," a handsome volume with nearly one thousand cuts. The illustrations are clear and sensible, and though the book covers too much ground to enable the writer to be very full anywhere, it appears to convey the most important facts about each material and the mode of using it. This opinion is given as the result of a necessarily hasty inspection of a work which seems likely to prove very serviceable. Comprehensive books were, the lecturer added, best as works to turn to when a student wanted to know something. The way to learn a subject was to begin with a restricted portion and to master that, and then go on to the next portion, and so to learn it in detail. Thus, for example, if a student wishes to take up Gothic architecture and had access to nothing better than the general writers, he might take Fergusson first. In the "*History*" he would find the comprehensive general course that was run by Gothic architecture illustrated by plans to small scale and views of important buildings, but no minutiae. To make real progress in the knowledge of Gothic architecture, so far as it could be got from books, the student would have to turn to something more specialized, and Rickman's "*Analysis*," which the lecturer had already named, was the book to which the student of Gothic architecture should first have recourse, and which he should make his guide, philosopher and friend. Rickman's "*Analysis*" was a book to possess and to study, and as the additions to later editions were not of the same value as the original, one should buy an early edition of the work if one was found reasonable. The various characteristics which Rickman gave could be fixed in the mind by careful reading and re-reading, and by making sketches, first from the illustrations in the book, and then from actual work.

The second-best special book was Sharpe's "*Parallels*," a huge folio book of illustrations, and a splendid volume. In it a certain number of Gothic abbey churches, chiefly those of Yorkshire, were anatomized, compared and contrasted in the most thorough and interesting manner. When the student got to Tudor architecture Sharpe's volume would, however, fail him, and he would then do well to look for examples of work in two finely-executed books of plates by Pugin in his "*Examples*" and his "*Specimens*" of Gothic Architecture. The lecturer would next recommend the careful study of the volume of lectures by Sir Gilbert Scott, which contained the results of an intimate knowledge of Gothic art acquired through a lifetime of study and practice, and were profusely and beautifully illustrated. It was usually easier, when one had mastered the rudiments of a study, to pursue it with reference to some good examples, than to go on with comprehensive views only, and a monograph on some good Gothic building would be helpful at this stage. Two such works were Scott's "*Westminster Abbey*" and Willis's "*Canterbury Cathedral*." Paley's book on "*Mouldings*" would supply in considerable detail, examples of one important feature in Gothic buildings, and would probably stimulate the reader to take profiles for himself. Two books by a prolific, but not always accurate, writer on Gothic architecture — the late John Henry Parker — ought not to be omitted, viz. his "*Glossary*" and his "*Domestic Architecture*." If now the student extended his pursuit of the knowledge of Gothic architecture across the Channel, there were two remarkable books,

each unrivalled in its way, which ought to be studied—the “*Dictionnaire de l'Architecture*” of Viollet-le-Duc, and the “*Abécédaire*” of Du Caumont—the first-named work was a perfect mine of knowledge, and was profusely illustrated by charming cuts. Of books describing French Gothic buildings, there was a profusion. The monograph on “*Chartres Cathedral*,” published by the French Government, was the finest known to the lecturer; but in the works of English writers, such as Johnson, Norman Shaw and Nesfield, as well as in the works of such Frenchmen as Chapuy or Du Caumont, there was an infinite wealth of illustration of details and ornament. Suggestive works calculated to give food for thought were Ruskin’s “*Seven Lamps*” and his “*Stones of Venice*,” Garbett’s “*Design*,” and, in a different strain, some of the publications of Pettit, Freeman and Sharpe; Street’s “*Brick and Marble Architecture of Italy*,” and his “*Gothic Architecture in Spain*,” carried the mature student farther afield, and were models of what an architect’s travelling-notes should be; but they were hardly easy reading. There were several useful manuals on the subject. The elementary volume on “*Gothic and Renaissance Architecture*,” which Mr. Poynter and the lecturer prepared was, he hoped, serviceable as far as it went; and then in Weale’s Series was Talbot Bury’s “*Styles*,” and another sound manual was Bloxam’s “*Principles of Gothic*.” In conclusion, Prof. Roger Smith described some of the luxuries of an architect’s or a reference library—magnificent volumes, full of large and brilliant plates, which it was a treat to examine. Students who had access to a fine library were not always awake to the idea of how easy it was to give themselves much pleasure by simply going through one of these great works as a relaxation after a spell of the more moderate and practical ones. Time thus spent was by no means wasted. It was for such a purpose that these sumptuous volumes were collected at great cost, and he would say to all students, Do not scruple to make use of them. Numerous examples of these valuable folios were exhibited, a few belonging to the library of University College, others from the Professor’s own library, and others lent for the evening by Mr. B. T. Batsford, of High Holborn, the architectural publisher, and the lecturer referred to several of these in detail, suggesting their special features and value in a brief running commentary. Mr. Roger Smith added: “I have endeavored to direct your attention to books on architecture as a valuable possession, as a source of information and interest, and as a means of real gratification. I have also pointed out a few of the books to which you can turn with the certainty of its being worth your while. Like many other fruitful subjects, that of books on our art is not capable of being completely dealt with, much less of being exhausted within the limits of an hour’s lecture, and if you take up architectural books as one of your pursuits, you will find them both profitable and pleasant. You cannot, even if you care nothing for books, get on altogether without them; but what I desire is to persuade you to form the habit of looking upon your books as among your best friends and your constant companions, the library as your pleasant resort, and reading as an art to be cultivated carefully and practised daily.”



ENGINEERS' CLUB OF PHILADELPHIA.

AT the business meeting, held November 4, 1893, President John Birkinbine in the chair, twenty-six members and visitors were present.

Mr. John C. Trautwine, Jr., with the aid of the blackboard, described the largest one of the four single-track stone bridges which are being thrown across the wild and narrow valley of the River Pruth in Galicia. This is a segmental arch, varying in thickness from seven to ten feet, and having a clear span of 213 feet, with a rise of about sixty feet. It was cheaper, on account of the good material at hand, to make these bridges of stone than to have them built of iron, and the one described above is believed to be the largest stone railroad bridge and the largest stone arch in existence, excepting the Cabin John Aqueduct Bridge, near Washington. In constructing the arch, the lowest or innermost ring, to avoid excessive loading of the centres, was built first and allowed to remain for two or three weeks before the upper layers were added. These were begun at not less than four points, the springing points and the middle of each haunch, simultaneously, and the closing of the ring took place simultaneously at not less than three points.

L. F. RONDINELLA, Secretary.

MORE ABOUT THE BURNS STATUE FOR PROVIDENCE.—The young sculptor W. Clark Noble has had another rebuff in his suit against the Burns Monument Association of Providence, R. I. The promoters of the monument to Burns encouraged him to begin and carry on far toward completion a statue of the poet, to cost \$15,000, but when subscribers pleaded poverty the sculptor was asked to apply his statue elsewhere. The first trial granted \$6,800 to Mr. Noble, but Judge Barker set the verdict aside. The second trial gave \$7,300 to the sculptor; but Judge Morton has now set that aside. Perhaps if Mr. Noble has the firmness and the money to persevere he may end in obtaining from some sympathizing jury the full amount of his claim.—*New York Times*.



[Contributors of drawings are requested to send also plans and a full and adequate description of the buildings, including a statement of cost.]

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THESE sketches are copied from *Teknisk Tidsskrift*.

IRON GRILLE AND MAIN STAIRCASE FROM A HOUSE IN THE AVENUE KLEBER, PARIS, FRANCE. M. RUET, ARCHITECT.

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THE OFFICIAL RESIDENCE, FREIBURG IN BREISGAU.

THIS plate is copied from the *Zeitschrift für Bauwesen*.

DANISH AND AUSTRIAN SPIRELETS.

THESE illustrations are copied from *Architektonische Rundschau*.

NEW CONVENT BUILDING, BANGALORE, INDIA.

THE building, of which we copy an illustration from *Indian Engineering*, deserves a few words beyond an ordinary description. In the first place, it has been erected almost entirely by private means, the Government only having given a grant-in-aid of Rs. 4,000 towards it. While in Bangalore, we had the pleasure of going over it with the Lady Superior, and from her we learned the otherwise incredible fact, that she began it without a single rupee in hand; but, to use her own expression, “with a large account in the Bank of God’s Providence.” Many a time, during the course of its construction, the nuns were on the point of suspending the work, but money came when least expected, not all at once, but little by little, and now, after a period of three years, Bangalore may boast of having one of the finest schools in Southern India. The height of the central tower is about 100 feet. In niches on either side are statues in terra-cotta of St. Joseph and the Blessed Virgin, and these, as well as the group over the portico, representing our Lord blessing the little children, came direct from Milan. Ringing the bell, the door is opened by one of the industrial girls in a neat uniform; we enter a spacious hall 14' x 54', on each side of which are reception-rooms. There is a grand staircase of polished black wood leading to the second story, but we glance over the school-rooms, etc., downstairs first. Crossing the hall, we find ourselves in a splendid veranda 12' x 184'. To the left and right are schoolrooms 23' x 83'. These look very bright and attractive, the walls being hung with bright-colored maps and pictures from natural history and “object-lessons” just fresh from England. The wings on either side are used as refectories and class-rooms. We now retrace our steps and mount the stairs. Here, again, there is a long veranda. The dormitories, which have vaulted roofing, are really, without exception, the finest we have seen in India, and all the arrangements for the comfort of the pupils are excellent. We cannot praise the dormitories too highly. There is a third veranda from which one of the finest views in Bangalore may be seen. We questioned the Lady Superior as to how she got enough money for such an undertaking and her invariable answer was “God’s Providence.” No money has ever been received from any Missionary Association! It came, as it was required! One piece of princely generosity must be mentioned, however; the Maharajah of Mysore at first gave the timber at a very reduced rate, and finally on the birth of the last Prince, telegraphed to the Lady Superior the acquittal of the debt even of that amount. The Lady Superior herself superintended

the whole of the work, paid the men and kept the accounts, and she assures me the total cost is under Rs. 60,000. Sir Harry Prendergast, who visited the Institution while in Bangalore, rated it at a cost of 1½ lakhs.

COMPETITIVE DESIGN FOR NEW CATHEDRAL, VICTORIA, B. C.

THIS fine and picturesque design was originally made in competition for the new cathedral at Victoria, British Columbia, a competition which does not seem to have given much satisfaction to the competitors. The author was Mr. H. Wilson, on whom the mantle of his former principal, the late J. D. Sedding, has fallen in more senses than one, as any one will recognize who remembers the characteristics of Sedding's church designs.

The building was planned with a view to being carried out in sections according to the means at the disposal of the building-committee. The exterior would have been executed in local stone with a slate roof. The chapter-house and morning-chapel were to be done after the cathedral had been built.

The seating-accommodation was for a little over 1,200 persons, including the choir, and the estimated cost about 20,000*l.*, exclusive of chapter-house, cloisters and carving.

The drawing was exhibited at the Royal Academy of this year. This plate is copied from the *Builder*.

NEW ENTRANCE GATEWAY AND LODGE, WELBECK ABBEY, ENG. MR. JOHN BROOKE, A. R. I. B. A., ARCHITECT, MANCHESTER, ENG.

THIS gateway which is now approaching completion, will be the principal entrance to Welbeck, the seat of the Duke of Portland. The wrought-iron gates and railing are an important feature in the design. The heraldic treatment includes the arms of the houses of Bentinck and Cavendish, and the recent quartering of the Portland and Dallas-Yorke families. The main piers of the gateway, which are surmounted by "supporters," have a total height of 35 feet. The total width of the large gates is 16 feet clear. The whole of the walling is of magnesian limestone from the Anstone quarries.

This plate is copied from *Building News*.

REREDOS, GLASGOW CATHEDRAL, GLASGOW, SCOTLAND.

DURING the past few years considerable changes have been made in the choir of Glasgow Cathedral, with the view of bringing the arrangements and fittings more into harmony with their surroundings. These fittings being intended for the use of a Presbyterian congregation, are of a comparatively simple character. The old pulpit, which formerly stood in the centre of the choir, has been removed to the north side, and the enclosed space—or "bench," as it is called in the Scottish church—has been greatly enlarged, and now extends to the east end of the choir, where the high altar formerly stood. This space has been paved with marble, and is enclosed on either side by richly-carved oak benches. Till quite recently the east end was not enclosed, but the blank there has been filled-up by the reredos which forms the subject of our illustration. This has been erected by Lady Maxwell, of Calderwood, in memory of her late husband, Sir William Maxwell, tenth baronet, of Calderwood, in the County of Lanark. The reredos is of Caen stone and alabaster, and is the work of Mr James Young, sculptor, Glasgow. The figure on the south side represents St. Kentigern—otherwise St. Mungo—the patron saint; and that on the north side St. Ninian, who is believed to have been the first to introduce Christianity into the district. In front of the reredos stands a communion table of oak, elaborately carved and having a sculptured panel in front representing the Last Supper. The reredos and all the new work in the choir has been executed from the designs of Mr. John Honeyman, A. R. S. A., of the firm of Messrs. John Honeyman & Keppie, Glasgow.

GLENPARK, BALERNO, MIDLOTHIAN. MR. JAMES G. FAIRLEY, F. B. I. B. A., ARCHITECT, EDINBURGH, SCOTLAND.

OUR illustration shows additions recently made to Glenpark, the residence of Mr. James W. Thomson. It is situated near the Pentland Hills, and overlooks the Water of Leith, which runs through the estate.

THEIN CHURCH, PRAGUE, AFTER A DRAWING BY SAMUEL PROUT.



ON THE LIFE OF IRON BRIDGES.—The following letter has lately been addressed to a member of the Glasgow Town Council by Sir William Arrol: "I am in receipt of yours of the 4th inst., and in reply have to say that if the convener is under the impression that the life of an iron bridge is only 40 years, he is under a mistake, as the life of an iron bridge depends entirely on how it is kept and the material with which it is painted for its preservation. I may say that in

my experience I have examined a considerable number of iron bridges, and one I examined was up for 50 years, and the parts of it which were properly looked after were practically as good as on the day they left the works. Some three months ago I examined another bridge over a river; it had been up 30 years, and had not been painted for 15 years, but there was very little corrosion, the parts that were rusted were parts where drips of water had fallen and had not been properly attended to. Then, again, I examined another a few weeks ago which has been up 38 years, and every part of that bridge is practically as good as on the day it was put up. A few years ago I bought the material of the old Hammersmith Bridge, London, for the purpose of using it as a temporary plant in the erection of the Forth Bridge. It had been up for 62 years, and a great many of the parts had not been painted since its erection, as it was impossible to get at them; yet these parts were in a good state of preservation—in fact, quite as good as when they left the works. I took some of the material with which it had been painted to ascertain the reason for the good state of preservation it was in, and the result of the analysis was that the material with which it had been painted was genuine white lead. You can see from these examples that an iron bridge, properly taken care of by those responsible for it, will last practically for any length of time. The Bonar Bridge, which we have just replaced, was carried away by the strong floods; it had been up for 80 years. The iron part of the bridge, which was 150 feet span, was perfectly good, but the masonry piers got scoured out and washed away, therefore the ironwork fell into the bed of the river and was destroyed."—*American Engineer and R. R. Journal*.

THE INCOME OF THE WORLD'S FAIR.—The total paid attendance at the World's Fair from the opening day and including yesterday, when the Fair was formally closed was 21,458,910, divided as follows:

May.....	1,050,037
June.....	2,675,113
July.....	2,760,263
August.....	3,515,498
September.....	4,638,902
October.....	6,799,102

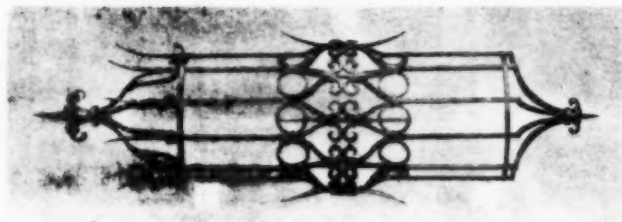
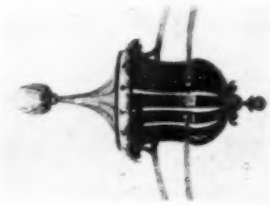
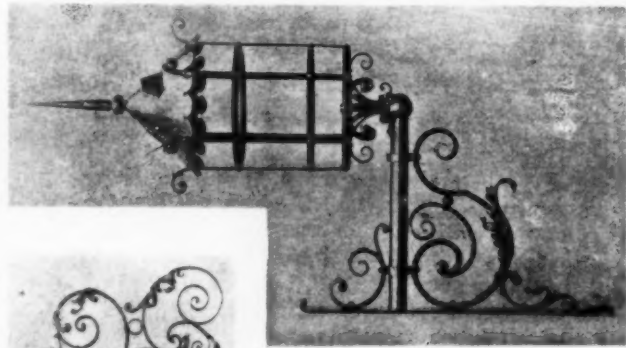
The total admissions on passes, including the employés of all kinds, exhibitors, concessionaires, etc., has been 5,953,818. Yesterday's admissions reached a total of 242,575, of which 208,173 were paid. The gate receipts will approximate \$10,500,000, and the concession receipts \$4,000,000. The fair has received about \$2,500,000 from souvenir coins and premiums, and receipts from various sources, added to the \$10,000,000 capital stock, make the total receipts approximately \$28,400,000. The buildings, grounds, administration, and everything else under the direct jurisdiction of the exhibition officials cost about \$25,000,000. The grounds will continue open as long as the managers deem best, but the dismantling will begin at once.—*N. Y. Evening Post*, October 31.

A BENZINE STREET FIRE.—A curious accident occurred at Budapest, Hungary, September 14, according to the *Electrical World*, in which a street was practically set on fire, the flames reaching higher than the houses. A glass carboy filled with benzine accidentally fell from the cart in which it was being hauled and broke, the benzine running over the street and through the slot into the conduit of the electric railroad. An electric car passed just at that time, and it appears that there was some sparking between the trolley and the conductor in the conduit; this lighted the benzine, which burned with an almost explosive violence. The car was stopped and the frightened passengers dismounted through a sheet of flame, while the car was being set on fire. The flames of the burning benzine reached as high as the tops of the houses, producing volumes of dense smoke, until it was all consumed, about ten minutes after it was lighted. With the exception of a slight injury to the car, no further damage was done.—*Fire and Water*.

A TIDAL CLOCK AT ROUEN.—A clock tower which has been erected by the Chamber of Commerce of Rouen gives the time on three sides, and the height of the tide on the fourth which fronts the harbor. The tide-indicator consists essentially of a float, which, by means of a cord and counterweight hung on a drum, actuates a series of shafts with bevel wheel-gearing, and moves a hand or pointer on a dial like that of a clock, marked with the usual figures to show the level of the tide. The clock has an apparatus for distributing the time to other clocks in Rouen and also for unifying the time, after the method adopted in Paris. The dials are of opal glass and are illuminated at night-time.—*Invention*.

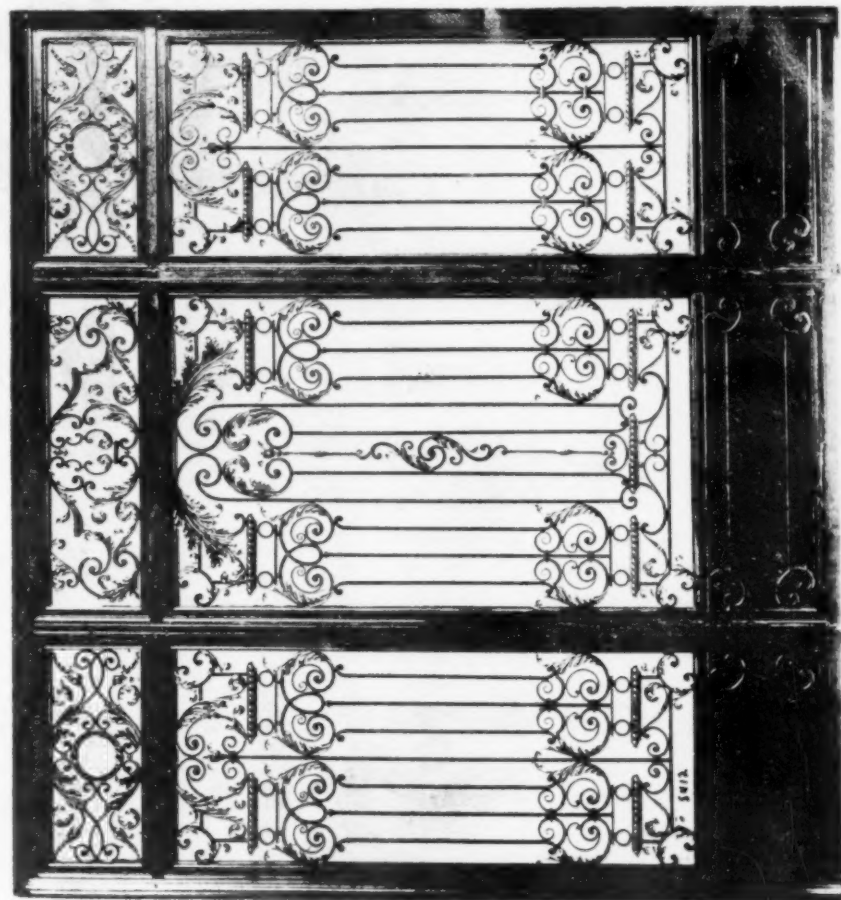
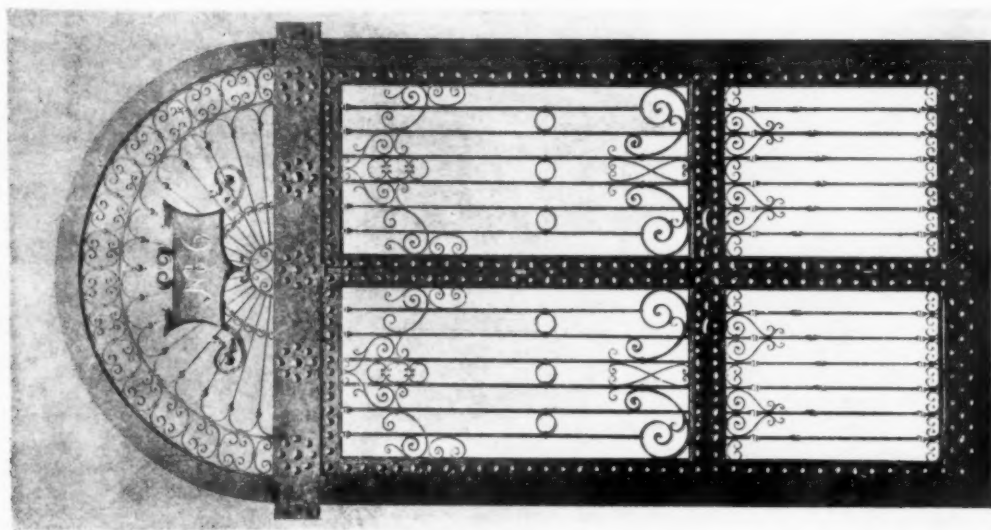
THE SITE OF THE NEXT PARIS EXHIBITION.—The Plenary Committee on Organization of the World's Fair, to be held at Paris in 1900 has confirmed the sub-committee's selection of the site. This site will include the Champ de Mars, the grounds of the Palais du Trocadéro, the Quai d'Orsay, the Esplanade des Invalides, the Quai de la Conférence, the Cours la Reine and the Palais de l'Industrie. M. Terrier, Minister of Commerce, presided at the committee's meeting.—*Exchange*.

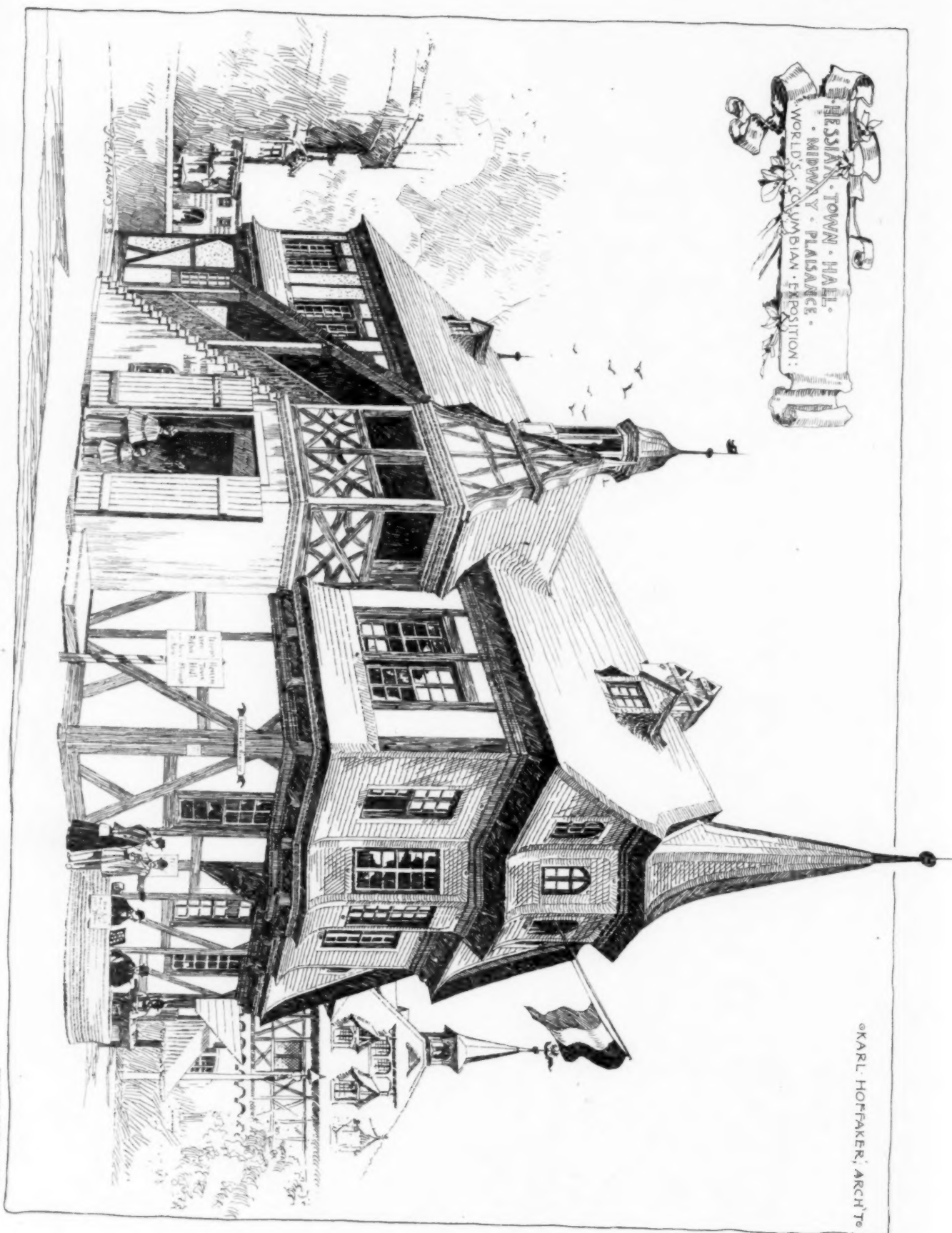
A REMOTE CAUSE OF EXPLOSION IN HOT-WATER APPARATUS.—As a possible source of danger that may have been overlooked hitherto, a writer in *Science* mentions the formation of explosive gas in the hot-water apparatus used in heating houses. Several quarts of gas each week were produced last winter in the radiators of two neighboring houses, the quantity being greater over a fire of anthracite than one of bituminous coal. The tests applied gave the impression that the gas was nearly pure hydrogen. It was evidently due to the decomposition of the water by the rusting of the pipes, which might be expected to take place most rapidly over an intensely hot fire of anthracite.—*Invention*.



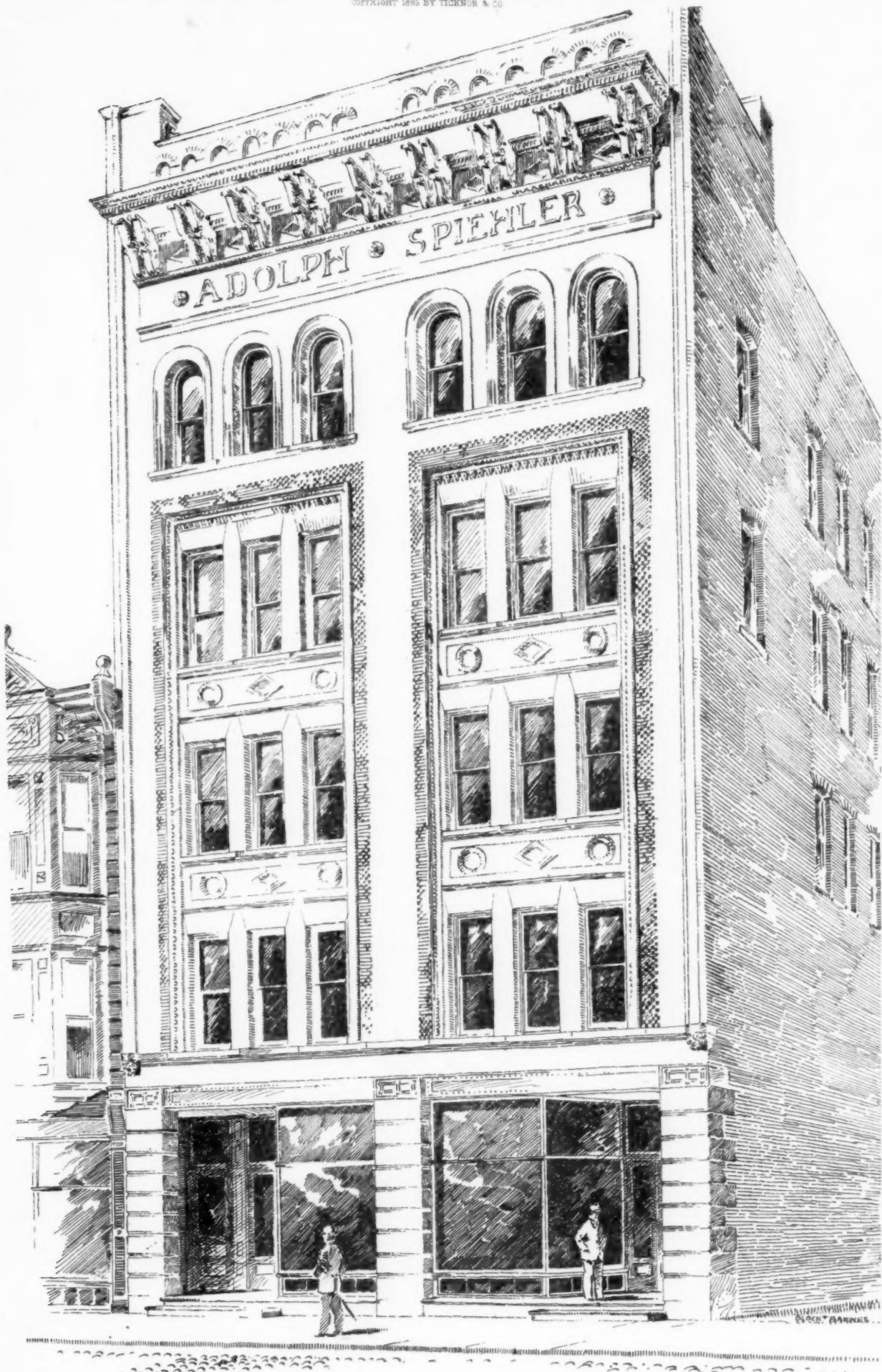


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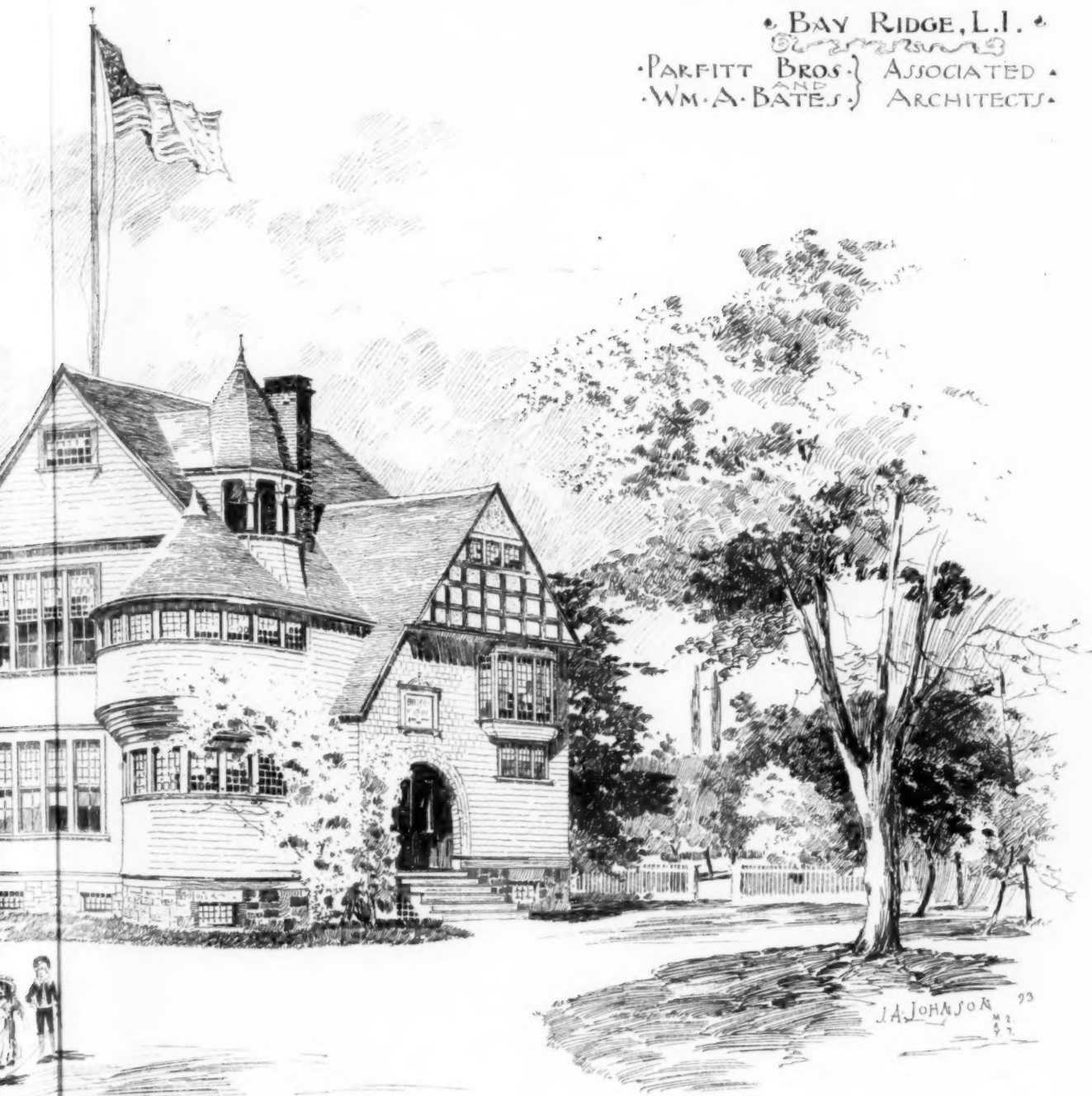
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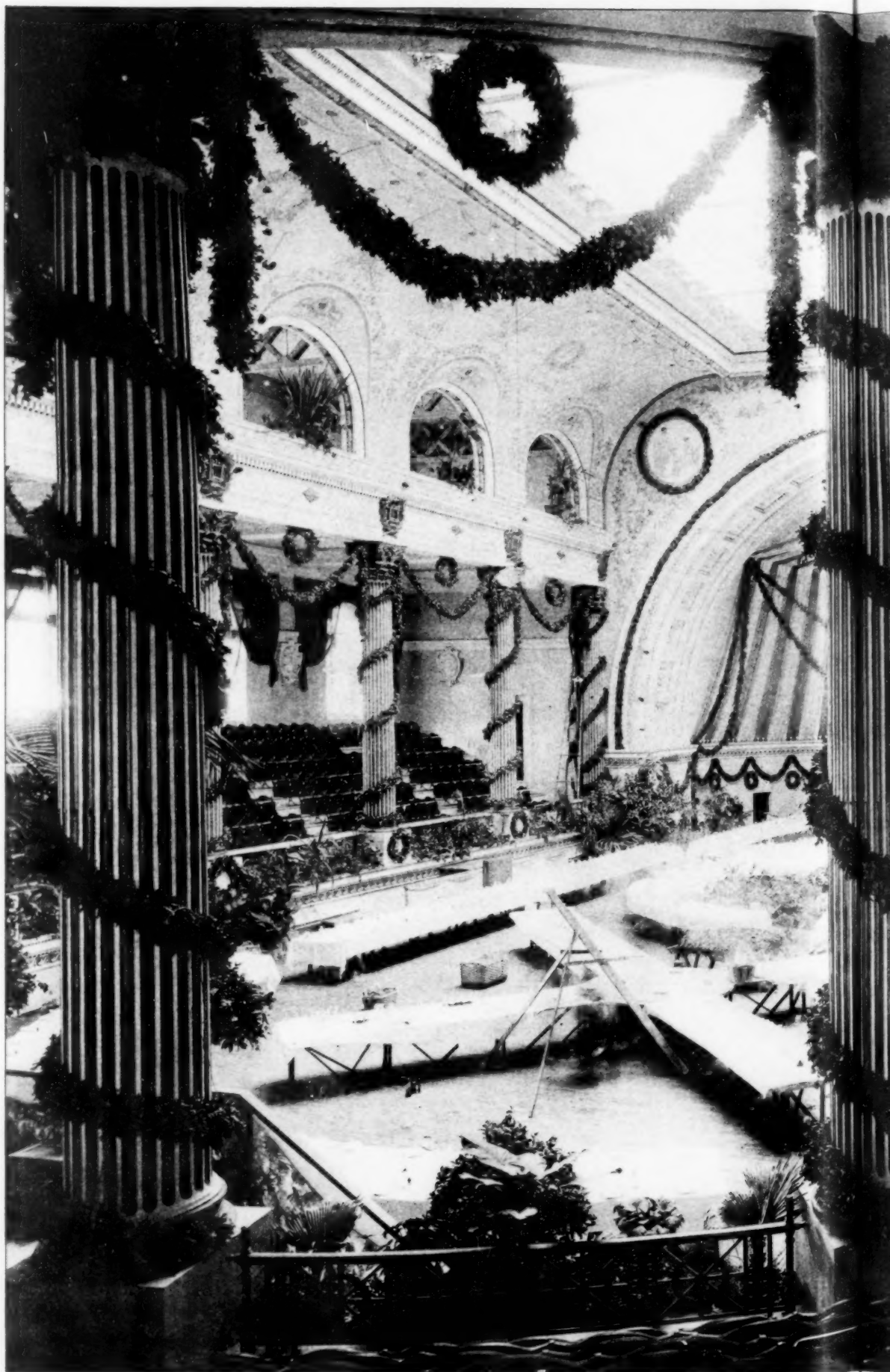


...THE SCHOOL HOUSE...

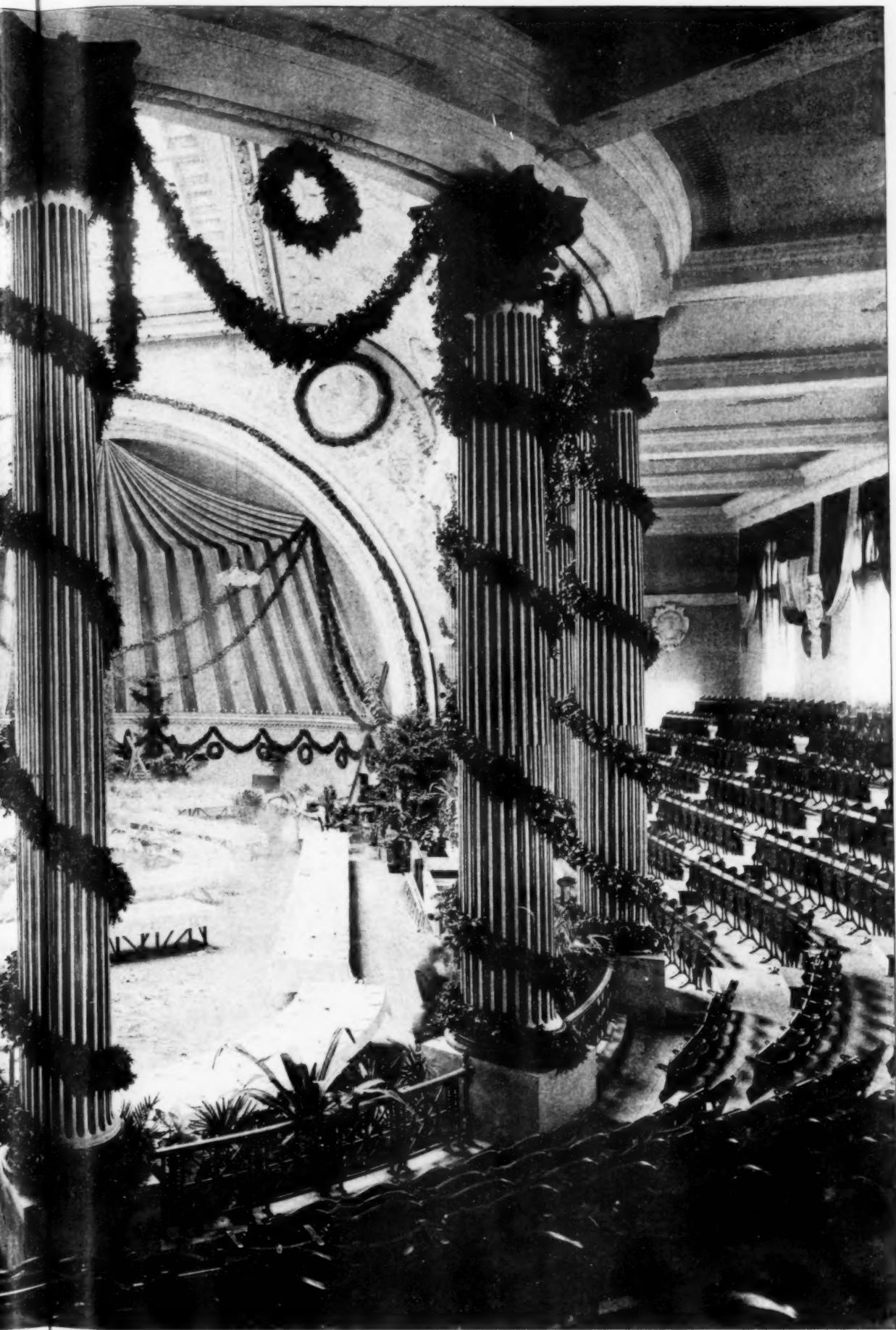
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THE MUSIC HALL, PREPARED FOR
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