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A SCHEME has been proposed by one of the Boston papers, for relieving the traffic through the narrow part of Tremont Street, which is certainly very crowded, by arcading the first story of the buildings on each side, so as to provide a sidewalk at the expense of the first story of the buildings lining the street, throwing the present sidewalks into the carriage-way. As the plan recommended by the Rapid Transit Commission, of widening the entire street, was rejected by the Legislature, it seems, at first glance, as if the arcading scheme might be a useful substitute, and it has certainly taken a strong hold on the imagination of the Boston people, who have a well-developed taste for picturesque novelties.

THERE is, however, reason to doubt whether the plan would prove much more economical than that of a complete widening. To make the sidewalks under the arcade of adequate width to accommodate the foot traffic, it would be necessary to take about twelve feet from the lower story of the buildings, which would give ten feet for sidewalk, and two feet for the piers of the arcade. Although the shelter of the arcade would to a certain extent favor the business of the stores along the street, the shading of the windows consequent on setting them back twelve feet from the open air would injure them considerably, and, as these stores furnish the principal item of rent in the buildings, there would be heavy damages to pay, under this plan, instead of a betterment assessment to collect, as there might be, in case of a simple widening, on account of the consequent better illumination of the buildings. Moreover, the expense of the arcading would not be much less than that of simple widening. It is probable that the abutting owners would wish to retain their basements to the full present width, which would involve costly waterproofing of the sidewalks; while the money required for needling, shoring and underpinning the front walls, and forming a suitable ceiling to the arcaded sidewalk, would go far toward paying for an entire new front; and the obstruction of traffic incident to the shoring would be serious.

OUR own suggestion for facilitating the traffic through Tremont Street, School Street, Washington Street and the other thoroughfares of the so-called "congested region," at a minimum of expense, would be simply to widen the sidewalks and regulate teaming more strictly. In no city in the United States, probably, are there so many foot-passengers

in the streets in proportion to the number of teams, and in none are the sidewalks so meagre in proportion to the roadway. In New York, the official width of sidewalks is, we believe, one-sixth that of the street, while in Boston it is one-eighth; yet hundreds of railway trains, and thousands of horse and electric cars, deliver daily upon the Boston sidewalks an immense suburban population, which is comparatively lacking in New York. The consequence is that in School Street, for example, we may see at almost any hour in the day throngs of pedestrians elbowing each other off the sidewalk into the gutter, while the roadway, which is at least one-half wider than it need be, is lined on one side with a long string of carriages permanently stationed in front of the Parker House, and on the other by a similar string of miscellaneous vehicles, the horses attached to which munch their oats peacefully, while the real carriage traffic of the street takes place with occasional difficulty between the two stationary lines.

IN Tremont Street, it has suited the citizens—or more strictly speaking their master, the West End Railway—to crowd and jostle each other off the sidewalks for the sake of affording room for a double-track railroad through the middle of the street, together with accommodations for stationary vehicles next the curb, and ordinary teaming between, and it must be confessed that there the movement is lively enough; but the ordinary aspect of the "congested" streets of Boston is that of two narrow sidewalks jammed to suffocation with pedestrians, and a wide space between, the centre of which accommodates moving vehicles, while the portions next the curb are devoted to the repose and refreshment of lines of team-horses and their masters. It is hardly necessary to say that the manner in which Boston-streets are utilized by teamsters would not be endured in London or Paris for a single day. Every one who has gone shopping in a London cab remembers the eagerness with which the driver deposits his passenger and whisks off, to return at a specified time and fly off again if his passenger is not ready for him.

THIS activity, which often provokes Americans, accustomed to have their coachmen sit quietly on their boxes for hours, if necessary, until their master chooses to appear, is due to a strictly-enforced regulation, which exposes any driver who allows his vehicle to stand for more than three minutes at the curb to arrest and fine; and a similar regulation, enforced with the same severity, would change the aspect of the "congested district" of Boston like magic. This would not be all, however. Something would need to be done to suppress those exhibitions of gymnastic chariotteering by which the whole traffic of the Washington Street roadway is stopped, at short intervals throughout the day, while a driver is engaged in the laborious and difficult process of navigating a heavy wagon, tail first, in or out of one of the many intersecting "avenues" which do not afford space to turn a vehicle in; and the privilege now granted to teamsters of halting a twenty-foot dray directly across any roadway, and keeping it there, regardless of the obstructions proceeding from the long lines of cars and other vehicles brought to a stop on each side, until twenty or thirty bales of cotton or wool, or bundles of hides, or casks of beer, have been carefully unloaded, deposited on a neighboring elevator and stored neatly in their places, should be withdrawn. If relief could be given in this manner from the obstruction of the roadway due to improper management of teams, it would be quite practicable to widen the Boston sidewalks to dimensions better suited to the needs of those who use them, and the complaint of "congestion" would be much less frequently heard; while, under the present system of using the busiest streets as baiting-stables, and allowing teamsters to drive or stand in all directions across them, there would still be "congestion" if their width were doubled.

HERR Robert Koldewey, whom some of our readers will remember as the pleasant associate of the American explorers during a part of the period of the Assos excavations, recently read before the Hamburg Society of Architects and Engineers a paper, which is briefly reported in the *Deutsche Bauzeitung*, on the excavations at Neandria. This ancient

town is situated near the coast of Asia Minor, occupying the top of a rocky hill, which overlooks the plain of Troy. The hill is nearly seventeen hundred feet high, so that from the ruins of the town can be seen not only the course of the little river Scamander, and the battle-ground of the Trojan War, but a considerable part of the Ægean Sea, with the islands of Tenedos, Imbros, Samothrace and Lemnos, and the entrance of the Dardanelles.

ALTHOUGH the hill of Neandria now affords so fine a prospect of the ground over which Ulysses, Achilles and Hector fought with and against the gods and heroes, the town itself seems not to have been in existence at the time when the wooden horse brought destruction to the city of Priam, and the Neandrians probably looked out over much the same prospect as that which presented itself to the German explorers, although nearly three thousand years have passed since the Æolian colonists climbed the little mountain to build themselves secure habitations at the top. Fortunately for them, the rocks which they scaled with so much trouble proved as inconvenient for their enemies as for themselves, and their city seems never to have been long occupied by foreigners. Even the Romans, who occupied Asia Minor for centuries, and established themselves in nearly all the habitable portions, seem to have found the Neandrian heights not worth the trouble of scaling, and no trace of Roman occupation is now found in what appears to be a purely Æolian town of the period beginning with the eighth and ninth centuries B. C.

THE town consists of two portions, occupying the two eminences into which the summit of the hill is divided, but both portions are included in the city wall, which is built of irregular squared stones, and is still visible throughout its whole extent. The workmanship shows that it has been altered at various times, from the seventh to the fourth centuries B. C., probably to accommodate the growing needs of the city; and it now encloses an area about a mile in length, by nearly half a mile in width, the whole of which is thickly covered with the remains of houses and other buildings. The houses on the northwest portion of the summit, which seems to be the oldest part of the town, are small and irregularly disposed, with narrow and crooked streets between them; but in the other portion they are larger, and more regularly built. In the middle of the town are the remains of a temple, dating from the seventh century, B. C., and consisting of a simple cella, enclosed with walls, and divided through the middle by a row of seven columns which carried the roof. The columns have been thrown down, but the capitals have been found, which show a combination of volutes and festoons, of an Ionic type. The roof was covered with earthenware tiles, alternately flat, with turned-up lateral edges, and semicircular, fitting over the edges of the flat ones, in the common antique manner. The ends of the lines of covering tiles were finished with antefixæ in terra-cotta, some of which were found. These have a sharply serrated edge, and are ornamented with a relief of a crouching panther. It will be remembered that the Assos temple was ornamented with reliefs of wild beasts, so that the Greeks of Asia Minor seem to have been either more familiar with such animals than their relatives in Hellas, or to have borrowed from their Assyrian neighbors a taste for representing them. At one end of the temple was found the pedestal of a statue, with an inscription, which is interesting as furnishing the first example yet discovered of the ancient Æolian alphabet. Besides the excavations at the site of the temple, a few pits were sunk in the cemeteries, which occupy a considerable area. These produced terra-cotta statuettes, with earthenware vessels of various kinds, some of early Æolic patterns, and others of foreign types. The fortifications of the town seem likely, later, to furnish many interesting discoveries. Although so ancient, their four principal gates, and seven smaller ones, are still to be seen, as are also the square towers by which the gates, and the weaker portions of the wall, were strengthened. As usual in ancient fortifications, the gates were so planned that persons entering them were obliged to turn the right side, which, not being protected by the shield, was the more vulnerable one, to the defenders on the walls. Besides the main fortification, the northwest hill, or oldest part of the town, is enclosed by a wall, which is more ancient than the more comprehensive one, and seems to belong to the earlier period of the settlement.

A MAN made application recently to the Berlin police authorities for a permit to build a house, submitting his plans, as usual. The plans showed the front of the house set back twenty-five feet from the street line, and permission to build was refused. The owner protested that there was no law prohibiting a man from setting the front of his house anywhere he liked on his own land, so long as he did not put it in front of the established building-line; but the police authorities responded that "the laws of beauty" would be violated by building a house in such a way that the uniformity of the street-line would be interrupted, and the blank side wall of the adjoining house, if any such should be subsequently built, would be exposed to view. The owner, considering, with some reason, that police inspectors are appointed to decide upon the laws laid down in the statute-book, rather than the laws of beauty, appealed to the Senatorial Court, which decided that, although the law authorizes the police inspector to refuse permits for the erection of grossly ugly buildings, the mere setting-back of the front from the street line did not constitute such ugliness as was contemplated by the statute; while, as to the effect of exposing a blank wall beyond, although this might be extremely objectionable, it held that the inspector had no right to base his refusal of a permit upon conditions which did not exist, and might never exist.

ONE of our correspondents is very anxious lest we should "weaken the strong hold" which we have upon the profession, by letting a statement of ours in regard to the speed attained by the galleys of the Norsemen and their predecessors, the Greeks and Romans "remain in circulation," "unless backed by absolutely indisputable proof." Our statement was, as we recollect, that the ancient ships were propelled, by means of their oars, at a speed approaching, if not occasionally surpassing, that attained by modern steamers. Our correspondent finds it impossible to believe this, and considers that the science of rowing is now so much more highly developed than it was in ancient times that our rowboats must go faster than those of the Greeks and Romans; but he seems to forget that the usual ancient practice of placing several "banks" of oarsmen on each side multiplied greatly the effect exerted upon the water. The ancient triremes and quadriremes were by no means clumsy tubs. Something is known of the official dimensions adopted for the Athenian war-vessels, which describe the length as one hundred and eighteen feet, exclusive of the projecting beak, and the greatest breadth at the water-line as fourteen feet. This gives the proportion of length to breadth as about eight and one-half to one. If we have been correctly informed, the steamship "*Aurania*," a very fast vessel, is modelled on the ratio of eight to one, while the "*Etruria*" and "*Umbria*" are ten to one; so that the Athenian trireme, although proportionally shorter than the "*Etruria*," was longer and narrower than the "*Aurania*," and far more so than the famous steamers of fifteen or twenty years ago.

WHO propel these sharp and slender vessels, one hundred and seventy oars were used. In our schoolboy days, we were taught that the rowers of the upper tier, in a trireme or quadrireme, used oars of such enormous length that the handle described an arc, at each stroke, of several feet amplitude; so that several men handled each oar, walking to and fro to execute the stroke. This notion appears to have been entirely unfounded. The official length for the oars of the Athenian triremes gives that of the lowest tier at seven and one-half feet; while those of these middle tier were about ten and one-half, and those of the upper tier fourteen feet. As every one who has rowed in a boat with outriggers knows, fourteen feet is a moderate length for an oar, and a rower, seated on a bench, would have no difficulty in putting the full strength of his arms and legs into every stroke with one of such dimensions; while the force exerted by the simultaneous stroke of eighty-five oars on each side must have been enormous. Naturally, we have no "absolutely indisputable evidence" of the exact speed attained by any of the antique vessels; but we have incidental statements of the length of time occupied by voyages between certain points, at known distances apart, which show that, with all the hindrances of winds and currents, fatigue and necessary interruptions, a considerable speed was maintained for long periods; and it is a fair inference that, on occasion, the average rate might, for short distances, be very greatly surpassed.

MODERN ARCHITECTURE.¹—VIII.Fig. 52. Cathedral of St. John the Divine, New York.²

TURNING now to the United States, we encounter a people with no architectural history. Owing to its Anglo-Saxon origin it was quite naturally subjected at first almost exclusively to English influences; early American art, therefore, follows the fluctuations of taste in the mother-land very scrupulously. For some time, however, since American youth began to study in Europe and draw their inspiration directly from original sources, we remark (see "Architecture of the United States," *American Architect* for July 18, 1891, *et seq.*) that the nation has been freeing itself from this faithful imitation of English types and has been creating a manner of its own. This may be defined as an adaptation of the Romanesque style to demands that are not merely modern, but American. A kind of construction peculiar to the United States is seen in the gigantic buildings of ten, fifteen and twenty stories in which business offices, newspaper offices, banks, etc., are massed. The problem of decorating the façades of these edifices was a new one on account of their extraordinary height and the unusual number of the superimposed stories. It would have been impossible to apply the rules or adopt the proportions of any Classic or Gothic types, as the conditions have nothing in common with those governing the construction of a temple or a church. The Americans saw that the Romanesque style could, almost by itself, supply the basis for them to work upon. Their choice has been justified: robust and simple as a style must be for this kind of utilitarian structure, it has, in fact, no rigorously defined proportions and easily lends itself to the most varied combinations.

In the articles on the Architecture of the United States, examples of this kind of adaptation have been presented; the Romanesque arcades, crowned with very vigorous and broadly projecting cornices, plainly secure the unity demanded by the complicated superimposition of stories, and without forcing the architect to sacrifices of space and of lighting facilities which would, on the other hand, be called for in Classic dispositions. As for the Gothic style, which is admirably adapted

to religious architecture and charming for small civil structures, it would be difficult, as may be conceived, to apply it to the huge commercial buildings of the New World.

The plan selected from the competitive designs recently offered for a cathedral in New York (Fig. 52) is Gothic; no objection can be made to it. Perhaps the broad terraces and esplanades, the staircases and balustrades accompanying it, are not absolutely in keeping with the style itself, which is generally suited to narrow streets with constructions massed about



Fig. 53. The Capitol at Washington.

it that give it "scale." In a word the proper setting for a Gothic church is a Gothic city. We cannot, however, expect the Americans to build a thirteenth-century quarter around their new cathedral, for the sake of having a faithful copy; such restorations are tolerable only on exhibition grounds.

In contrast with this carefully studied imitation of Gothic masterpieces, we reproduce the Capitol at Washington (Fig. 53), which belongs to the period when English influence predominated in America and when the English were infatuated with Classic traditions. The French will also detect in it some suggestions of the Louvre colonnade and of the Garde-Meuble, as well as of the Panthéon.

The State-House at Hartford (Fig. 54) recalls in more than one respect the modern Viennese Gothic of Herr Schmidt and his rivals or disciples: for example, the Stiftungshaus and the New Rathhaus of Vienna. There is the same association of certain architectural or decorative Gothic forms with others quite incongruous, such as rectangular bays and modern roofs. It is difficult for us to accept the dome amalgamated to these already very diverse elements. Undoubtedly they were common in Italy at the extreme periods of Gothic art; but it must be remembered that the Italian Gothic is not a model of purity and that, moreover, the examples that might be cited belong to a transitional epoch quite unsettled as to its style. The English have also recently attempted these bold combinations; but American architects are in a better path when they



Fig. 54. State-House at Hartford.

attempt to solve the problems of modern architecture with their own resources, and from their own initiative.

In closing this sketch which must of necessity be very brief, but which has, nevertheless, been extended beyond its proper

¹ From the French of P. Planat, in Planat's *Encyclopédie de l'Architecture et de la Construction*. Continued from No. 868, page 97.

² Our author is at fault here, the design he refers to, the one shown in the cut, is the design offered in competition by Mr. R. W. Gibbon, but not accepted. The successful design by Messrs. Heins & LaFarge is essentially Romanesque.—EDS.

limits, we desire to say a few words about Belgian art in connection with the French. This is a matter of some interest because the tendencies are in just the opposite directions in the two countries: merits and defects become the more apparent by contrast.

Flemish art, along with its grand qualities, has its imperfections, like all other schools, none of which is universal and whose only value, even, consists in bringing out strongly certain beauties peculiar to them, to the detriment of the rest. For a basis of judgment, turn to the productions of the artists



Fig. 55. First Prize.



Fig. 56. Second Prize.

that have given fullest expression to these merits and defects; it will immediately be perceived that one type in no way detracts from another. Therefore, we must not compare Flemish masters with others of opposite tendencies; they are different without being inferior. To be sure, their painters have not known the fulness of perfection of Raphael's women, nor the delicate and refined seductiveness of Titian's courtisans, nor the disquieting ambiguities of Leonardo da Vinci. But instead they have the work of Frans Hals and Rubens.

These same merits and defects appear in their architecture, which proclaims comfort, or wealth, or even pomp sometimes; but which never indicates a reaching-out after a distant ideal. If Hals had been an architect, he would have constructed the great square of Brussels, with its honest corporation houses, where the burghers have taken pride in symbolizing their trades and in rearing dwellings worthy of their own estimates of these.

Rubens exercised a direct influence over the architects of his day. His designs for triumphal arches may still be studied, and we find in them the primitive type of those exuberant triumphal façades loaded down with statues, with engaged columns—pilasters seemed too insignificant for them—and with flowing emblems, the origin of richly decorated, prominent projections.

Flemish architecture is open to the same criticism as Flemish painting; the style has not of course the purity of antiquity; its profusion is not always in very correct taste, although it has been singularly successful. Is this a reproach to it? We think not. Do we reproach the painter for substituting novel and original qualities for others unsuited to the temperament of this people? Do we criticise his creations because they are in harmony with national characteristics, instincts and aptitudes, the worth of which can be questioned only by prejudiced minds?

Its mission accomplished, this school of architecture became extinct. Then followed the critical period, through which all Europe passed, the period of the Restoration, comprised mainly in the reign of Leopold I, corresponding exactly to that of Louis Philippe. This period may have had its political and literary successes; it was wholly unproductive in architecture, in Belgium as everywhere else.

Then the awakening began; constructional activity, so long arrested, revived. Brussels, like Paris, embellished her streets: for many years they had been neglected owing to changes in commercial interests, which had centered elsewhere; but modern industry found a most favorable field in Belgium; great private fortunes were amassed, disseminating comfort all through the burgher class. The traditions of olden times

were restored. In the transformed capital, as it appeared one fine morning in its new garb, the dominant structure was not, as in Paris, the gigantic apartment-house, which is necessarily utilitarian beneath its false, monotonous and commonplace luxuriousness, because it must be suited to the needs of all indiscriminately. In Brussels the dwellings are of modest proportions, comprising three or four suites of apartments at the most; often they are occupied by a single family; for this reason there is great diversity and a chance for the exercise of individual fancy, which gives the new boulevards an original and ever-varying aspect. The street commissioners have wisely refrained from interfering, by rules and regulations, with the proper play of personal caprice. Brussels is in a country where every one has long prided himself upon doing as he pleases; and the government does not think itself wiser than the individual; the only prerogative that it does assume in the matter is that of preventing the individual from trespassing on his neighbor's rights.

The city fathers bethought themselves that in the twelfth century Milan had a commission *del ornamento* whose duty it was to see to it that the new structures were not so excessively ugly as to impair the beauty of the city as a whole, of which it was justly proud, and which it was to its honor to maintain. This was a delicate mission, in truth; where did beauty end and ugliness begin? The Brussels officials did not consider themselves plenarily competent to decide this question. They had the good sense to adopt the Milanese idea, though in a form better fitted to a people accustomed from earliest times to the fullest freedom. They said: we will award numerous and valuable prizes to such buildings as shall be recognized as the most remarkable. This was a most excellent plan; it restored architecture at once to its proper place and turned every one's attention upon it. The public began immediately to follow, step by step or rather stone by stone, the progress of every new edifice, comparing, judging and discussing zealously. Architecture became once more a preëminently living art and the centre of universal interest!

Competition was all the more lively because there were two rival schools in the field; one of these bowed to foreign dictation, especially to that of France, whither it turned for correction, for choice and for models of delicate taste; the other cared only to reinvigorate itself at the primitive sources of Flemish art, to draw from thence inspiration and weld the present to its past.

Our French architects are, as we all know, justified in attributing to certain specimens of this Neo-Flemish style an exaggerated weightiness, a profusion of ornamentation that is sometimes in deplorably poor taste. Yet, notwithstanding all these defects, in spite of the many misconceptions of artists not very sure of their ground, a native sap courses through all their productions bearing life with it. The inventive faculties are active. The new streets have not that aspect of flat



Fig. 57. Third Prize.



Fig. 58. Fourth Prize.

monotony which too often characterizes our Paris boulevards. Time and progress will do their work, carrying with them a purer taste that will be able to prune, to select and to restore

better proportions. Even now, many, in studying these new and varied features and following these more or less fortunate ventures, prefer this originality, in which choice is permitted, to the imitation of styles suited neither to the climate, nor to the people, nor yet to the temperament of the artists.

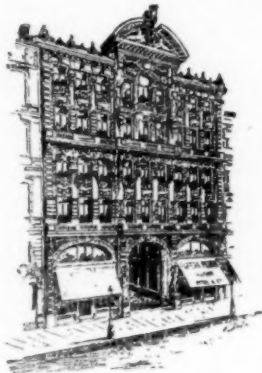


Fig. 59. Maison Primée.

Passing up and down these new streets again and again, we are impressed with the fact that, for the Flemish architect, an edifice is a block to be carved, silhouetted and decorated from the massive stone; while with us, it is a superimposition of cleverly adjusted parts, the joints of which we conceal beneath a few elegantly disposed arabesques. We no longer know, to the extent that we did formerly, the keen delight that the sculptor feels in taking the stone bodily and bringing out of it a creation, which necessarily preserves all the unity

of the single block. In France we depart too far from this conception, which is the true one.

There is another tendency in France detrimental to its architecture; in Paris, the interest of the public in the streets is centered on the sidewalks. In Brussels, on the other hand, it is the houses and edifices that attract attention; the people are fond of stone and of architectural symmetry. The French are concerned only with the passers-by, and consequently sacrifice everything in behalf of circulation. The architecture of Paris must not be obstructive; projections are out of the question; nothing, moreover, is allowable that uselessly turns aside one's gaze. This accounts for our disgraceful pilasters sunken back into themselves, our false consoles that have not the strength to support anything, our simulated entablatures, flush bandeaux and flat casings. The restrictions that were forcibly imposed at first, soon ceased to be restrictions and rose to the dignity of rules; a means was converted into an end; there was a time when the aim of the art seemed to be the suppression of everything that constituted its glory, namely, free projections clearly outlined, beautiful entablatures and all those prominences that impart vigor to the creation through the play of light and shade. The architect levelled, with an exquisite taste and so thoroughly that he actually succeeded at one time in *sinking* his productions. It is not then to be wondered at that our architecture is accused of having too long become "the triumph of the flat," of not daring to show itself and of shunning rather than attracting attention.

Name it excess if you will, the Belgian school has exaggerated merits and defects exactly opposite in character. And this is just why we are led to say that it would be a good thing for our French architects to set aside preconceived notions and superficial criticism, and carefully study what our neighbors are doing. We shall not think, of course, of copying an art that is at home in Flanders but would be entirely foreign with us; but we should be forcibly reminded of the fact that architecture has nothing in common with engraving, that it is dependent upon projections and that thinness and timidity have no place in it. This would greatly benefit French art.

As for examples of modern French architecture, they will be found scattered through different articles in this "Encyclopædia" on special subjects, such as "Civil and Religious Architecture," "Apartments," "Casinos," "Colleges," "Construction," "Hôtels," "Museums," "Town Halls," "Parliament Buildings," "Universities," etc.

P. PLANAT.

A CALIFORNIA FLUME.—The flume which conveys the water from the mountains to the reservoir at San Diego, Cal., is said to be the largest and longest thing of the kind in the world. It is 35 miles long, and is composed almost wholly of red-wood. In its course this monster flume crosses 315 streams and cañons on trestles, the longest of which is 1,700 feet long and 85 feet high. It is known as the Los Cochinos trestle. The Sweetwater trestle, the second longest, is 1,200 feet long and 85 feet high. The timbers used in them were put together on the ground and raised to their present position by horse-power. Besides its many trestles this flume passes through eight tunnels, the longest of these being 2,100 feet in length. The tunnels are each 6 feet by 6 feet in size with convex roofs. Building a water-tight box 35 miles long over fathomless chasms and through the hearts of mountains is a gigantic undertaking which many believed could never be accomplished. The result has proved different. — *Inventor.*



It is well known that Meissonier had received an order for a large decorative painting for the Panthéon, and every one who is interested in such matters felt great curiosity to know how this great painter of little things would succeed with a decorative composition of such importance. This feeling of curiosity was accompanied by a certain distrust, which is easily explained by recollecting the peculiar character of Meissonier's talent, which busied itself solely with little creations treated with the utmost minuteness of detail. What could he be going to do with these great surfaces, and would not the vicinage of M. Puvis de Chavannes be very dangerous for the painter of the "Battle of Solferino?" To tell the truth, Meissonier didn't seem to be in any hurry to measure himself against his confrère. Everything took the form of promises. At his death it was learned that the master really had made a sketch, and that this sketch was to be given to the city by his family. The subject imposed on, or at least suggested to, the artist, was drawn from the life of St. Geneviève. He was to represent St. Geneviève saving Paris from famine during the siege of that city by the Franks. Meissonier, however, does not appear to have concerned himself greatly with fulfilling his engagements. Did the subject not inspire him? At any rate, rumor had it that the great artist did not feel himself able to cope with the task. Confronted with this rumor, he rebelled, and in a few days his sketch was ready to present to the Direction of the Beaux-Arts. It was, after all, a matter of a siege of Paris, but the epoch was not that which had been suggested to him, and St. Geneviève was conspicuous through her absence. St. Geneviève had been demanded of Meissonier, but he was unwilling to deliver her up, and all the concession he would make was in the following letter to the Director of the Beaux-Arts, in which he sketches out a second scheme. This letter is very curious and is worth quoting. Meissonier wrote as follows:

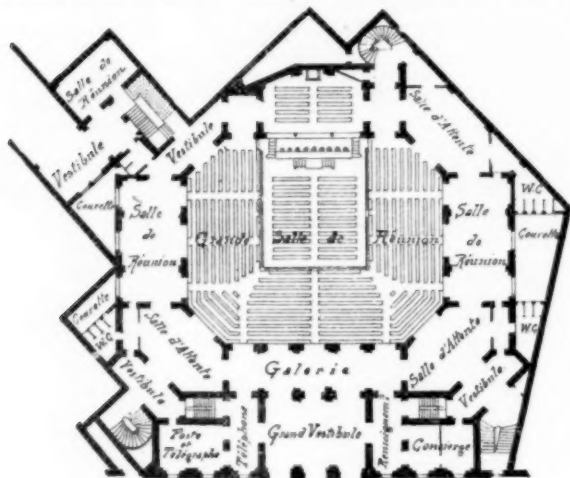
"The meaning of my new composition is the 'Triumph of France.' France advances, bearing a light, and offering peace. Those who behold her coming salute her with enthusiasm, and those who accompany her follow her lovingly. I represent her on a chariot drawn by lions, led by Prudence and Force. In the right hand she lifts a torch: in her left, resting on the tables of the law, she holds the balance of Justice, while Minerva protects her. At her side advance the Letters and Arts; Architecture, Painting, Sculpture are on the right, hand-in-hand, and Poetry precedes them, while children, supporting appropriate attributes of each one of them, precede the figures. At the left I shall personify Letters, that is to say, Philosophy, History, the Theatre, etc. Behind the chariot, Agriculture, Industry and Science will be represented by peasants, workmen and students. Horsemen will follow, bearing standards. They represent the different races. At the head of the cortège, unarmed horsemen crowned with laurels, young and full of vigor, will wave branches of olives, the symbol of Peace. One of them will bear our national flag, which all salute. The whole composition, although crossed by three of the building's columns, will form a single scene, and will be continued behind the columns. In the frieze above I shall paint a vision which materializes upon the sky—no longer sympathetic figures, but real personages who have made our history—Clovis and his Franks, Charlemagne and his peers, St. Louis and his knights, Francis I, Henry IV, Louis XIV, Napoleon, the Revolutionary generals, all on horseback, surrounded by the aureole of Victory."

What could have been the execution of this composition, which as one reads it, seems incomplete and academic, and in any case very complicated? We may perhaps be able to form an idea of it, for it is this sketch which is to be given to the city. Perhaps it will show that we have nothing to regret that the artist departed before he could bring to a conclusion a work from which his talent shrank. His glory did not need to be inscribed on the walls of the Panthéon, and his reputation certainly incurred a certain amount of risk.

Every year the French architects gather together in congress and examine questions and communications which are of interest to their corporation. The congress lasts a week and its meetings and discussions are interspersed with visits made to new undertakings of interest. This year these visits were principally consecrated to the Musée Galliera—which we will examine later, when it shall have been completely finished—and to the Palais de Justice, where the new great chamber of the Cour de Cassation, by M. Coquart, excites universal admiration. The ceiling of this hall, which measures twelve metres by twenty-four, entirely gilded, is executed in staff. Very vivacious, with pronounced reliefs, pendentives, rinceaux, etc., it has framed at its centre a decorative panel by Baudry, which represents the "Glorification of the Law." The general effect of the

whole is rich beyond the possibility of conceiving, though it lacks a little of the severity which one has a right to demand at the hands of Justice.

Members of the Congress also visited the Bourse du Travail, built by M. Bouvard, architect of the industrial galleries and the central dome of the Exhibition of 1889, and now chief of the service of architecture of the city. This building was opened in the month of



BOURSE DU TRAVAIL A PARIS

PLAN DU REZ-DE-CHAUSSEE

May last. Its object is to allow the assembling of the workingmen, and the free operation of syndicates. First of all, it was established to resist the private intelligence-offices, which made a living out of the workmen and the employers, who addressed themselves to them to find either work or workmen. The Bourse du Travail is on the Rue du Chateau d'Eau, where it joins the Boulevard Magenta, occupying an irregular site of 1,755 square metres. This site cost the city of Paris 1,010,000 francs, and the total cost of the building was 1,920,000 francs. The façade, which measures thirty-six metres in length, is in the Classic style. A great Corinthian order of pilasters extends through three stories in height and rests on a base which rises to the height of the entresol. Above the cornice of the third story is an attic story, the middle of which is occupied by a clock, surmounted with the arms of the City of Paris. Three great doorways give access to the main vestibule, which precedes a gallery opening on the grand hall of assembly. Around about this hall are found other smaller rooms, which in case of large meetings can be thrown into the great hall. Four staircases are arranged in such a way as to liberally provide for every portion of the building.

In the basement, beneath the grand assembly-room, is the Salle de Grève, lighted through a ceiling of floor-lights; also three annexed rooms, and all the apparatus for heating, lighting and ventilation. The first story takes its light from the street and the light area, which rises above the great assembly-room, and contains a fine lecture-hall, library, committee-rooms and offices for the inspectors of labor, the administrative offices and a conference-hall. The waiting-rooms, dressing-rooms and so on are conveniently arranged and scattered. The Salle de Grève in the basement has an area of 426 square metres and a height of five metres. The grand assembly-room on the ground-floor, which receives its light at the height of ten metres, can contain 1,650 persons, while by opening the adjacent halls, this number can be raised to 2,200. The library on the first floor has an area of seventy-two metres.

Finally, the building contains more than 150 offices, lighted by electricity and furnished in such a way as to be able to accommodate at least two syndicates. One feature which it is worth while to lay stress on is that, in spite of the difficulties of construction on a site which was invaded by a sheet of water, the architect succeeded in keeping the expense below the contemplated cost, while there was every reason for fearing that the estimate would be exceeded.

The annexed plan of the ground-floor will give an exact idea of the general arrangement of this building, which is very well decorated within, although sober in character, in consideration of the people who were to occupy it, who, to tell the truth, are little interested in such matters.

These visits of the Congress generally occupied the morning. The afternoon was consecrated to the discussion of questions according to the programme. These meetings took place as usual in the Hémicycle in the École des Beaux-Arts.

The committee of arrangements this year put forward as of first importance the three following questions: First—The examination and refutation of the criticisms or accusations of which architects are ordinarily the object. Second—The confusion caused by certain legal decisions between architect and contractor, particu-

larly from the point of view of responsibility. Third—What does the architect owe the client?

So far as the first question goes, several means were proposed for remedying a condition of things, which is doubtless regrettable, but altogether difficult to change. All the bodies of the State are subject to criticisms or pleasantries which are in a measure classic. Doctors are asses, from the time of Molière down; advocates are babblers; business men deceive their customers, and architects exceed their estimates. All this is understood. It does not, however, prevent the doctors from caring for their patients, or the advocates from making their pleas, or business men from cheating or architects from building. I think that the Congress gave too much importance to a thing which did not deserve to be seriously considered. However that may be, several means of defence were suggested, of which a certain number are at our disposition. First, a union better understood and better adhered to by all architects. (Not easy, this method.) Second, a profession more interested in the general movement of the time. Third, an appeal to the press for coöperation. Fourth, extension of the operations of the *caisse de défense mutuelle*, and the creation of a vigilance committee who shall receive and reply to attacks. Fifth, the establishing of a clearer and more general distinction between architect and contractor. This brings us to the second question. Other means were proposed, which would depend largely on public powers. First, demanding of the Government obligatory rules for determining the choice of honorable architects for administrative works. (Neither is this method easy, and it is more complicated.) Second, the organization of architectural instruction in the provinces. Third, sanctioning of studies which may be undertaken, by means of an obligatory diploma.

All this is not serious. That which is serious, however, is the second question relative to the responsibility and the confusion which exists, from the public point of view, between the architect and the contractor. This question has given rise to numberless studies, but conclusions have been difficult to establish. The law assimilates the architect with the general contractor. This is not fair. Upon this head several of our confrères demand the revision of the law. Others pretend that it will be sufficient to bring pressure to bear upon the legal fraternity, which often shows itself favorable to the wishes of architects.

What is, in fact, in its mission, the legal position of the architect? All our confrères are not agreed upon this point. Some consider that the architect is purely a *locateur d'ouvrages*. Others hold that he is sometimes a *locateur* and sometimes a *mandataire*. Finally there are some who would prefer that he should be considered solely a *mandataire*. M. Hermant, Vice-President of the Société Centrale, very judiciously remarked that if the architect was considered as solely a *mandataire*, he was not held, in case of blundering, to prove that he had not committed the fault. But, on the contrary, it must be proved against him, which in legal matters, is a shade of difference of great importance.

As to the solidarity established by the Code between architect and contractor, our confrères absolutely deny it, except, of course, in the case of actual complicity. This solidarity, in fact, seems to be in disagreement with the law itself, which does not in principle admit association between contractor and architect. If there cannot be association, it seems inadmissible that there should be solidarity. Finally, in cases of adjudication the architect, not having the choice of contractors, cannot be their guaranty, nor share their proper responsibility. But this question, the most serious of those which interest the profession, cannot be lightly solved, so at this year's congress a complete and satisfactory solution could not be arrived at. We shall see next year what progress has been made, and what studies have been prosecuted. Perhaps then a conclusion of the whole matter may be reached. The other questions submitted to the Congress have only been hinted at, and the result of this year's reunion of all the societies of French architects has been simply to cause them to gossip and discuss and—go home again, leaving matters as far advanced as before.



THE DARLING HARBOR BRIDGE.—THE NEW YORK LIFE INSURANCE COMPANY'S BUILDING—BLUNDERS CAUSED BY LACK OF AN ADEQUATE BOARD OF WORKS.—NEW THEATRES.

SYDNEY, July 11, 1892.

THE awards in the competition for the proposed new bridge over Darling Harbor have at last been made, after a long and unparadonable delay. Forty-one sets of designs were sent in and the Government on the recommendation of the Board appointed has awarded the first prize to A. C. Pain, M. I. C. E., engineer to the Tottenham and Forest Gate Railway, and J. R. Lilljequist, A. M. I. C. E., late chief-assistant engineer at the Forth Bridge works. Second prize, J. J. Webster, M. I. C. E., London. Third prize, A.

M. Howorth and Carl Datgard, C. E. (Technical University, Stockholm), of Sydney. The first prize is £700, second £300, third £200. After the prize winners the three following competitors come next in order of merit; Max am Eude, M. I. C. E., Victoria Street, London; Charles A. d'Ebro, A. M. I. C. E., Melbourne; J. A. L. Waddell, Consulting Bridge Engineer, Kansas City. If the bridge is built according to the first or the third set of plans the work will cost between £200,000 and £300,000. According to the second set of plans the cost would be less than this amount.

Strange to say, the decision has been received without any display of the usual dissatisfaction. Not so, however, the decision in the competition for the Woman's College within the University of Sydney. The first premium in this competition, of which I spoke in a former letter, has been awarded as every one thought it would be, to Messrs. Sulman & Power, and disappointed competitors rudely refer to the whole thing as "a job." Public bodies should know by this time that architectural competitions seldom prove satisfactory, but, at any rate the assessors appointed should be, like Cæsar's wife, beyond suspicion. In this case, though each member of the Board is, so far as one can know, an honorable and upright gentleman, still under the circumstances the constitution of the Board was such that it is difficult to believe that its judgment as a body could be impartial.

Another competition has caused some little excitement here, a private one this time, namely, that for the new offices of the New York Mutual Life Insurance Co., on the recently-acquired site in Martin Place. The drawings were duly sent in and the competitors were informed that the designs would be forwarded to America where their merits would be determined by the Directors of the Company. An artless competitor found business would require his presence in Europe in a short time, and so it occurred to him that he might go by way of the United States, and a letter of introduction which he procured from the Local Manager here to the Directors in New York might—well, who can say what it might not effect. So his passage was taken in the same steamer as that by which the designs were to be sent, and in order to prevent jealous co-competitors from putting any uncharitable constructions of their own on this little excursion, he is alleged to have arranged to have his name kept out of the passenger-list. But the best laid schemes, as the poet tells us, sometimes fail, and this broke down utterly; for everybody was in possession of the facts weeks beforehand and the representations of some of the architects interested shed such a light on the subject that the manager decided at the last moment to keep back the drawings until the following mail, a month later.

In connection with Martin Place, it may be mentioned that a pavement of asphalt and marble tiles, laid down some time ago at considerable expense, has all been torn up again because the minister who is now at the head of affairs disagrees with the arrangement entered into by his predecessor (which was to leave the maximum of space for pedestrians and a thirty-three foot roadway for vehicular traffic) and considers that the Place should be a continuation of the recently formed Moore Street. This is certainly what should have been done in the first place, but a shameful waste of money and material would have been prevented if the work had received due consideration before. In Moore Street, too, a similar example of municipal stupidity exists. The City Council, some time ago, determined to resume sufficient land on that street, which was to be, and certainly is, the finest in the city. They resumed enough for a roadway a hundred feet wide, and paid a fair price for its resumption; but for some inexplicable reason they left a strip on the northern side with over a hundred feet frontage to Moore Street and an average depth of only nine feet six inches. The owners had to pay a heavy betterment tax, and after vainly striving to get the Council to resume the whole of the property, they determined to make it in some way remunerative. They accordingly had plans prepared for shops and offices and were about to build, when an uproar was raised by some persons, not so wholly disinterested as they would have us believe, who appealed to the City of Sydney Improvement Board to prevent the erection of buildings which, on such a site, could not possibly be suitable for so fine a street. Nothing has yet been done, and the Improvement Board has no jurisdiction. The fault is, of course, primarily with the City Council for resuming too much, or not enough, and it is therefore hardly fair to blame the owners for trying to get some return from land for which they are heavily taxed.

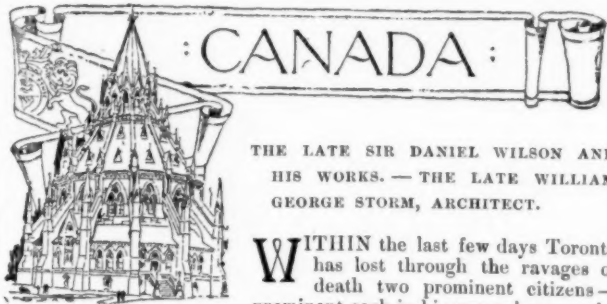
But all this shows the necessity for an able and properly constituted Board of Works to take the place of the old and effete Improvement Board, which has no power to do anything, apparently, but recover fees for oftentimes unwarrantable interference with the rights of property-holders.

Though an army of the unemployed parades our streets daily, asking for work or food, and though the commercial depression is still keenly felt, it would seem that theatre managers in Sydney have little to complain of, if one can judge from their activity in the building way. A fine new theatre, to be called the Lyceum, is now in course of erection in Pitt Street, the Criterion is to be greatly enlarged and the Theatre Royal, lately destroyed by fire, is to be rebuilt. In the meanwhile, the other theatres are reaping a golden harvest, if one can judge from the crowds that fill them nightly.

The report of the Council of the Institute of Architects on the Sydney Hospital question, has been read at the annual meeting of the Institute, and published. Though diffuse, it does not throw much additional light on the subject, but, at any rate, it upholds Mr.

Rowe, the original architect, and charges Mr. Kirkpatrick who is now carrying on the work, with a grave breach of professional etiquette. Mr. Rowe, it may be stated, is not a member of the Institute, though Mr. Kirkpatrick is.

While on the hospital topic, I may mention that only £68,000 have been spent on the building so far, and that a tender, which is under £52,000, has been accepted for its completion; so that the hospital will cost little more than half the amount of Mr. Rowe's last estimate, which was £210,000. By an unaccountable blunder, I stated in my last letter that something like this sum had already been expended, which, of course, is absurd.



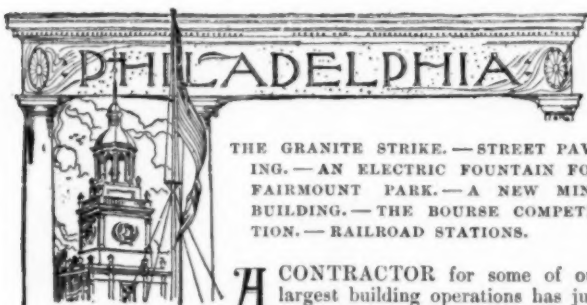
THE LATE SIR DANIEL WILSON AND HIS WORKS. — THE LATE WILLIAM GEORGE STORM, ARCHITECT.

WITHIN the last few days Toronto has lost through the ravages of death two prominent citizens—prominent each in his own sphere—who leave behind them names and records that will long survive them: Sir Daniel Wilson, LL.D., K. C. B., F. R. S., president of the University of Toronto, and William George Storm, architect, past president of the Ontario Association of Architects, one of the leading men of the profession in Canada. Sir Daniel Wilson passed away quietly and peacefully at the age of seventy-six on August 6. Although not of a great age, as ages go, it was simply that his constitution had given out and the cause of his death was nothing else than age. His last appearance in public was at the University Commencement Exercises on June 10, since which time he has been gradually failing until death came. He had been advised to take a rest and go out of town after the meeting of June 10, but his whole heart and interest were centered in the University, without which he cared not to live, and to the last the concerns of the University were prominently in his mind. It being vacation, he was busy in arranging specimens with his own hands in the new ethnological museum, and so great was his interest that he undertook a journey to Montreal on the same business. He returned out of health and within twenty-four hours it was known that he could not recover. It was a touching incident and characteristic of himself that he desired to die in his library surrounded by his literary treasures, the scene of many years' of industrious and vigorous study, and for this purpose he requested to be moved there from his bedroom and there he spent his last hours.

Sir Daniel Wilson was born in Edinburgh on January 5, 1816, and being one of a large family had early to make his way for himself. His father apprenticed him to an engraver, but he did not continue long at that work but set about improving his somewhat meagre early education by attending the local grammar-school and at lectures. At the age of twenty, or thereabouts, he went up to London and while further prosecuting his self-education plans lived by the aid of his pen. He published in 1847 "*Memorials of Edinburgh in the Olden Time*," and four years later (1851) his great work "*The Archaeology and Prehistoric Annals of Scotland*," both of which works were illustrated by sketches made by himself. For a number of years he was associated with the Society of Antiquaries and in 1853, at the instance of the historian Hallam, he came to Canada and was appointed on the recommendation of Hallam and Lord Elgin to the chair of history and English literature at the Toronto University. Since then he has published many books. "*Prehistoric Man—Researches into the Origin of Civilization in the Old and New Worlds*," in 1862. In 1869 he issued a Shakespearean study, "*Caliban, or the Missing Link*"; in 1873 a volume of poems entitled "*Spring Wild Flowers*," which he reprinted with additions two years later. In 1885 "*Reminiscences of Old Edinburgh*" appeared and his work on Anthropology, and in 1890 "*William Nelson, a Memoir*." He also recently republished his "*Edinburgh in the Olden Time*," which is a work of special interest as it contains illustrations by his own hand of many buildings long since pulled down. "*The Right Hand—Left-handedness*" has just been published in England. He wrote articles for the *Encyclopedia Britannica*, and on academical topics has constantly written at large in the daily press. One of his most successful books was "*Chatterton—A Biographical Study*." He was a great authority on all historic and ethnological questions and was for some years president of the Canadian Institute, and after being in 1882 vice-president of the literature section of the Royal Society of Canada, he was in 1885 elected president of the Society and received in 1888 the honor of knighthood for his distinguished services in the causes of education and historical research. He was a Fellow of the Royal Society of England, and his long and active life devoted to works of great interest in his particular line brought him into connection with the great savants of his day in the old and new worlds, many of whom who knew him intimately will deeply regret his death. The object of the last thirty years of his life has been, first, the establishment and development of a system of

public education in Ontario and secondly the raising of that system to a pitch of absolute efficiency, so that his university should be second to none in the new world. As an example of his success it may be mentioned that at the time of his appointment there were but thirty students attending lectures, while only one student was admitted to the degree B. A. in the previous year. Last year there were no less than 679, of whom 130 were women, with degrees conferred to the number of 228. The burning of the University Building which was described in a former letter, was a great blow to the old man, but he lived just long enough to see it rebuilt with enlargements and formally reopened, and having seen this accomplished he could pass away content.

Mr. Storm, who died on August 8, singularly enough was the architect of the University Building mentioned above. He was born in Yorkshire in 1837, his father being a prominent builder. After coming to Canada he entered the office of Mr. Thomas, who at that time was the only architect of note in the city of Toronto, and with him he studied for the profession. Subsequently he entered the office of Col. F. W. Cumberland and in partnership with him carried out the principal buildings of the city:—St. James's Episcopal Cathedral, the Court-house, the Normal Schools, the University and Osgoode Hall, the building in which are situated the High Courts of Justice. Colonel Cumberland retired and Mr. Storm carried on the practice alone and designed many of the principal buildings erected here during the last few years. As first president of the budding society of the Ontario Association of Architects, he had a great deal to do with the development of that corporation and only completed his three-year term of office in February last. He was a prominent mason, a conservative and a staunch adherent to the Church of England. His remains were interred on the 10th and were followed to the grave by a large number of masons, members of the Ontario Association of Architects and others.



THE GRANITE STRIKE.—STREET PAVING.—AN ELECTRIC FOUNTAIN FOR FAIRMOUNT PARK.—A NEW MINT BUILDING.—THE BOURSE COMPETITION.—RAILROAD STATIONS.

A CONTRACTOR for some of our largest building operations has just returned from a tour of the various stone quarries throughout the New England States. He makes the statement that the effects of the strike upon the business interests of the country are almost incalculable, and that about \$3,400,000 have been lost in wages alone. He says, however, that the strike is practically at an end, and thinks that everything will be running smoothly by the first of next month. All the New England quarry-owners have recently signed an agreement not to give-in to the demands of the strikers, nor recognize the union; so there seems to be nothing left for the workmen to do, but to acknowledge defeat and go back to work.

The repaving of Broad Street from Columbia Avenue to Spring Garden Street is progressing rapidly and promises to be a model piece of work in the line of asphalt paving. Two hundred and twenty-five men are employed, and three squares have already been completed and thrown open to the public. The material is laid in three separate courses, the first being a course of crushed stone, from one and one-half to three inches in size, mixed with cement, making a course eight inches in thickness, tamped down with wooden tampers. The next course is called a binder, and is composed of broken stone, the largest dimension of which is not over one-half an inch, and mixed with a distillation of coal tar. This course is laid one inch thick. The last and finishing course is the Trinidad Lake asphaltum, two inches in thickness, making eleven inches in all. The asphaltum is laid about two and one-half inches thick, but is compressed about 35 per cent by the thorough rolling it receives from the seven-ton steam-roller.

It is said that Fairmount Park is to be presented with a magnificent electric fountain, which is now under process of construction by a firm in Paris. It will throw an illuminated column of water to a considerable height and many pleasing effects will be produced by means of light and shade. It will cost \$30,000 and will be presented to the Park by P. A. B. Widener of the Traction Company.

The work of widening Chestnut Street has already actively begun and many fronts have been removed, thus revealing transverse sections through the various buildings. In some instances, this is indeed a revelation, as some very questionable construction is exposed to view, which was evidently never intended for the popular gaze. Being old buildings, comparatively, these constructional defects have doubtless not been of such a serious nature as to impair the safety of the buildings, and if the public and the city inspectors will only be a little lenient in their opinions, the points in question

will soon again be consigned to a happy obscurity behind the massive walls of new and imposing fronts.

A new building for the United States Mint is now an established certainty, and it is to be hoped that another year will see it well underway. The appropriation is made and the commission of citizens, appointed to select a suitable site, have unanimously agreed upon Sixth and Walnut Streets. All that now remains seems to be for the Secretary of the Treasury to approve the site and take the necessary steps for the condemnation of the property and the making and signing of the deeds. It is to be hoped that the design for this building will be selected from among a number submitted in an invited or general competition, thus forming a new departure from the old established custom of having all Government work designed and carried out by the Supervising Architect of the Treasury. It would be unfortunate, however, in trying the experiment of architectural competitions in the matter of Government buildings to have a repetition of the Bourse programme. A successfully arranged competition, and one satisfactorily carried out, is indeed a rarity; and in connection with Government work, it will doubtless be found a most difficult undertaking to obtain judgment based entirely upon the merits of the design and free from obnoxious political influence, even though the requirements of the programme be all that could be desired.

The managers of the Bourse enterprise are still, so far as is publicly known, without an architect, although the drawings were sent in for consideration upon the first day of July. It is rumored that a certain architect of Philadelphia may secure the work, although upon what basis it would be hard to imagine, as this gentleman's signature appeared upon the protest sent by the architects of Philadelphia to the Bourse Committee; and although it was well known that this gentleman had plans in preparation, his assurance was given that they would not be presented unless the obnoxious clauses in the programme of requirements were changed.

There can be but one conclusion, therefore, in case the work should be awarded to him, viz: that the Bourse Committee acknowledge their mistake, and are willing to employ him upon the terms proposed by the other architects in their former interviews on the subject.

Messrs. Furness & Evans have been awarded the work of the extension to the Broad Street Station of the Pennsylvania Railroad, and a building is contemplated which will outlive the great Reading Terminal on Market Street. Work will be begun as soon as the working-drawings are finished and no expense will be spared to make this the finest railroad station in the country.

The Reading have decided to build another new passenger-station at Ninth and Spring Garden Streets for the accommodation of thousands of passengers on the New York, Germantown and Chestnut Hill divisions. This new station will be a large two-story structure, the large lobby and waiting-room being on the second floor, level with the elevated tracks, the ticket-office to be on the first floor or street level. The station being near the round-house will contain accommodations for a number of the road officials.



THE MINING BUILDING.—SUNDRY STATE BUILDINGS.—SOME FOREIGN BUILDINGS.—MODELS OF EARLY VESSELS.—THE FIRST RAILROAD TRAIN.—THE ELECTRIC PLEASURE BOATS.—THE "FLOATS" FOR THE PROCESSION OF THE CENTURIES.—CHICAGO UNIVERSITY BUILDINGS AND CURRICULUM.

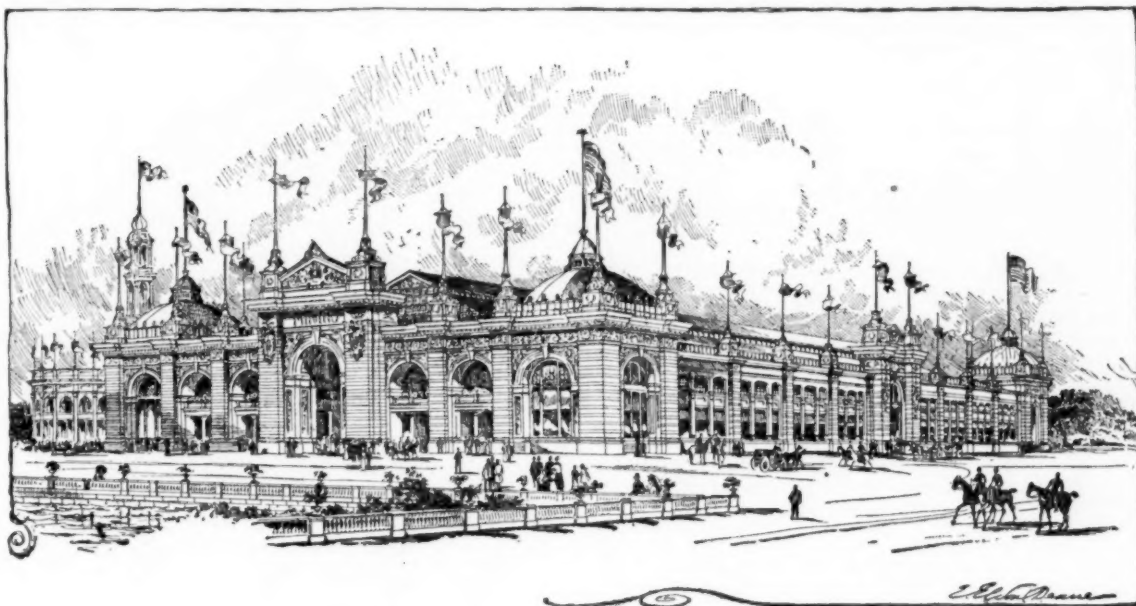
LAST month several of the buildings, now nearing completion in the World's Fair Grounds, were mentioned in the letter from Chicago. Those especially written of were the Forestry, Horticultural and Transportation Buildings. Next to the latter, in a walk southward through the grounds, the visitor comes to the Mines and Mining Building. This structure, though not as large as many of the others, seems to particularly impress its size on the beholder, because of the heaviness of its details and lesser architectural features. The general outlines when seen from a distance are extremely good, but this heaviness is rather overwhelming upon a nearer inspection of the building. There seems to be but little individuality of thought in the designs of the ornamentation and if, as is apparently the case, this part of the work is completed there is little of interest in it to attract the visitor. In regard to the lack of any element of lightness in the structure, the idea here may have been to keep it in harmony with the character of the exhibits which it was to house, for its size certainly does not warrant details of such ponderous proportions. There seems to be little native feeling in the designer for the laws which govern the Classic style, though these laws have been closely observed at times and in certain parts. In the union of the old orders and the French Renaissance there is just that lack of sympathetic inspiration that in some of the other buildings, though under different conditions, gives such good results.

The pediment is chiefly filled with a winged head, presumably a Victory, as typical of the struggle of man in wrestling from the earth her treasures. On either side the entrance, on the columns, are huge shields surmounted by the American eagle. Surrounding the arch of the entrance are bas-reliefs of male and female figures, which are in no way striking—in fact, are rather mediocre in character. They seem to be the familiar groups of Victory and Fortune, or such close connections of theirs that their individuality is not recognizable. On the face of the columns supporting the arch are scrolls in low relief, in which mining tools have been successfully introduced. One rather foolish adherence to the old Classic forms is found in the doors and door openings, narrower at the top than at the bottom, which is a feature not well suited to our present needs and requirements. On each of the four sides of the building are placed the entrances, those of the north and south fronts being the principal ones. To the right and left of each entrance, inside, start broad flights of stairs leading to the galleries. The galleries are about sixty feet wide, and are twenty-five feet above the ground floor. They are lighted by large windows on the side, and from above by the clerestory that extends around the building. At each of the four corners of the building are large, square pavilions surmounted by low domes and lighted by arched windows opening into the galleries. Between the main entrances and these pavilions are arcades, forming a loggia on the ground floor and a recessed promenade on the gallery level. These covered recesses are over two hundred feet long by about twenty-five wide, and from them access is had to the main building at numerous points. In their decoration, marble of various kinds and colors

Museum will send specimens of its collection to illustrate the habits and customs of the inhabitants for centuries back. The progress in mining, manufacturing and the liberal arts will be especially illustrated, and, in fact, the changes in dwellings, furniture, costumes, etc., of the country for eight hundred years will be demonstrated by the exhibition. Norway will, it is understood, make a special exhibit in the Fishery Department.

Not very far from the Swedish and Norwegian Building will be that of the German Empire, which will be one of the largest of its kind on the grounds. It will be situated near the Lake Michigan shore, and will cost in the neighborhood of a hundred thousand dollars. It will illustrate in a general way the peculiarities of German architectural style. A curious feature appears to be the mixing of an open-timber construction, used in so many of the old Nuremberg houses, with a cathedral-like annex in the rear. In this structure will be an exhibit of stained-glass from the Royal Manufactory. The lower stories will be of stone, while the upper will be of brick covered with cement and woodwork.

The north end of the grounds will be devoted to such buildings as these just mentioned, and will comprise in this division eighty-four acres. How interesting or satisfactory this group of State and foreign buildings will actually be when thickly placed together, with comparatively little space between, will be a question which we shall have answered on the grounds in 1893. Several of the buildings in an exhibition where there were fewer other attractions would be conspicuous features. Here, however, limitations of space and the dangerously close proximity of other buildings may do much to detract from the impression. Some general harmony



The Mines and Mining Building from the Northwest.

will be used, which will be part of the mining exhibit. The building is now painted a light buff or deep cream color, very pleasing to the eye, so presumably it will be the final tint.

The other buildings, though progressing finely, still lack the finishing touches, which lend so much of interest to them. The Agricultural Building is an especially successful structure, but, as its sculptured ornamentation is unusually attractive, it will gain much when all has been finally placed upon it.

Many minor points of interest in the way of State buildings and special exhibits are being settled, and each week unfolds new plans and shows fresh developments.

Louisiana will hold her exhibit in an old colonial plantation-house, or, at least, its counterpart, while the Virginia headquarters will be a duplicate of Washington's old home. It is proposed that it shall be a copy in all particulars, except that this structure will be of wood, though finished to imitate the material of the old Mount Vernon homestead. The idea will be to reproduce even the furnishings, several pieces of furniture having already been obtained similar to those in the original mansion. The dining-room, it is reported, will be furnished like the one at Washington's residence, with fine specimens of old silver, to which will be added a collection of portraits of distinguished Virginians of the last century.

California will embody in her building the spirit of her famous old Missions.

Norway and Sweden are to have a characteristic structure built after the style of the old Norwegian cathedrals. From the sketches it appears rather uncouth, though far from devoid of interest. A curious central tower, much like that of those old wooden cathedrals, rises in the centre two hundred feet high. It is said the woodwork of the building will be made entirely in Stockholm, and shipped to this country in sections, ready to be put together. The exhibits of these countries promise to be most interesting. The National

may be hoped for, however, as every building erected must first be approved by the Chief of Construction, thus in a measure making the whole group more like the result of one mind than of many.

The Midway Plaisance, of which we heard so much in the beginning of the Fair, has again come to the front and we hear rumors of pagodas from India, mosques from Turkey, Algerian temples, a village from Ceylon, a palace of the Moors, a village from Germany and a complete street scene from Cairo. Architecturally this portion of the grounds may offer greater attractions than any other part.

Illinois will have an interesting feature in her exhibit in specimens of all the indigenous woods of the State.

To those interested in marine architecture, an exhibition sent from Norway will prove attractive. This will be a model of the craft in which Leif Ericson made his famous voyages. Next year a fac-simile of Columbus's celebrated ship the "Santa Maria" will be exhibited here, while by its side, will be nearly a true copy in regard to size, shape and equipment of the ship in which "Red Eric" made his adventurous voyages. About twelve years ago two seamen, brothers, discovered in the sand-dunes of Sandford the old Viking ship of "Gog stod," where it had been buried over a thousand years. This discovery was turned over to the Archaeological Museum of Norway and is now displayed in a separate building near the University at Christiania. It is from this relic that the model will be fashioned.

Equally interesting and somewhat similar in character will be an exhibit made in the Transportation Building by the New York Central of the first railway train ever run in America, and which has already made its appearance in several exhibitions in different parts of the country.

A somewhat curious exhibit will be the Esquimaux settlement, preparations to obtain which are now being made. A schooner is

being fitted out at Halifax intending to sail to the northern part of Labrador. It will go as far north as possible and there about a dozen Esquimaux families will be engaged to go to the World's Fair, bringing with them dogs, fishing-gear and all implements used by them.

The matter of pleasure-boats to carry passengers through the inland lakes at Jackson Park has at last been decided. The contract has been awarded to the New York Electric Launch and Navigation Company who will be required to build forty launches. This decision has given rise to a good deal of dissatisfaction among the competing firms, but the conclusion reached is certainly a very wise one, as obtaining the safest mode of transportation for the hundreds of visitors and the least amount of noise and dirt for that portion of the park, the chief one, surrounding the lake and lagoons.

An occasion, which has given rise to as much indecision and far more unpleasant controversy than this matter of the pleasure-boats, has been that of the decision concerning the "floats," which will be prominent features in the dedicatory ceremonies next October. The Chief-of-Construction has denounced these floats, as inartistic and inappropriate. The committee on these arrangements was not one that would calmly submit to such a criticism, and something somewhat resembling a tempest in a tea-pot has been the result. The floats have finally been accepted by the Directory, however, in spite of the Chief-of-Construction. Whether they are good or bad it seems a pity to spend so much money on an affair which will mean so little to any one, when money is needed for so much more important uses. Over ninety-two thousand dollars will be the cost of these twenty-four floats alone. The idea is to dedicate the buildings of the Fair to the use of the World's Columbian Exhibition on the four hundredth anniversary of the day on which Columbus discovered the new world. The carnival will last three days, beginning the nineteenth of October. The programme for the occasion published in the daily papers are tinged with a glowing enthusiasm seen often in the hand-bills and posters of our circuses and "Wild West shows." The floats will be used for entertainment on the second and third nights and will be propelled around the lakes and lagoons of Jackson Park, by means of a sub-marine cable. Sixty electric search-lights of six thousand candle-power each will illumine the "Procession of the Centuries," as the series of floats is called. Each scene will be about thirty feet high by fifty long, and five hundred people will be required in connection with the procession. Part of these will be on the floats in costume, representing the people which the float symbolizes.

The subjects are as follows:

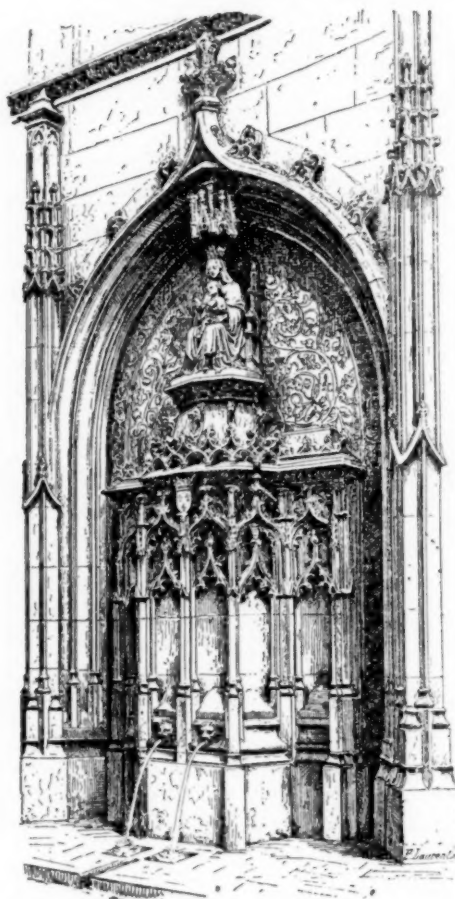
- Aboriginal Age.—Representing American Indians.
- The Stone Age.—Representing the Cliff Dwellers and Toltecs.
- The Bronze Age.—Representing the Aztecs, their religious rites, manners and customs.
- Columbus at the court of Ferdinand and Isabella.
- Departure of Columbus from Palos.
- Discovery of America.
- Columbus before the court of Ferdinand and Isabella, presenting natives and the strange products of the new country.
- English cavaliers and the settlement of Jamestown.
- Hendrick Hudson.—Discovery of the Hudson River; Dutch Settlement of New Amsterdam.
- Landing of the Pilgrims.—Illustration of early Puritan life.
- Ferdinand de Soto.—Discovery of the Mississippi.
- Pierre Marquette.—Robert, Cavalier de La Salle and the Northwest.
- Washington and his contemporaries.
- Signing the Declaration of Independence.
- Union of the Colonies.—The thirteen original States; the sisterhood of the great Republic welcoming the Territories to the constellation of States.
- "Westward the course of empire takes its way."
- The genius of invention, application of steam, etc.
- Electricity and electrical appliances.
- War.—Representing valor, sacrifice, power, death, devastation.
- Peace.—Representing tranquility, security, prosperity, happiness.
- Agriculture.
- Mining.
- Science, Art and Literature.
- Universal brotherhood of man, equal rights, law and justice, Liberty enlightening the world.

Among other buildings which the close of the building season will see nearing completion are those of the new Chicago University. Mention has been made of the undertaking in these letters heretofore and of the sympathy which had been evinced here for the success of the undertaking. Aside from those whose substantial aid has proved their live interest in the enterprise, there are the casual observer and looker-on who have a decided curiosity as to what will be the result of a university that comes not from a natural growth, but begins at the place which many institutions have reached only after a patient struggle of many years. It is proposed aside from the actual collegiate department to start in connection with it schools of more technical description, the proposed architectural department awakening considerable interest among the men of high standing here in that profession.

The dormitories and the chief recitation building all under one roof are now fast getting into shape. The structure is of buff Bedford stone with red tile roof. The Recitation Building is of slow-

burning mill-construction, all the timbers showing, affording panelled ceilings and visible beams. Some points of the exterior of the building are pleasing, chiefly the grouping of the windows and the treatment of the roof, monotony in the façades being avoided by the first feature, while by the latter a satisfactory outline for the whole is gained. What is most to be deplored is the careless mixing of the styles of the different centuries. It may have been intended to create a building which would recall those at Oxford and other English centres of learning but this edifice can certainly only do so in a very general way. A really charming fifteenth-century chimney stands in close proximity to thirteenth-century gables. The main entrance is much too heavy to harmonize with the general fifteenth-century outline of the whole, and the Tudor roses around the doorway are not fitting companions for the French details in other portions of the building. And again the pointed entrance, which is not an arch, harmonizes poorly with the pointed-arch form used in other parts. The actual entrance itself, as just intimated, is in its shape a curious departure from either French or English models, from which apparently the designer has drawn his inspiration for much of the building.

THEATRE BUILDING REGULATIONS.¹—VII. ADMINISTRATION.



Fontaine de la Crosse, Rouen, France, XV Century. From Havard's "Dictionnaire de l'Ameublement."

THE final rules of the London County Council as to management, are not as full as is the case with foreign regulations, as the parliamentary powers of the Council are limited.

[London.] Notice must be given to the Clerk of the Council of any intended structural addition to, or alteration of, any theatre, in respect of which the Council may have granted a certificate under the said Act of 1878, to the effect that such premises were, on their original completion, in accordance with the Council's regulations.

The notice must be accompanied by plans, elevations and sections, block plan and specification of the works to be executed similar to those required in the case of premises to be certified for the first time by the Council, and showing such intended addition or alteration.

The Council then will, if necessary, cause a survey of such premises to be made.

No doors, bolts or other fastenings, obstructions to the means of egress, flap seats or other means of diminishing or stopping up the gangways, can be put, nor can any alterations of a like nature be made to a theatre without the previous consent of the Council being obtained thereto.

¹ Continued from No. 868, page 99.

Finally the Council reserves to itself the right from time to time, in any special case, to modify or dispense with the regulations.

All applications for dispensations or modifications must be made in writing, addressed to the Clerk of the Council, and contain a statement of the facts of the particular case, and the reasons why it is desired to modify or dispense with the regulations.

The person or persons in whose name the license is granted is held responsible by the Council for the carrying out of the regulations, for the due management of the theatre or music-hall, and for the safety of the public and his or their employés in the event of fire.

I have now to run rapidly through some further rules which appear in foreign regulations but not in those of the London County Council.

[*St. Petersburg.*] In St. Petersburg there is a provision made that all theatres must be supplied with a lightning conductor.

In the same city dwelling places are not allowed in theatres, even for watchmen.

[*Paris.*] In Paris no person is permitted to reside in any part of the theatre with the exception of the caretaker (*concierge*) and cashier.

[*Brussels.*] In Brussels every theatre must have a caretaker's office (*loge de concierge*) on the ground floor, abutting upon the street, and communicating with the auditorium, but no other portion of the house may be used as a dwelling.

[*New York.*] I have already mentioned that no portion of a New York theatre may be recognized as a hotel, boarding-house, or lodging-house. No lodging accommodation except for the janitor is allowed.

[*Austria.*] All parts of the Austrian theatres must be well lighted by windows, and no windows whatever may be protected by iron bars.

[*Paris.*] The cloak-rooms of the Parisian theatres must be so situated as not to interfere with the circulation of the audience.

[*Austria and Berlin.*] In Austria and Berlin the corridors must not be used as cloak-rooms. Special rooms must be provided so as to leave the passages unencumbered.

[*St. Petersburg.*] Near the vestibule there must be cloak-rooms in the St. Petersburg theatres.

[*Brussels.*] In Brussels the cloak-rooms must be set back from the gangway (*l'alignement du passage*).

[*Paris.*] Smoking-rooms are allowed in the Paris theatres in positions to be approved by the Theatre Commission.

CURTAINS.

[*St. Petersburg.*] All curtains, draperies and hangings surrounding the doors in the St. Petersburg theatres must be guarded securely from the possibility of catching fire.

[*Austria.*] Portières or curtains to the doors in Austrian theatres are not allowed, but all doors must be protected from draught, either by cloth-lined, two-leaved, swing-doors with gutta-percha edging, or for outer doors, wind-guards or lobbies with side swing-doors. The front of such wind-guard must, however, be so constructed as to form an opening, opening outwards.

ORCHESTRA.

[*New York.*] In New York theatres where there is an orchestra over the proscenium-opening it must be on the auditorium side of the proscenium-wall, and entered from that side only.

CONSTRUCTION.

[*New York.*] All the partitions in the auditorium of a New York theatre shall be of fireproof materials, and none of the walls or ceilings covered with wood sheathing or canvas, this, however, does not exclude the use of wainscoting to a height of six feet. All that portion of the stage not comprised in the working of the scenery, traps and other mechanical apparatus for the presentation of a scene usually equal to the width of the proscenium-opening, must in a New York theatre be built of iron beams filled-in with fireproof materials, and all the girders supporting these beams must be of wrought-iron. The ceiling or underside of the flies must be covered with iron or tin over the entire exposed woodwork.

ROOFS.

There does not appear to be any restriction in London as to the materials of which the roofs are to be constructed, with the exception of the roofs of staircases which must be fireproof, but in foreign countries, there is such restriction, for instance in

[*Paris.*] The roofs and ceilings of the auditorium must be constructed of iron and pugged (*hourdes*) solid with cement concrete. No erection is allowed on the roof.

[*St. Petersburg.*] All walls, ceilings and roofs of theatres must be constructed of non-inflammable materials.

[*Brussels.*] The roof of the theatre must be covered externally with incombustible material.

[*Austria.*] The ceilings must be fireproof, and the construction of the auditorium-ceiling be perfectly independent of the roof. The roof must be of iron covered with fireproof material.

MANAGEMENT.

[*Paris.*] Very little is said in foreign regulations as to sanitation. In Paris water-closets and urinals must be formed in such number

and under such conditions of propriety and sanitary arrangement, as shall be approved by the Commission.

[*New York.*] In New York the plumbing and draining arrangements have to pass the Board of Health.

[*Austria.*] In Austria water-closets, etc., are to be arranged in all parts of the house provided with water and well ventilated.

[*Paris.*] A Paris theatre must contain an office for the police; a room for the doctor in attendance; a guard-room for the guard in attendance (*la garde de service*); a fireman's station in immediate proximity to the stage.

No theatre in Paris can be opened till it has received the approval of the Supreme Theatre Commission which is under the Presidentship of the Secretary-General of the Prefecture of Police and consists of:

The Chief of the Cabinet.

The Chief of the Municipal Police.

The Chief of the Office of Theatres.

The Chief of the Chemical Laboratory of the Prefecture of Police.

The Colonel of the Fire-brigade.

The Engineer of the Fire-brigade.

The Architect-in-Chief of the Prefecture of Police.

The Architect of the District on Duty (*circonscription de service*).

The Justice of the Peace of the Quartier and the Officer of Peace of the Arrondissement.

A sub-committee consisting of:

The Architect of the District, an Officer delegated by the Fire-brigade, the Justice of Peace of the Quartier and the Officer of Peace of the Arrondissement have to make periodical inspections of each theatre and after such survey draw up and forward a report to the management with a view to the proper action being taken upon it.

The Commissioner of the Police is responsible for the general supervision during the performance, the maintenance of order, and free circulation of the public outside. Police are not permitted in the auditorium except when the public are endangered, but officers are allowed in the lobbies and vestibules.

The fire appliances and arrangements are under the supervision of the fire-brigade.

A medical staff is insisted upon to attend performances and rehearsals.

The rules as to play-bills, prices of admission, lost property, etc., do not concern us; but the rule that the public waiting for admission must be arranged in files (*en queue*) is one that should always be observed, also that the doors between the stage and the auditorium should be closed during the performance.

Music-halls and other places of public amusement in Paris are only allowed one fixed scene, and a stage without machinery and no flies or cellar, in other respects the theatre regulations apply to this class of building.

[*Austria.*] An Austrian theatre must have Royal boxes with ante-room, separate staircases, vestibules, and covered approach. Covered ways must also be provided for the general public.

[*Vienna.*] Within the Vienna police district, the official inspection of theatres is under the police, who meet one hour before the doors are open to the public, to make a tour through all parts of the house, and order immediately what may be necessary to ensure safety from accidents or fire. The duties of these inspectors are defined by the authorities.

Every town in Austria containing a theatre, appoints a permanent local committee, having for its object the periodical examination of theatres with special regard to their stability and internal arrangements as to safety from fire and the security of the public. The results of these examinations are reported to the town authorities with a view to the immediate rectification of faults where discovered. This local committee consists of several persons professionally acquainted with buildings, of members of the fire-brigade, of the doctor and (in the Vienna Police District) of representatives of the director of police and the magistrates, or (in towns having a town council) of members of such council, or (elsewhere) of members of local boards or vestries. Each committee elects its own chairman.

In Vienna the Committee of Safety, consisting of members of the Town Council, of the Police and Magistracy under the presidency of the Chief of the Town Council, assisted by a certain number of persons with technical training, examines and reports to the Town Council both in the case of new theatres and the condition of old ones, the report being drawn up with special regard to public safety and safety from danger of fire. The Lower House sends three of its members to be Members of this Committee.

[*St. Petersburg.*] In St. Petersburg every theatre must be annually examined, previous to the theatrical season, by a Commission specially appointed by virtue of the municipal regulations for the control of theatres. The owners and lessees of the theatres (which this commission shall find in accord with the requirements of the building regulations and of the obligatory regulations) receives annually a certificate for the carrying on of the theatre.

In the event of any theatre not complying with the measures for the prevention of fire, the Municipal Council informs the holder of the theatre that the license granted for the carrying-on of the same has been withdrawn, after which time no further performance can take place until a new license has been obtained.

Every theatre is placed under the care of a responsible person (an inspector) and on his undertaking the duty of permanently watching over the construction and all technical arrangements of the theatre,

a written notice is forwarded to the Municipal Council. The inspector has to possess a sufficient technical knowledge of his profession, and have under his immediate orders the requisite number of assistants. The inspector and his assistants must be present during every performance, as well as an hour before and after the same. At the conclusion of a performance the inspector has to examine every part of the theatre.

In conclusion I cannot help wondering, as I have no doubt many others have done, that a perfectly fireproof building is not insisted upon in every country.

The majority of the structural portion of the regulations refer to arrangement and width of staircases, passages and exits, in relation to the numbers accommodated in the theatre. This is obviously to reduce the chances of disaster from panic. Surely the necessity of constructing a building fireproof in all its details is of equal importance. Given good exits, no doubt a crowd will have a better chance of a rapid escape, but given a fireproof building, which the audience knows is fireproof, there is slight chance of such an audience becoming excited and panic-stricken: with knowledge of security will come calmness and reason, the two qualities naturally opposed to panic.

There is one part of the theatre where improvement seems to be entirely at a stand-still, I refer to the stage machinery. This appears to be on exactly the same pattern and lines as some generations ago; little or no advance having been made in the construction of the various traps, sliders and bridges. No regulations exist compelling any alteration in the old wooden stage, and considering the fact that it is on, and from the stage that the danger of fire is most reasonably expected, it is surprising that advantages have not been taken of modern invention and science, and the stage-carpenters and stage of the past been replaced by one that would be fireproof in its working details. The thing is quite possible, but it requires thought, care and invention. Whenever a new theatre is erected the old-fashioned stage is built by the stage-carpenter, not by the architect, and theatrical managers being somewhat conservative are quite satisfied with this, more so perhaps than with anything new.

I have spoken of the laxity of the rules on ventilation. This is such an important point it is a wonder that much more is not thought of it by the various authorities. Sanitation, too, is treated but lightly. Such are the world's building-laws in relation to theatres as far as they have come under my personal notice.

E. A. E. WOODROW.

AUSTRIAN SHEET AND MIRROR GLASS.¹

THE manufacture of glass in Austria dates back as far as 1442. The first sheet-glass and mirror manufactory was established by Count Johann Joseph Maximilian Kinsky, at Bürgstein, in Bohemia, in the year 1722. In the latter half of the eighteenth century Bohemia may be said to have held the first rank among the

pressed crystal glass, the Bohemian glass could not compete; and, notwithstanding the most strenuous efforts made by some of the principal Bohemian glass-manufacturers, the decline of the glass industry in Bohemia became inevitable. In later years this industry has regained some of its former prestige, and there are now in Bohemia about one hundred and fifty glass-works and three thousand grinding establishments, employing together nearly 30,000 hands in the manufacture of glassware. There are, however, only two works in Austria making cast or rolled plate-glass. The principal works engaged in the manufacture of sheet-glass and mirrors are situated near the town of Pilsen, in Bohemia.

Besides Bohemia, there are a number of glass-works in the other Austrian provinces; and in Hungary, whose industries are growing rapidly, there are at the present time over seventy glass-works in operation, some of which also manufacture sheet-glass and mirrors.

As the value of plate and mirror glass chiefly depends on its purity, the greatest possible care is taken to procure materials of the very best quality, and almost every manufacturer guards the formula of his own special mixture as a trade secret.

An analysis of Bohemian sheet-glass gives the following elements:

	Per cent.
Silicic acid.....	67.7
Potash.....	21
Lime.....	9.9
Alumina, ferric oxide, and manganese.....	1.4
Total.....	100

The two following mixtures are known to be in use in Bohemia:

Components.	Quantity.	Components.	Quantity.
I.	Pounds.	II.	Pounds.
Quartz.....	200	Quartz.....	200
Potash, purified.....	133	Potash, purified.....	149
Marble.....	66	Hydrate of lime.....	40
Saltpetre.....	13	Saltpetre.....	13
Arsenic.....	3.2	Arsenic.....	3.2
Manganese.....	0.4	Manganese.....	0.4
Cobaltic oxide.....	0.02	Smalt.....	0.05

Another recipe is the following:

Fine white sand, freed from impurities by washing....	240
Nitrate of potash.....	8.3
Sulphate of soda.....	150
Slaked lime.....	27
Gullet of plate glass.....	141.6

The following is a description of an improved plant for casting glass plate, as employed in some of the larger Austrian glass-works. This plant is shown in the following drawings in vertical and in horizontal section.

The furnace is of elliptical form, and contains twelve pots, each of which holds about 2,000 pounds of glass. The grate is about twenty-six inches wide, and extends through the entire length of the

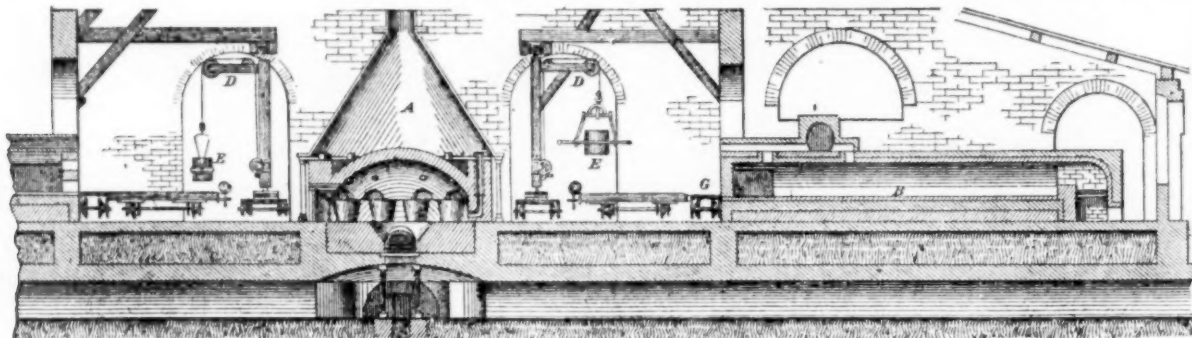


Fig. 1.

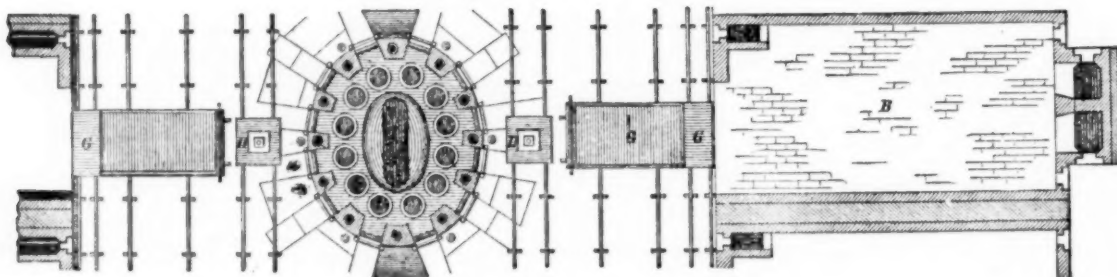


Fig. 2.

glass-manufacturing countries of the world, and in 1799 the value of the glass produced in Bohemia amounted to 2,500,000 florins (\$1,000,000). When, however, about the year 1810, the markets were flooded with the cheap English, and later on also with French,

¹ Report to the State Department of the United States by Consul-General Goldschmidt, of Vienna.

furnace, about sixteen and one-half feet. Around this grate the melting pots are symmetrically arranged upon the so-called bank in the furnace. For inserting and removing the pots, the furnace is provided with twelve openings, the sills of which are on a level with the bank, and each are closed with a large stone. These stone plates are provided with openings, which are again closed by plates

of refractory clay, each of which has again several smaller apertures. Through these openings the batch is introduced into the pots by means of shovels attached to a long rod. Through the apertures, which are closed up with clay during part of the time required for melting the frit, the temperature of the furnace may be watched.

The grate is free for about two-thirds of its length, while its ends enter at either side into a vault in the bank, below which are situated the flues for supplying the necessary air for the combustion. The floor around the furnace is covered with cast-iron or steel plates.

When the furnace is heated the rising flames envelop the pots and escape through small flues in the interior of the furnace pillars, whence they enter a great central chimney of sheet-iron (A). Below, this chimney is provided with a smoke jacket covering the whole furnace, and serving as a means of ventilation for the immediate vicinity of the furnace.

The furnace is situated in the centre of a house 100 feet wide, and at either of its sides, parallel to the sides of the house, the annealing ovens are symmetrically erected.

Each annealing oven has three fireplaces for heating it, and is furthermore provided in front with a wide opening for introducing and removing the plates, with several openings through which, when the oven is to cool down, air may be gradually admitted, and with a funnel for conducting smoke into a common chimney.

The construction of the sole of these ovens requires great and special care. The stones, which must be well smoothed on all sides, are placed on edge and rest in a layer of sifted and dried sand of uniform grain; there is no mortar employed, in order to permit the free expansion of all parts of the sole. As this sole must always remain perfectly level, it is examined before every charge by means of a long straight-edge and a spirit level.

The casting-table is an iron or bronze plate from ten to twenty feet in length, and from five to ten feet in width, five or six inches thick, with a perfectly level surface, and resting upon an iron carriage—the so-called table-carriage, which is movable upon rails. The crane is situated between the casting-table and the furnace, and is also movable upon rails parallel to the front of the annealing ovens. Before casting, the casting-table is heated by placing hot coals upon its surface, which is subsequently thoroughly cleaned again. When everything is ready, the pot is lifted out of the furnace and placed on the iron floor, where the forceps or grapple of the crane is attached to it, and the pot is raised and poised over the casting-table, having previously been carefully skimmed. Two bars of iron or bronze, about one inch wide and of a thickness corresponding to the thickness of the plate to be cast, are laid on each side of the table. Upon these bars is placed a roller, the length of which corresponds to the width of the table and which has a diameter of about one foot. This roller, which is also of iron or bronze, and which, as a rule, is hollow, was formerly operated by hand, but is now, in most works, operated by a windlass placed upon a carriage at the opposite end of the casting-table, the chain of which windlass is connected with the axle of the roller. The roller being in position upon the bars, the pouring is commenced just in front of the roller, and while the pot is being moved by the crane along the table toward the other end of the table, the roller is made to follow. During this operation two men are holding the guards against the roller just outside of the bars, so as to prevent the glass from overflowing the latter; at the same time a third workman cleans the casting-table with the wiper just ahead of the spreading glass. When the roller has passed over the plate it is run onto the windlass-carriage, upon which it is wheeled away, and the windlass-carriage is replaced by the bridge-carriage, which, by means of a suitable connection with the casting-table, forms a level surface over which the plate, after having sufficiently cooled to permit its handling, is passed into the annealing oven, the sole of which is covered with a thin layer of sand.

The operation of casting a plate, from the moment of taking the pot from the furnace until the sliding of the plate into the annealing oven, does not take any longer than about five minutes.

The annealing oven is left to cool gradually, which takes from eight to fourteen days. When the plate is sufficiently cooled, it is carefully drawn from the oven, and before it is taken out altogether the so-called "head" or uneven part which has formed at the end is cut off. The plate is now taken entirely out of the oven in a horizontal position, and then turned up on edge, in which position it is carried by a number of workmen into the cutting room. Here the plates are carefully examined, and the defective places marked with a piece of chalk, whereupon they are cut into pieces as large as the defective places will permit.

The average cost of production of plate-glass in Austria up to the time of grinding and polishing is about fifteen cents per square foot.

The grinding and polishing process of plate and mirror glass comprises three stages, viz, the coarse grinding, the clear grinding and the polishing. The coarse grinding is intended to remove all superfluous substances from the plate and to give it a perfectly even surface. The grinding material is in this operation, coarse, sharp-grained sand, or, better, ground quartz, which is employed in different grades, commencing with the coarsest and finishing with the finest grade. The clear-grinding process is intended to remove the traces of the coarse grinding, for which purpose emery powder of different grades of fineness is employed. The clear grinding is generally done by hand, but some establishments have also for this process introduced machine work. The polishing, which is also done by machine work, gives to the still dimmed surface of the plate its

original lustre. The polishing materials used are colcothar, tripoli, or tin ashes. In coarse as well as in clear grinding two glass plates are employed, of which the so-called bottom plate, or bottom glass, is, as a rule, from three to four times larger than the top plate.

For grinding the plates are imbedded in plaster-of-Paris in the following way:

The grinding-table is a stone plate, resting upon a solid base about two feet high. The plate to be ground is raised upon the grinding-table and rested there upon its edge on narrow strips of felt placed along the edge of the grinding-table. The plate must be held so that when it is turned down upon the grinding-table that side upon which it has rested in the annealing oven will be the one imbedded in the plaster. A quantity of plaster is now sifted upon the grinding-table, and, with water, formed into a paste, which is evenly spread over the entire surface of the table. Now the plate is carefully laid down upon it, and, after the felt strips have been removed, it is moved backward and forward upon the plaster paste until all the air bubbles in the latter have escaped. The successful fastening of the plate upon the table depends upon giving the proper consistency to the plaster paste. If the paste is too thick, the plaster will set before the plate has been sufficiently rubbed down upon it, and in order to remove the remaining air bubbles the rubbing must be continued with a greater pressure, which impairs the exact horizontal position of the plate; when this is not maintained the plate will receive an unequal thickness in grinding. In this manner the plate also receives too great a tension, which will cause it to separate from the table or to crack when the plaster adheres too firmly. When the plaster paste is too thin it will relax at the beginning of the grinding, thereby necessitating a refixing of the plate, which makes it very difficult to obtain an even surface, and which must never be done near the finish of the grinding. An exact recipe for the plaster paste cannot be given, as this entirely depends upon the skill, experience and observation of the workman. The bottom plate is now surrounded with a frame or border of plaster, and when all the plaster has set the superfluous is removed and cleaned away with a scraper or spatula. In the same manner the top plate is attached to the bottom of a wooden box, which is open on top so that it may be filled with suitable weights. This box is called the grinding-box. The weights must be evenly distributed in the box, as upon this depends the uniform action of the top plate, and therefore also the success of the entire process of coarse grinding or roughing. By displacing the weights the centre of gravity of the grinding-box may be shifted to the spot where greater irregularities in the surface of the top plate require a harder grinding.

There are at the present time but very few, and only the smaller, plate works where the coarse grinding or roughing is carried on by hand, all the larger and more important establishments employing machines for this purpose.

The principle of the hand grinding is essentially the same as that of the grinding by machinery; the hand-grinding process is described in the following:

The grinder places some of the coarsest sand upon the highest part of the bottom plate, moistens it with water, and now begins to move the grinding-box to and fro by holding the handles, imparting to the box a turning movement, which is maintained until the sand between the two plates has been used up. The grinding-box is now pushed aside, fresh, wet sand is applied, and the grinding continued until the highest places of the top glass have been removed, whereupon this is taken off the box and replaced by a fresh one. In this manner the grinding is continued. By frequent examination all the higher spots of the same level on the surface of the plate are ascertained, covered with sand, and ground, until at last the entire surface of the bottom plate is superficially levelled. All the top glasses also having been ground down to this first state, the operation is recommenced with the first top plate and continued until the whole surface of the bottom plate appears perfectly even. The coarse surfaces thus obtained are now prepared for polishing by grinding first with finer and finer grades of sand, and at last with two grades of emery. Before passing over to a finer grade of sand, the plates must be always carefully cleaned from the sand of the coarser grade used previously. Every grade of sand employed is applied to the plates twenty times. The weight of the grinding-box is gradually increased at the same time, so that it will be about 100 pounds when the finest sand is used. Before using the emery the plates are taken off and fastened afresh with plaster-of-Paris in the manner already described. The grinding-box is now weighted with 120 pounds, and the coarse grade of emery is applied to the bottom plate twelve times for each top glass, and twenty times when the finer emery is used. The plates finished in this manner for polishing are now turned over and subjected to the same treatment on their other surface. The taking off of the glass plates from the plaster in which they are imbedded is done in the following manner: A knife is inserted between the glass plate and the plaster on the longer side of the plate about two inches deep and a wooden wedge about eighteen inches long is inserted alongside the knife, and the latter is withdrawn; in this manner about twelve such wedges are introduced at either side of the plate, and by gradually driving in these wedges about two inches at a time the glass is separated from the plaster. In grinding the other surface of the plate the coarsest grade of sand employed upon the first surface is omitted.

It is reckoned that a grinder is able to coarse grind or roughen thirty-six square inches per hour by the hand process.

The form of coarse and clear grinding machine, employed in many Austrian works, consists of a revolving table of from nineteen to twenty-two feet in diameter attached to a strong wrought-iron shaft, and making on an average twenty-five revolutions per minute. About ten inches above the face of the table a strong wooden beam is mounted, at the two opposite sides of which, to the right and left of the centre of the table, two notched cast-iron plates are fastened. The notches serve for receiving and holding a knob in the centre of the top plates. This mode of attachment permits the top plates to be approached to or removed from the centre of the table by inserting the knob into a nearer or farther notch. The top plates revolve around their centres and receive their rotary movement by friction from the table, those parts of the latter situated farther from the centre having a greater speed than those near the centre. The movement of the top plates by friction is better suited to the work than that caused by any other agent. This arrangement also offers the advantage that the surfaces remain free and unobstructed by parts of machinery, which greatly facilitates the fixing, turning and removing of the mirror plates. A machine of this kind will grind from 2,300 to 3,000 square feet per week on both sides.

Before polishing the glass plates their edges are cut straight and square and slightly ground, whereupon the edges are chamfered off, to prevent injury either to the plate itself or to the polishing felt. The plate is now, in the before-described manner (with plaster-of-Paris) fixed upon the polishing table, consisting of a stone plate, the surface of which is ground perfectly even and smooth.

The first stage of polishing is, properly speaking, only a continuation of the grinding process, having for its object to produce a surface fine enough for receiving the last polish. For this operation five different grades of emery are used. The finish, as already indicated, is given with colcothar, etc.

The polishing of the mirror-plates is always done by machinery, and, although these machines as employed in the different establishments greatly vary in detail, the general principle is in all the same as that of the grinding-machine described and shown.

In most of the Bohemian glass-works the same uncouth polishing machines are still in use which were constructed at the end of the last century. In the venerable plate grinding-works of this description great crank-wheels, situated on the ground floor of the building and operated by one or more water-wheels, are by their pitmans connected with long wooden beams suspended on the upper floor. These beams, which receive by this connection a rocking movement, operate clumsy frames on the upper floor, to which, by means of hinged rods, the polishing plates are suspended. These plates, of which there are about six on either side of the frame, only make rectilinear backward and forward movements upon the bottom plate fixed to the polishing table.

A polishing machine constructed in 1877 by an Austrian (Pfister) is employed in several Austrian glass-works, and is said to give very satisfactory results. This machine consists of the two uprights, connected by two cheeks; to these cheeks eight guide rolls are attached, upon which rests the table, of T, angle, and sheet iron. By an endless-screw gearing and a crank-wheel a slow backward and forward movement is imparted to the table. By loosening the small screw and giving a turn to fork the table is disconnected from the machine, so that it may be removed for the purpose of fixing on and taking off the glass plates. At each end of the machine a horizontal crank-wheel, operated by suitable gearing, is mounted and supports a frame extending across the length of the table. This frame consists of cast-iron arms or brackets and two long and four short rods, which latter are provided with four knobs each, which serve to form the connection with the sixteen polishing blocks. This connection being a loose one, the blocks freely bear with their own weight upon the surface of the glass plate. By raising up the short rods, which swing with their brackets freely upon the longer rods, the blocks are raised from the table, springs preventing their dropping down again. The iron blocks have a diameter of twelve inches and a weight of thirty-five pounds each, with the exception of the corner blocks, which are a little larger and heavier in order to secure a simultaneous finishing of the corners and narrow sides of the plates with its other surface. The blocks are on their circumference provided with holes filled with wood to permit the nailing on of the polishing felts.

In fixing a number of glass plates upon the table care must be taken that all the plates are exactly in the same level, for otherwise a uniform polish could not be obtained. For this purpose a special device is employed, consisting of a polished glass plate of the size of the machine table. This plate is set in a strong, wooden frame and balanced on two trunnions, so that it may easily be tilted. The ground-glass plates which are to be polished are arranged in the different suitable sizes upon the plate, which has previously been moistened with water, so that the force of adhesion will retain the plates. When the whole arranging plate is covered with the plates to be ground, so that as few free spaces as possible remain, the machine table is wheeled alongside of the arranging plate. After the table has been evenly covered with the plaster paste, the plate holding the glass is tilted over the top of the table and upon the plaster. Everything is left in this position until the plaster has firmly set, when the arranging plate may be removed. All the glass plates now offer a perfectly even and level surface for polishing. An interruption of the polishing work is avoided by providing

reserve tables. In this manner one arranging plate may also be made to serve for several machines.

The block frame making fifty strokes per minute, the surface of the table, which, in deducting the interstices between the glass plates, is about thirty square feet, may be polished on one side in from ten to twelve hours.

As has already been said in the introductory part of this report, there are only two works in Austria employed in the manufacture of cast or rolled plate-glass. All the glass of this kind, with the exception of the plate manufactured by the two establishments just mentioned, is imported from Belgium and France. All the rest of the mirror and similar glass produced in Austria is blown in the well-known manner, the grinding and polishing process being that herein described.

A glass-blower in the Austrian glass-works may, under favorable circumstances, earn from 200 to 250 florins (1 florin = 42 cents) per month. Rolled-glass workers earn about 50 florins a month, and common day laborers are paid about 50 kreutzers per day in winter, and 60 kreutzers per day in summer. In the glass refineries wages are from 20 to 50 florins a month, skilled laborers being paid about 1 to 1.50 florins a day.

In conclusion, I give the following formula for Bohemian crystal plate:

Components.	Quantity.	Components.	Quantity.
	Pounds.		Pounds.
White sand.....	200	Arsenic.....	0.06
Potash, purified.....	64	Brownstone.....	0.04
Hydrate of lime.....	26	Cullet.....	2.00

JULIUS GOLDSCHMIDT,
Consul-General.



[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

CHIMNEYPIECE, CRANE MEMORIAL LIBRARY, QUINCY, MASS. H. H. RICHARDSON, ARCHITECT.

[Gelatine Print issued with the International and Imperial Editions only.]

SKETCHES OF THE *American Architect* TRAVELLING-SCHOLAR FOR 1891, MR. ALBERT KAHN, DETROIT, MICH.: THREE SHEETS.

[Issued with the International and Imperial Editions only.]

ARMORY OF THE FIRST CORPS OF CADETS, BOSTON, MASS. MR. W. G. PRESTON, ARCHITECT, BOSTON, MASS.

THE building which the First Corps of Cadets of the Massachusetts Volunteer Militia is now erecting at the corner of Columbus Avenue and Ferdinand Street, Boston, is at once an armory, a fortress and a house. It will be an imposing structure of stone, brick and iron, substantially fireproof, consisting of a drill-hall having external dimensions of 200 feet by 100 feet, and a head-house or administration building, triangular in shape, of four stories with a hexagonal tower rising above and commanding the whole at the acute angle formed in the junction of the cross street with the avenue. A passage twelve feet in width separates the building from the adjoining property on the avenue, and also in the rear.

Under the drill-shed are the lockers for clothing, the bowling-alley, store-rooms, bath-rooms, lavatories, kitchen, pantry and dining-room, the rifle-range for short in-door practice being provided for in the latter. The engine-room and ample coal-bins are also in this basement.

The basement of the head-house contains the billiard-room, which becomes the band-assembly and dressing room when the corps turn out. Adjoining are the dressing-rooms of the officers and non-commissioned staff-officers including the first sergeants, with lockers and other conveniences.

The ground floor of the head-house contains the Corps room for meetings, with the library in the tower adjoining.

The second floor is similar to the ground floor and is the foyer to the gallery running around the drill-hall.

The third floor has been designed for the use of the Massachusetts Military Historical Society, whose valuable library, the gift of John C. Ropes, Esq., will thus be in custody of the Corps for safe keeping in a fireproof building. An agreement between the Society and the Corps gives members of the Corps the privilege of attending the meetings of the Society.

The upper story of the head-house is a large room, high studded, connected with the room in the tower of the same stud where squad drills may be conducted and a gymnasium established. Quarters for janitor and engineer adjoin.

The rooms in the tower above the roof of the head-house, are three, one of which will be mainly occupied by a large water-tank; the other rooms will be museums for the display of the ancient uniforms and other relics prized by the Cadets.

All the windows of the drill-hall will have sliding iron shutters, bullet-proof, and all the windows on or below the same level in the head-house will be similarly provided.

The building is so contrived that all the parts of the walls and adjacent spaces may be swept by a flanking fire of musketry, and by water, boiling, if need be. This should render the building invulnerable to mob-attack at close quarters. The water-supply, carried in reservoirs filled from the rainfall on the immense area of the pitched roof of the drill-hall, will be independent of the city mains, although the city water will be introduced as an auxiliary.

An elevator well with engine chimney and ventilating flues will occupy the angle of the head-house at the junction of the rear passage with Ferdinand Street.

HOUSE OF J. C. SIMONDS, ESQ., CHARLESTON, S. C. MR. J. L. NORRMAN, ARCHITECT, ATLANTA, GA.

The building is to be of brick, plastered, and will cost about \$50,000.

HOUSES AT THE CORNER OF WEST END AVENUE AND 77TH STREET, NEW YORK, N. Y. MESSRS. LAMB & RICH, ARCHITECTS, NEW YORK, N. Y.

[Additional Illustrations in the International Edition.]

DETAIL OF A HOUSE ON THE QUAI AU SEL, MALINES, BELGIUM.
(Gelatine Print.)

A GENERAL view of this house may be found in the *American Architect* for December 20, 1890.

ENTRANCE TO THE HOTEL DU VIEUX RAISIN, TOULOUSE, FRANCE.
(Copper-plate Etching.)

THE HALLES, BRUGES, BELGIUM.

THERE was a time when Bruges was supposed to be a sort of City of the Dead, but any one who was acquainted with it twenty or thirty years ago would admit on seeing it now that Bruges is susceptible to change. The new railway station by itself is a sign that the old ways which were aptly figured by the slow traffic on the canals are coming to an end. There are new buildings near the station and elsewhere in the city. Even the ancient Halle has obtained young neighbors, and its dark brickwork appears almost gloomy when contrasted with the bright masonry of the offices which were lately completed. It is to be hoped that speculators will not convert the large plot which is surrounded on its four sides by the buildings which were sacred to crafts and commerce when Bruges attracted merchants from most parts of Europe, and of which the tower shown in the illustration was and is the crowning feature:—

In the market-place of Bruges stands the belfry old and brown, Thrice consumed and thrice rebuilt, still it watches o'er the town.

The belfry was erected in the fourteenth century, and it used to be surmounted by a *flèche*, which was subsequently destroyed. It is evident that some such termination was needed, although without it the bells continue to be as delightful as ever. Longfellow, lying at the *Fleur de Blé*, tells us how—

As the evening shades descended
Low and loud and sweetly blended,
Low at times and loud at times
And changing like a poet's rhymes,
Rang the beautiful wild chimes
From the belfry in the market
Of the ancient town of Bruges.

He was tempted to ascend the tower, and the sounds brought back to him visions of the days departed, and the glories of Bruges.

I beheld the pageants splendid, that adorned those days of old,
Stately dames, like queens attended, knights who bore the Fleece of Gold,
Lombard and Venetian merchants, with deep-laden argosies,
Ministers from twenty nations; more than royal pomp and ease.

A good many English visitors do not value Bruges; it seems too quiet and poor to suit them. But it ought not to be forgotten that England had much to do with bringing about the decline of the city. In 1859, it is said, a double duty was imposed on goods which were to be sent to Flanders, and, further, the Flemish traders grew afraid of the militant propensities of the crews of English ships. For a time there was in consequence a stagnation of trade in Bruges, and rival cities seized the opportunity to get possession of its commerce.

HOUSE, PALACE COURT, BAYSWATER, LONDON, W. PLANS OF PRINCIPAL FLOOR AND OF ENTRANCES. MR. J. M. MACLAREN, ARCHITECT.

PRIMITIVE METHODIST HALL, BRADFORD. MESSRS. H. & E. MARTEN, ARCHITECTS.

For some years past the congregation worshipping at the old Primitive Methodist Chapel have felt their work to be seriously retarded by the extremely inconvenient arrangement of the building,

and by its unattractive and gloomy appearance. It was erected about thirty years ago, after the original chapel, erected in 1824 at a cost of £3,500, had been burned to the ground. The circumstances under which the disaster happened prevented the rebuilding of the premises at the time in any but the cheapest and most economical style, for the fire occurred before the original building-debt had been removed, and the structure itself was actually uninsured. Some portion of the debt on the rebuilding of the place after the fire, amounting now to about £2,500 still remains, but it is considered desirable that new premises should be obtained without delay. For this purpose the old chapel is already being demolished, and the building shown in our illustration is to be erected in its stead. The project is a bold one; it is said that no such step has ever been previously taken in the Primitive Methodist body, for the cost of the new building will probably be £4,500.

In connection with the new erection the name "chapel" will be abandoned, and the title Central Hall will be adopted. In design the building will, so far as Bradford is concerned, be a novelty, though places of worship somewhat similarly planned have been erected in some other towns. The ground floor will be occupied by two large shops situated one on either side of a vestibule and entrance-hall, which will give access to the chapel and schools. The schools were rebuilt some twelve years ago in the rear of the old chapel, and as they are convenient and substantial buildings they will not be interfered with in the present alterations. The hall will be upon the first floor, and will be some fifty-five feet square. Behind the rostrum will be a recess for an organ, and this externally will project over the glass roof of the school building on the ground floor, supported upon corbels. The galleries, which will occupy three sides, will be very large, and altogether accommodation will be provided for about a thousand people. The hall will not extend the whole width of the building, but space will admit the construction on either side of show-rooms above the shops, and, on the floor above these, of workrooms. By making the workrooms a few feet narrower than the show-rooms below an additional width of ten feet is gained for the gallery plan, and this space forms a convenient aisle round the galleries. An arcade supporting the roof will separate the aisles from the galleries, and will also form a prominent and pleasing feature in the internal aspect of the building. The galleries themselves will not be supported upon columns, but upon brackets or cantilevers bolted into the outside walls of the building, and there will consequently be nothing to obstruct the view of the preacher in the rostrum. With the same purpose the gradient of the gallery is greater than is usual. The staircases, which at present communicate with the school classrooms, are to be continued to the galleries, and as these open directly upon the side streets they will afford useful means of exit. The hall will be lighted from the ceiling by means of skylights in the roof, with ornamental lanterns in the panelled ceiling beneath. Besides this, there will be windows in the front and in the gable in the rear. Five sunlight gas-burners will be fixed in the ceiling, and the ventilation will be effected by automatic air-pump ventilators. The business premises on either side will be completely separated from the hall by fireproof walls and ceilings. There will be a basement, which will also be let for business purposes.

NOTES AND CLIPPINGS

UNDERGROUND ELECTRIC RAILWAY FOR PARIS.—One of the most important undertakings recently sanctioned by the Municipal Council of Paris is the construction of an underground electric tramway from the Bois de Boulogne to the Bois de Vincennes. This project is likely to be put in hand soon. The tubular tramway will be composed entirely of metal. The perforation will be made by means of hydraulic boring appliances, and as these machines advance, cast-iron plates will be bolted together, forming a solid and durable wall. To check oxidation on the outside of the metal tube, each plate is provided with a hole in the centre, through which mortar will be forced by hydraulic pressure, so as to fill up every crook and crevice. This will likewise prevent any moisture from finding its way inside, and the tube being thus perfectly dry, the question of ventilation will be much simplified. All that will be necessary for this purpose will be to provide some vent holes along the tube, and to draw out the vitiated air by means of electric fans. There will be no other communication with the thoroughfare above except the stations, which will number seventeen. Each train will be composed of four carriages, affording seats for 200 passengers. The motive power will be generated at a central station, and a motor will be placed under each car. Electricity will likewise be used to light up the tunnel the whole of its length. The cars will travel at a speed of twenty-five to thirty kilometres an hour, so that taking into account the frequent stoppages, the distance of eleven kilometres will be traversed in about half an hour.—*New York Mail and Express*.

LONG DISTANCE ELECTRIC POWER TRANSMISSION.—The *Electrical World*, in an article on "Long Distance Electric Power Transmission," describes the power plant now in course of construction for the San Antonio Electric Light and Power Company in the San Antonio cañon, Southern California, which is asserted to be the most important electric power-transmission plant yet undertaken in this country. There is a minimum flow of 1,300 cubic feet of water per minute, affording a head

of about 400 feet. The water is brought to the power-station through 1,900 feet of thirty-inch and 600 feet of twenty-four inch double-riveted sheet-iron pipe, which involves a loss of head by friction of 12 feet, leaving 390 feet effective head or running pressure. The laying of the pipe line necessitated a rock tunnel 1,300 feet in length as well as several heavy open cuts. The power-station is provided with four double-nozzled Pelton wheels, 34 inches in diameter, coupled direct to the armature shafts of as many Westinghouse alternating-current generators of 200 horse-power each. The current thus generated will be carried on two No. 7 bare copper wires down the cañon to a point where they diverge, one running to Pomona, fifteen miles, and the other to San Bernadino, twenty-eight miles, covering by the return circuit in the latter case a distance of fifty-six miles. By means of transformers the potentials will be raised at the generating station to 10,000 volts, and the current carried at this pressure to sub-stations just outside the cities named, where by means of step-down transformers it will be reduced to about 1,000 volts and then distributed for both light and power purposes. This installation, the *Electrical World* says, is attracting much attention, as it is by far the highest tension distributing system ever attempted in this country on so extensive a scale for commercial purposes.

THE ELECTRIC-CAR SYSTEM AT DOVER, N. H. — The employment of storage-batteries on street railways is being very actively discussed just now, without any apparent results in the way of practical work. The trolley goes on conquering and to conquer, but the storage-battery falls back dispirited and defeated after nearly every new effort. It has not occurred to many persons that the two methods could be made to supplement each other, but this has now been done at Dover, N. H., on the line of the Union Electric Street Railway Company. The road consists chiefly of steep grades, and one of them, over 9 per cent, lies at the end of the line farthest from the power-house on the Salmon Falls River. Propelling the cars up this grade has so taxed the capacity of the plant, that it has been customary to employ four to six horses at this point, so as to prevent the stalling of all the cars along the line. It has now been decided to replace the horses by storage-batteries, and the experiment has proved successful up to date. In a small outhouse on top of the hill, 238 cells of battery have been put, the charging current coming from the station. As soon as the trolley-car reaches the hill, the trolley-circuit is opened and the batteries are cut in, the car taking current from them while it runs a distance of about 300 feet. A car with fifty passengers on board will now climb the hill easily. It remains to be seen how long the batteries will stand up under the treatment they thus get, but there is some satisfaction in knowing that the horses benefit by the change. — *New York Evening Post*.

TO PREDETERMINE EFFLORESCENCE ON BRICKWORK. — It is possible to determine in advance of their use whether brick will effloresce. Knowing this, architects and builders should permit the use of none which will not stand the test. A building is more valuable, when rented or offered for sale, if it has not been made unsightly by this lime-like deposit. At the Royal testing-station of building material in Berlin, brick are gradually heated to the boiling point in a water-bath, and are then suddenly immersed in cold water. They are boiled for one hour in a 15 per cent solution of common salt and frequently cooled as before. They are again boiled half an hour in 5 per cent soda lye. They are further boiled half an hour in the same solution, with the addition of 1 per cent of ammonium sulphate. They are then boiled half an hour in a solution containing 2 per cent blue vitriol and 10 per cent common salt. Fragments of the brick are placed for seventy-five hours in 3 per cent hydrochloric acid and for fifty hours more in 5 per cent hydrochloric acid. By further treatment of the fragments with pure 4 per cent hydrochloric acid a fluid clear as water is formed, which, when treated with barium salts, should not show the presence of sulphates which are the cause of efflorescence. These tests determine the quality of the brick as well, and none which fail to stand the test should be allowed to enter into the construction of a building. As it is in Chicago, any piece of burnt clay which passes under the name of brick is used. The question of the discoloration of brick walls is of sufficient importance to command the attention of the building department, as well as of architects and builders. — *Clay Record*.

WATER-POWER AND THE ELECTRIC LIGHT. — The proposal to light Rome with electricity generated by the Falls of Tivoli has at last been carried into effect. The Roman of the nineteenth century is not a personage whose aestheticism will rebel at making use of the Anio Falls for creating electricity or anything else. Six turbines of 2,000 horse-power have been erected, which are capable of driving dynamos generating currents ample not only for lighting up the streets and public buildings, but, at a small additional cost, admitting of being so increased as to provide illuminations for private dwellings also. These currents are carried across the Campagna for fifteen miles and transformed into currents of lower pressure, at a loss, it is said, of only 20 per cent of the initial force. Already there are numerous electric railways, electric installation plants and the like worked by waterfalls, and before long the power which, for millions of years, has been rolling into Lake Ontario will be compelled to earn its livelihood by supplying electricity for many an American town. The problem has, in truth, been fully solved by the company which undertook to transmit power from Lauffen, on the Neckar, over 110 miles of wire to Frankfurt. This is, of course, more than seven times the distance over which the energy of the Anio is to be borne, while the turbines erected at the rapids of the Neckar have not more than a twentieth the power of those at Tivoli. Yet, at Frankfurt, three thin copper wires, each less than a quarter of an inch in diameter, yield electricity enough to supply 10,000 glow lamps, or their equivalent, equal to a sixty-horse-power motor, and an additional number of lamps. By means of special transformers at each end of the line the electrical pressure is raised to the amount, first, of 12,000 volts, then to 15,000, and, later to 30,000

volts, thereby enabling large powers to be conveyed through comparatively thin wires without the great loss in efficiency which would have occurred at a lower voltage. After three months' trial it was found that the 113 horse-power taken out of the Neckar was, at Frankfurt, 110 miles away, still efficient, in spite of all possible sources of loss, to the amount of over 72 per cent. The American electricians promise to carry 1,000 horse-power force from Niagara to the Chicago exhibition, and already electric transmission has supplanted rope transmission at Schaffhausen. It is, in short, evident that we are yet at the mere outset of this new departure in engineering, and that in the near future a waterfall may be more valuable property than a gold mine, and the grime and smoke and tall chimneys now characteristic of a manufacturing town will be unknown. It may be also that the tides which now idly fling themselves on the beach will be yoked to a turbine and dynamo in the service of humanity. — *The London Standard*.

BORING FOR BITUMEN IN FRANCE. — Writing to Messrs. Barton, Parr & Co., Newcastle, from Prompsat, Puy-de-Dôme, where a careful search for mineral oil is now being prosecuted, a correspondent says: — With regard to the bitumen, this mineral is found here in immense quantities. There are three varieties equally abundant, the liquid, bituminous limestone and the bituminous sandstone. The mineral is met with at a few feet from the surface. The seams of bituminous limestone are in some places 200 feet thick. The mines have never been worked beyond 80 or 100 feet. The mineral gives oil and gas by distillation, but as experiments have been made only on the bitumen near the surface, of course it gave but small quantities of light oil. The bitumen extracted by boring deeper contains more volatile oil. At a depth of from 500 to 600 feet inflammable gas comes up through the bore. The only use to which the mineral is turned, at present, is for the manufacture of paving blocks. The bituminous limestone is used for this purpose; it is crushed into powder, a small quantity of liquid bitumen and sand added, and then the mixture is put into moulds and submitted to very high hydraulic pressure, and the blocks thus turned out are in the form of bricks or tiles as required. They resist perfectly well the action of heat; the trials made in different towns where they have been employed for paving the streets have turned out most satisfactory. The work is very neat, and it costs less than the ordinary paving stones. I note that this year there is a great demand for these blocks. This business, started about three years ago, has proved a success. The boring in search of petroleum continues very slowly, on account of the pressure of the gas, which drives up the sand and soil into the tubes to a height of 100 metres, and prevents the working of the bores. For the last three weeks they have been pumping down water, which, on its way back, brings away the soil which chokes the bore. They have not got beyond 200 metres. I do not think they have got the proper machinery for the purpose; neither have they experience in such work. There can now be no doubt about oil existing at a certain depth; it comes up already on the surface of the water. Would it not be possible to get some one who has had experience in such mineral enterprises to come over here and see if something could not be done to work either the petroleum or the bitumen? I think there is a great future for this mineral. This is the first time that boring to any depth has been carried on. The ignorance and indifference of the people here on such subjects is incredible. Now would be the time to act. Later on, if oil is discovered, it will be difficult to treat with the proprietors of the concessions. — *Invention*.

PUMPS FOR NATURAL GAS. — Bairdstown, a few miles west of Fostoria, in Hancock County, is soon to have a unique establishment. The failure of natural gas in that section has compelled the Northwestern Ohio Natural Gas Company to put in an immense pumping-station for the purpose, not only of forcing the gas through the mains to Toledo, Detroit, and other points reached through its pipes, but also to increase the flow of gas by drawing it from the rock. The pumps will have a displacement of 13,000,000 cubic feet of air in twenty-four hours, and it is expected they will make it possible for the company to furnish satisfactory pressure miles away. The great source of anxiety is that the immense suction power may draw too large an amount of salt water from the rock, but a system of automatic drips is being arranged to obviate this difficulty if it should occur. It is interesting to reflect that even this powerful pumping-station can produce at best but a small fraction of the power and energy that were wasted in the early days of natural gas. The great Hutson well, for instance, drilled in March, 1890, had three times the capacity of these two huge twelve-ton pumps. Nearly every well in that section had a capacity as large as this station, but waste, that is almost inconceivable now, hastened the present condition, and compels the use of artificial for natural pressure if the company in question is to continue to supply its city customers. — *N. Y. Times*.

DEFORESTING THE WHITE MOUNTAINS. — A lumber firm, it is said, has purchased the right to cut down the trees on the south side of Mount Washington, and will soon begin to clear the land at the rate of 10,000,000 feet a year. The forests of Mount Willard, report says, are also in the hands of a speculator, who offers to forego his lumbering operations if the neighboring hotel-keepers will pay him \$20,000. The *Boston Transcript* testifies: "The portable sawmill is dragging its deadly course up and down the mountain glens, leaving everywhere a track of devastation behind. The beautiful Zeeland Valley is one vast scene of waste and desolation; immense heaps of sawdust roll down the slopes to choke the streams, and by the destructive acids distilled from their decaying substance, to poison the fish; smoke rises night and day from fires which are maintained to destroy the still accumulating piles of slabs and other mill debris. Those who ride through the Crawford Notch, viewing the splendid scenery as the train creeps slowly up the mountain side, find their vision offended again by the telltale sawdust heaps — some of them are as large as dwellings — signs of the ruthless destroyer's tooth in that charming and wonderful defile." — *Burlington (Vt.) Free Press*.

1. The first part of the paper is devoted to a general discussion of the problem.

2. The second part is devoted to a detailed study of the case of a single particle.

3. The third part is devoted to a study of the case of a system of particles.

4. The fourth part is devoted to a study of the case of a system of particles.

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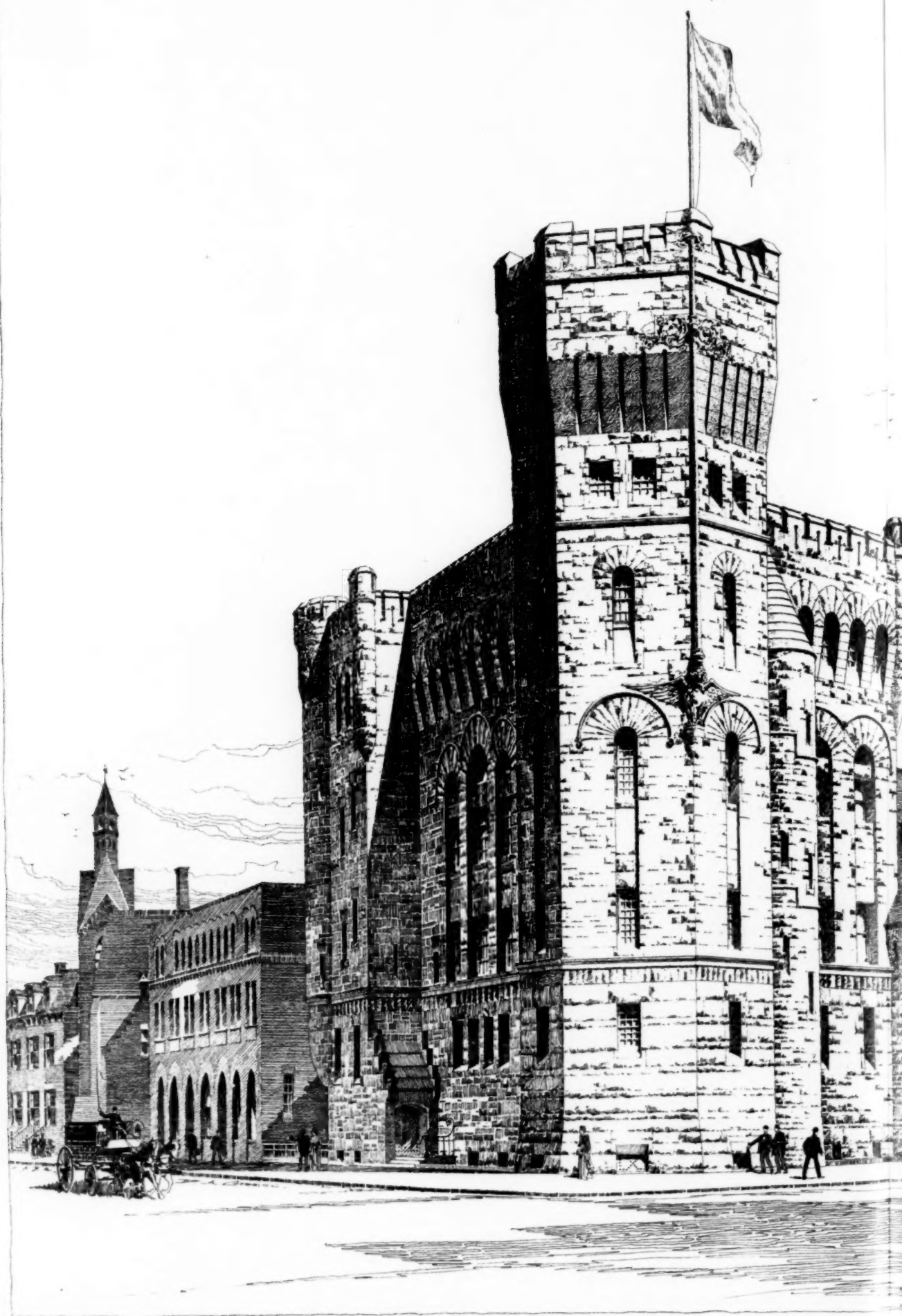
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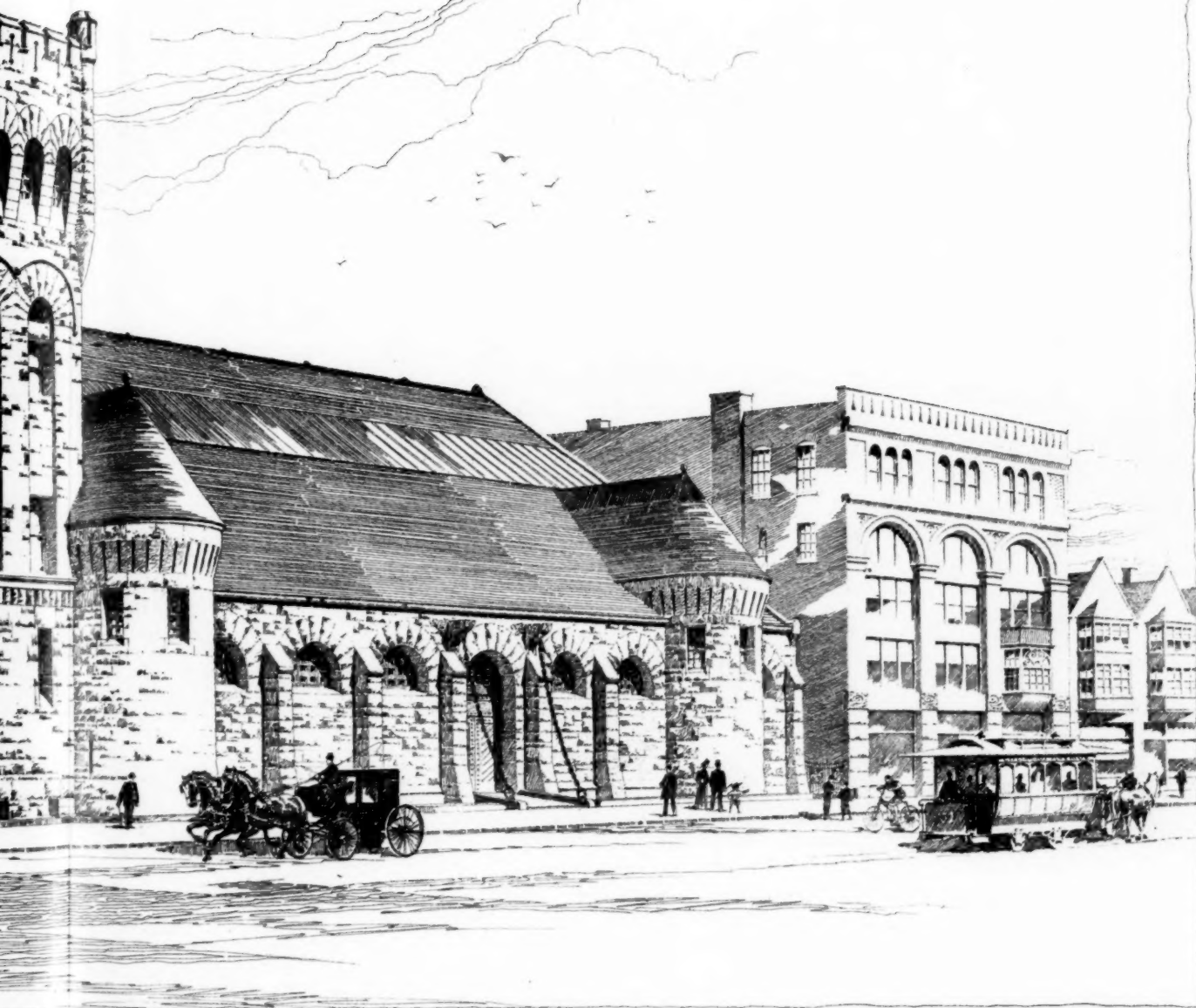
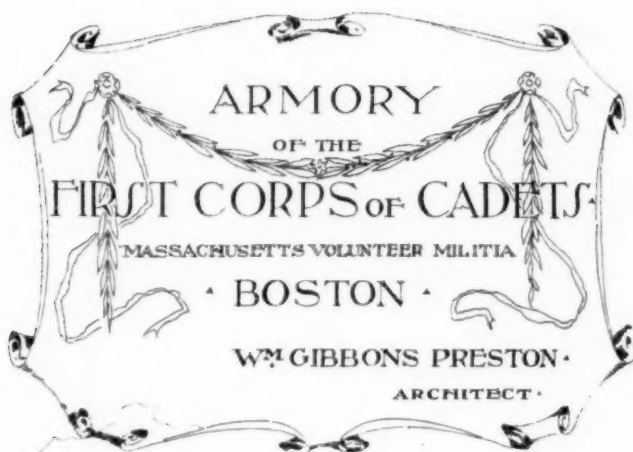
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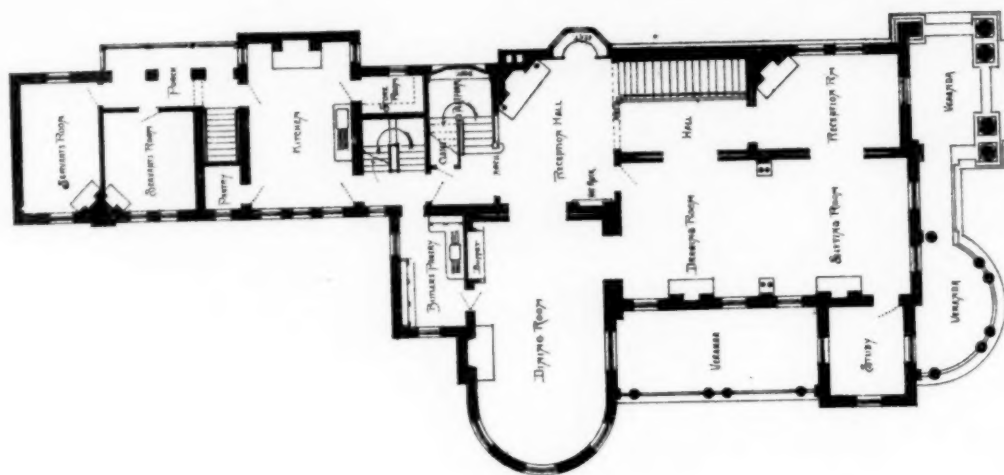
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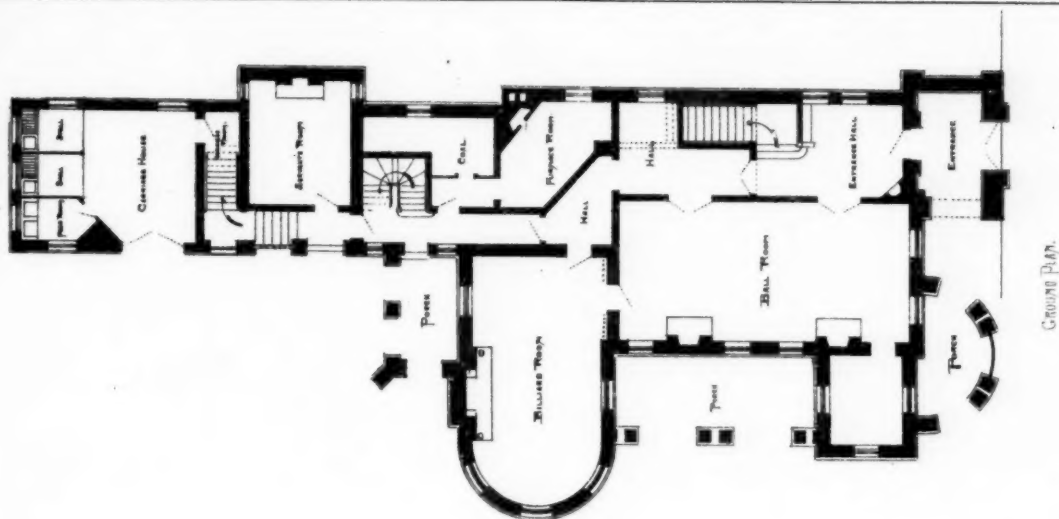




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