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WITH a deep sense of personal loss we have to record the death of one of the most generous and lovable men we have ever had to deal with, one with whom long years of intercourse produced no slightest uncomfortable friction, one whose captious criticism was not to be expected, one whose mind was open to suggestion and prompt to detect the desirable from the undesirable. Generous, discriminating, just in his dealings with those whose lot it was to serve in his employ, the death of James Ripley Osgood will bring real regret to scores of men, of almost every nationality, who were at different times in the service of the publishing house of James R. Osgood & Company and of the Heliotype Printing Company. Mr. Osgood, at the time that business reverses obliged him to leave Boston and take the position of Harper & Brothers' London representative, was one of the best known and most influential citizens of Boston, for he had the happy gift of great social tact, while his sterling good sense and his acknowledged business capacity gave him an enviable standing both in the social and business worlds, and it was an unkind turn of the wheel of Fortune that compelled him to die an alien in a foreign land. In spite of the weight brought upon him less by advancing years than by the anxieties attending his reverses in business Mr. Osgood, with characteristic perseverance, had succeeded in establishing recently an independent publishing house in London under the style of James R. Osgood, McIlvaine & Co., which at once won for itself standing and recognition in the already crowded book world of London. It is a satisfaction to us that in all the changes through which he passed between 1876 and 1885 Mr. Osgood and the *American Architect*, one the creation of the other, were loyal one to another. His belief in the future possibilities of the journal was to us a comfort and an unfailing support, and it is a gratification to all concerned to know that events have proved it was not misplaced.

THE people of Boston are considering the question of building a new city-hall, the one now in use, which never was a very good one, being far too small for the present requirements of the city's business. Some time ago, a proposition was made to build a new structure on the Public Garden, the land for which was granted with the express reservation that it might some time be utilized for the purpose; but it was found that there would be general dissatisfaction at the loss of

the Garden, which, as now managed, is one of the most popular small parks in the world, and, although the location would be a very fine one for such a building, it is not very central, and quite inconvenient of access from the region occupied by architects and business men, who have every day more occasion to consult the city officers; so that the Mayor, who is very familiar with the conditions of the problem, pronounced, in a message on the subject, in favor of a site nearly at the top of Beacon Hill, separated only by a street from the State-House grounds, and looking diagonally across the Common. There is no question that this would be one of the best, if not the very best site in the whole city, not only for convenience of access to all the business portion, but for architectural effect; and the latter is a very important consideration. If there is any city in the United States in which one would expect to find the civic pride and taste which would delight in a noble and nobly-placed building for its municipal offices, that city is Boston. To the true Bostonian, no structure could be too beautiful, and no situation too imposing, for the Public Palace, and the Mayor's suggestion was very well received. The city architect, Mr. Wheelwright, prepared careful plans for a building on the site proposed by the Mayor, and the City Government appointed a committee to visit the city-halls of the principal cities in the United States, and report upon them, and upon the recommendations which had been submitted. This committee carried out its mission faithfully, and presented a report which has a very considerable interest. One of the questions which the committee had to consider was whether it was best to erect a new building, or to raise the roof of the old one, and build extensions, covering the adjoining sidewalk. The answer made to this question by the majority of the committee was that it would be more judicious to build a new structure than to try to patch up the old one, but a small minority dissented. Architects will probably agree with the majority, that it is rarely satisfactory to try to make a new building out of an old one; and in the Boston case, as the old City-Hall occupies a comparatively small portion of a large lot, in a location where land is very valuable, it seems all the more impolitic to spend money on a temporary makeshift, when the old building, with the land, could be sold for a price which would go far toward paying the cost of the new site proposed, at the moderate prices which as yet still prevail in that part of the city.

UNDER the Massachusetts law, however, authority must be obtained from the Legislature before the city authorities can appropriate land for public purposes, and the Boston municipal authorities accordingly made application for the necessary authority. Rather to the astonishment of the public, the committee of the Legislature, to which the request was referred, has just reported unfavorably. Why the Legislature of Massachusetts should have any objection to allowing the citizens of Boston to build a new city-hall at their own expense, in the place which they think most suitable, no one seems to be able to say, and all sorts of speculations have been put forward as to the motive for the committee's action. One theory holds that the Legislative committee, being Republican in its politics, is afraid that the present Democratic administration of the city will derive too much credit from the successful carrying out of such a large and important building; but the mayor of Boston is likely to be a Democrat for some time to come, and a grievance against the Legislature, for blocking the attempt of the citizens to get their new building, would make Democratic, rather than Republican votes. Another theory, which seems to us more plausible, is that the Legislature is conscious of not having achieved a signal success in its economical scheme, which is now being carried into execution, for enlarging the State-House, the pride of Massachusetts, by the addition of an enormous tail-piece, connected with the original structure by a tunnel, and does not wish to invite comparisons between the product of its own intellect and a neighboring building of the character of the proposed new city-hall; but this explanation also finds a difficulty in the fact that the Legislative committee does not object specifically to the Beacon Hill site for the new municipal building, but recommends that no authority should be given to the city to take land anywhere for the purpose of building a city-hall. However, the Legislature has yet to act on the committee's report,

and, if its recommendations are not rejected, they will at least have to be supported by some sort of reasons, so that the mystery will be at least partially solved. Meanwhile, if the Legislature should agree with its committee, it appears that the result will be, not to prevent, or even postpone, the erection of the new city-hall, but to fix its site upon the Public Garden, which can be taken without legislative permission.

AMONG the other pieces of information collected by the Committee of the Boston City Government on the City-Hall Extension is a comparative statement of the cost of various city-halls in the more important towns of the United States, which affords food for a good deal of reflection. It will be remembered that the Chicago City-Hall and County Court-House form symmetrical halves of one building, which was originally intended to have a central dome, at the joint expense of the city and county. During the process of erection, both the City and County halves of the building were the subjects of various scandals, the County half, perhaps, surpassing its twin in this respect. Now, however, after the tales of corruption have been somewhat forgotten, the Report of the Boston committee recalls them by a calculation, from which it appears that the cost of the City wing of the building was twenty-nine cents per cubic foot, while that of the County wing was fifty-eight cents—exactly double. The Committee's Report makes no comment on this startling discrepancy in cost between the two halves of the same building, but meekly adds them together, and divides by two, and announces the "Average cost per cubic foot" as forty-two and one-half cents. This way of getting at the cost per cubic foot of a public building reminds one of the method pursued by a Massachusetts statistician in ascertaining the moral character of factory girls in a certain town. He made inquiries about them of one man, who said that they were very bad; then he asked another, who said they were very good; and on this basis, by adding the totals, and dividing by the number of examples, he arrived at the conclusion that the average character of the factory girls in that place was about the same as that of other girls of the same age. In the same manner, by adding in the speculations with the honest expenditures, the Boston committee arrives at an average which has no value unless corrected by some formula, involving terms of bribery, stealing and incompetency, which has not yet been deduced. Of most of the other city-halls visited, the Committee obtained the cost per cubic foot, and, nearly all these buildings being of recent construction, the amount so ascertained is probably somewhere near the honest cost of the work; but there are strange variations. The cost, for example, of the Buffalo City-Hall, a very plain building, and not even fireproof, was fifty-one cents per cubic foot; while that of the Cincinnati City-Hall, a splendid fireproof structure, with a tower nearly three hundred feet high, was only forty-two cents; and that of the St. Louis City-Hall, when completed, will probably be only about thirty-eight cents. On the other hand, the City-Hall of Baltimore has cost about sixty-four cents per cubic foot, and that of Richmond will cost about sixty-six cents. The Philadelphia City Building, the most magnificent, though not the most beautiful, building in the country, outside of Washington, has cost about fifty-eight cents. Whether these figures are absolutely reliable, we cannot say positively. They offer a certain internal evidence of having been made by dividing what some one thought was about the cost of the various buildings by the number of cubic feet, as estimated by the janitor, but this is, of course, a mere conjecture, which may do injustice to the Committee and its sources of information. On the whole, it seems safe to infer that a first-class city-hall, absolutely fireproof, with a tower, and a few statues, will cost about fifty cents a cubic foot, if honestly built. If the tower is left out, Mr. Wheelwright's estimate for his Boston plan, of forty-six and one-third cents, is certainly fair; and, with strict economy, a tolerable building may be erected for even less than this.

THE discussion in regard to protecting the interests of workmen in Germany by means of something corresponding with our mechanics' lien laws grows very interesting. Herr Freese, a distinguished advocate of the proposed reform, has been studying the question in Rome, where all building industries are now completely prostrated, and describes in the journal *Freiland* some of the results of his investigations. We need not repeat what he says in regard to the circum-

stances which have brought about the Roman disasters. Our readers know already that, after the removal, in 1870, of the seat of the Italian Government to the Eternal City, a period of wild speculation set in. The population doubled in twenty years, and it was impossible to build houses fast enough to meet the demand. Land in the suburbs, which the owners thought themselves fortunate to be able to sell at half a franc a square metre, was resold for two hundred francs, and building operations were carried out, with the help of the banks, on an enormous scale. To a great extent, however, Herr Freese says, the business was managed by swindlers of the class which operates so extensively in Berlin and Vienna. In most cases, these individuals would begin with one or two modest undertakings, which they carried out with scrupulous honesty. Having thus provided themselves with a good reputation, they would avail themselves of it to launch a grand scheme. There was no difficulty in getting advances from the banks, which considered themselves amply secured, of money enough to pay for land and materials, and the labor was obtained on credit, the workmen being paid with nothing but promises, but relying on the previous good character of their employers. When the crash came the speculators disappeared; the mortgagees took the land and buildings, and there was nothing left for the poor workmen. Even if the banks which held the mortgages had been disposed to do something for them, which is quite likely to have been the case, as the Italians, though prudent, are, as a race, kind and honorable, they could not: the value of the property they had acquired fell as rapidly as it had risen; neither purchasers nor tenants could be found for the buildings in which they had sunk their depositors' money, and a large number of them failed, ruining their stockholders. The poor workmen, unable to find further employment, and driven nearly to desperation by want, wandered in crowds through the streets, and disorder was only averted by the prudence and wisdom of the Italian Ministry, which, out of the scanty resources of the Government, came to the assistance both of the banks and the workmen, restoring credit, finding employment and giving help where it could. Nevertheless, the workmen have been, and still are, in a wretched condition, through no fault of their own, but as the result of treachery against which they had practically no means of protecting themselves. Curiously enough, it seems that now, the sharpest distress of the situation being over, a political element is being introduced into the discussion upon it. It is hardly necessary to say that nothing like a mechanic's lien, or other inequitable class preference, is known to the logical and precise Italian code; but, under the old-womanish despotism of the Papal régime, there was a law, or, more probably, a custom, which gave workmen a prior lien for their wages on buildings erected by their labor. Many of the unfortunate victims of the speculators' rascality were old enough to remember the advantage which this peculiarity of the temporal rule of Saint Peter's successors gave them, and did not fail to contrast the former system with the new one, to the disadvantage of the latter, while the clerical journals were happy to come to their aid with moral reflections.

MEANWHILE, the subject has been approached from another side by a Viennese lawyer, who, in two articles on the "Protection of Building Workmen," in the *Juristische Rundschau*, takes the ground that, inasmuch as improvements attached to a piece of land increase the value of the land, the persons through whose money and labor this increased value of the land has been created should have the first claim upon that increased value as security for payment for their labor and materials, in preference, we suppose, to mortgagees, who do nothing of themselves to increase the value of their security. We must confess our inability, in general, to keep up with German *à priori* reasoning, and least of all with that of a German lawyer; so we will not comment on this new aspect of the question, but will simply observe that it seems to us that the American law, which recognizes that, in the present state of the world, the poor man has not an equal chance with the rich man in getting what belongs to him, and therefore, without worrying itself about abstract justice, gives him a special lien on buildings and land on which he has expended labor, stands on much more reasonable ground, and is much more likely to commend itself to German common-sense, than legislation based on theories which contemplate the subversion of our present ideas of the rights of property.

FIREPLACES.—I.

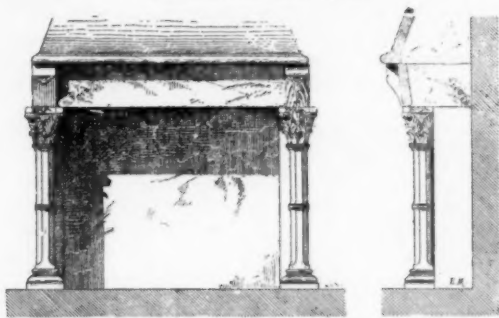


Fig. 1. From the Old College, Vézelay.

OF the various kinds of fireplaces, only such as are suited to living-rooms will be discussed in this article. The study of these naturally bears on two points: the decoration, and the constructional requirements for securing their proper practical working; the former subject will be treated here.

Antiquity has bequeathed us no examples of fireplaces of this sort. It is generally supposed that the ancients made use of *braseros* for warming comparatively small rooms, while heating on a larger scale was done by means of *hypocaustes*, a primitive kind of stoves. We are inclined to think that in rigorous climates fireplaces were instituted as soon as the inhabitants learned to build dwellings of any considerable importance. However this may be, the oldest civil constructions in existence when, about the middle of the present century, the reaction came in favor of the architecture dating from the establishment of the Eastern Empire down to the fifteenth century, went back to the twelfth century. Though accurate knowledge concerning the general plan-dispositions of earlier edifices has been obtained from excavations, and though their *ensemble* can be restored with some degree of certainty from fragmentary remains, nothing of the kind is possible with respect to any such special detail as the disposition of fireplaces in rooms. We are then reduced to hypotheses as regards all constructions antedating the Middle Ages. It is therefore with an example from the twelfth century that we begin our series of illustrations. They are arranged in chronological order and indicate the various stages through which the fireplace passed in the transformation from its original character

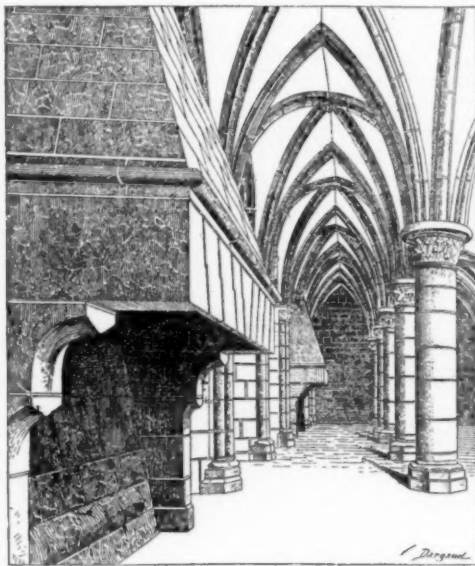


Fig. 2. From the Salle des Chevaliers, Mont Saint-Michel.

of a veritable edicule to that of a mere piece of furniture; then later, as in all other architectural productions, comes a revival of Mediaeval and Renaissance forms, characterized by the preponderant rôle assumed once more by the fireplace in the decorative system.

Savages make a fire in the centre of their huts, with a hole

in the roof above, for the escape of the smoke; it is possible that similar primitive arrangements were adopted in the first dwellings. But these cannot properly be called fireplaces; this term is applied to the disposition employed in the Middle Ages and which has been perpetuated in its general character down to the present day, the modifications which it has undergone having been such as to alter the aspect without affecting the principle. The latter is based on the necessity of providing a ready exit for the products of combustion, and of conducting them to the roof without allowing them to penetrate the interior spaces. To secure this result a vertical tube is so disposed above the fire that all the smoke escapes through it, if certain constructional conditions are fulfilled.

Of course the best place for the fire and the chimney is in connection with one of the walls, the chimney being either in the wall or against it.¹ The mediæval builders, true to their instincts of sincerity, frankly indicated the general purpose of the disposition. They made the fireplace more or less sumptuous, and more or less important, according to the character of the edifice itself; but the hearth, hood and chimney are always found sharply defined.² Since the beginning of the eighteenth century architects have, on the contrary, exhibited a desire to conceal all dispositions necessitated by the practical demands of life; the chimney has consequently been hidden, the hood suppressed, and the importance of the mantel has been greatly diminished, thus making the fireplace, as remarked above, of scarcely any prominence in the decoration of apartments.

Our first figure represents a fireplace of the twelfth century belonging to the old college at Vézelay. The hearth is formed by a recess in the wall against which the chimney is placed; on either side is a polygonal pilaster surmounted by a console; a slightly inclined mantel spans the space between the two

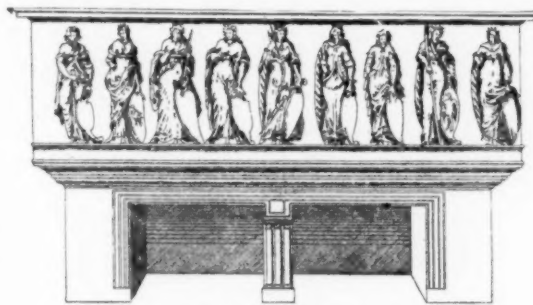


Fig. 3. From the Salle des Preuses, Coucy.

pilasters, while a gently sloping hood connecting with the smoke-tube and conveying to it the products of combustion, reaches from the mantel to the ceiling. A certain awkwardness not wholly without attractiveness is noticeable in the disposition of the consoles and the mantel; but this primitive example exhibits the constituent elements which we shall find repeated in all the Mediæval and Renaissance solutions.

The two fireplaces seen in Figure 2, in the Salle des Chevaliers at Mont Saint-Michel, bear a striking resemblance to that at Vézelay; there is, however, no recess in the wall, as the base of the back is on a line with it and the piers project but slightly, so that the fire is really in the room. The practical results must be far from satisfactory. The arrangement of the piers and consoles is much better than in the preceding example; the mantel is well supported. These fireplaces at Mont Saint-Michel furnish an excellent type of simple constructions suitable for large halls in which the decoration is solely dependent upon a judicious use of materials: most of those belonging to the first half of the Middle Ages are treated in this manner. It will be remarked that the mantel is not of a single stone, a disposition which is, in fact, almost impossible when fireplaces are very large; the method of laying the stones indicated by our illustration was the one generally adopted. The lord's coat-of-arms was often carved on the key-stone. In rare instances the mantel took the form of an arch. In simple edifices it was often of wood, in which case the hood was built of very small material or was even in plaster. Sometimes the

¹ It is interesting to note here a disposition employed in England from Anglo-Saxon times, as in the castle of Conisborough, where the smoke-conduit crossed the wall obliquely, debouching on the other side. P. P.

² Early in the Middle Ages the fireplaces were usually against the front walls; if these were too thin to admit of building the chimney in them it was carried outside on corbelling, which furnished charming decorative motives for the façades.

³ From the French of G. Aubry, in Planat's *Encyclopédie de l'Architecture et de la Construction*.

supporting pier is wanting, the entire weight of the mantel being borne by the consoles; such is the well-known example in the Castle of Clisson.

In all the fireplaces which we are about to glance at — with the exception of that in the house of Jacques Cœur — the hood

Coucy. His engraving is faithfully reproduced here (Fig. 3). At Mont Saint-Michel we saw two fireplaces in the same hall some distance apart; here the two hearths are side by side, surmounted by a single hood, on which there are nine huge statues. From this time forward the human figure often ap-

Fig. 4. Fireplace in the Salle du Donjon, Pierrefonds.



has a vertical exterior while the inner face slants to make a better conduit for the smoke; as the fireplace projected into the apartments, naturally when interior decorations came into vogue mediæval artists turned their attention to this prominent feature of each; the sloping faces of the primitive hoods

peared in the decoration of fireplaces; the lower animals were also represented and we find entire scenes depicted in this favored place, according to the fancy of the sculptor.¹

As to the general disposition adopted, we note the disappearance of the corbels and, in fact, no more examples of these will be encountered; on the other hand corbelling mouldings were introduced on the lower part of the mantel, making it a much more complicated member than was the plain lintel of our first examples. In the fireplace from the Castle of Pierrefonds shown in Figure 4 all the sculptural enrichments are concentrated on this lintel; an escutcheon borne by two heraldic animals occupies the centre and stands out on a richly carved frieze. The hood, on the contrary, which is quite pronounced in form, is lost as to decoration in the general mural paintings of the apartment. Undoubtedly Viollet-le-Duc had good reasons for adopting this comparatively irrational disposition. It furnishes a solution which may be of practical service in those cases, of frequent occurrence, where the architect is compelled to attempt, with very restricted means at his disposal, the execution of designs that call for the expenditure of large sums.

The supports are henceforth almost always composed of several colonnettes, with capitals adorned with rich foliage, and form a decorative whole; the massive piers and corbels of the preceding century, even though embellished with sculptures, would be out of keeping with these delicate mantels. The back of the fireplace is entirely in metal. It was frequently in brick with a metal plate in the centre at the bottom to take the brunt of the heat. This is the case in the fireplace in the Cluny Museum shown in Figure 5; the plate is not of the same

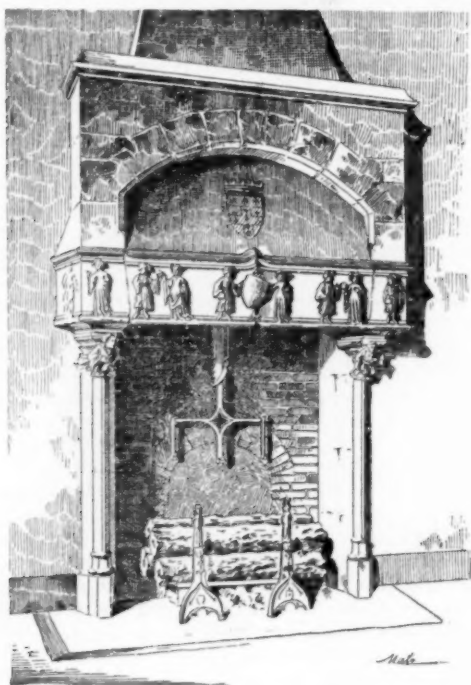


Fig. 5. From the Cluny Museum.

not being adapted to sculptural ornamentation they were replaced by straight faces. The gain in artistic effect compensated for what was lost in sincerity.

Du Cerceau has preserved for us in his "*Plus excellents bastiments de France*" the great fireplace of the Salle des Preuses at



Fig. 6. From the House of Jacques Cœur, Bourges.

¹ At the rear of the great hall of the palace of Poitiers there is a monumental fireplace in three compartments separated by clusters of colonnettes.

period as the fireplace itself, but the general purpose is indicated. The discharging-arch in the back will also be remarked. As this is a small fireplace the mantel is borne on single colonnettes; small supporting figures form the capital; a central shield and figures in high relief adorn the mantel which is

foliage, are very good, but the top displays an odd mixture of reason and fancy. The hood slopes, indicating thus its function; but this inclined surface suggested to the sculptor the idea of a roof, so he put dormer windows on it, and crowned the mantel with machicolations and battlements; then he

FIG. 7. Fireplace in the Ducal Palace of Dijon.

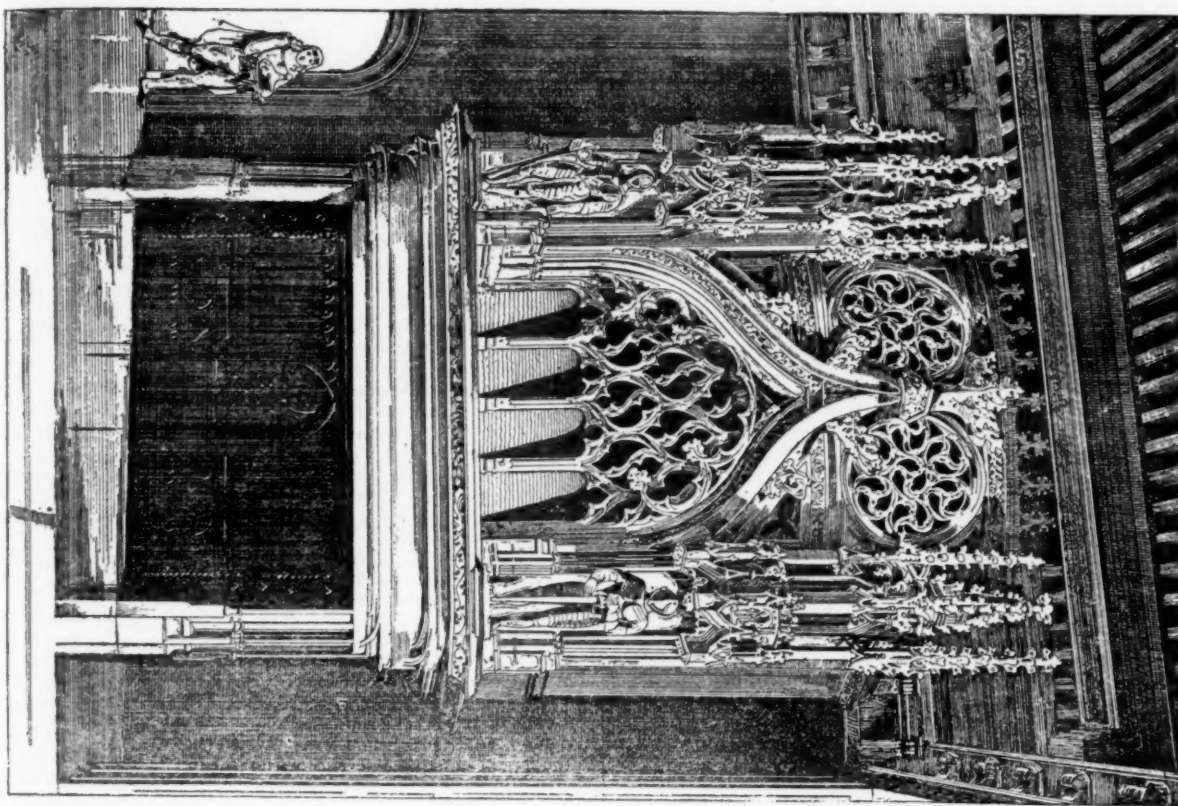
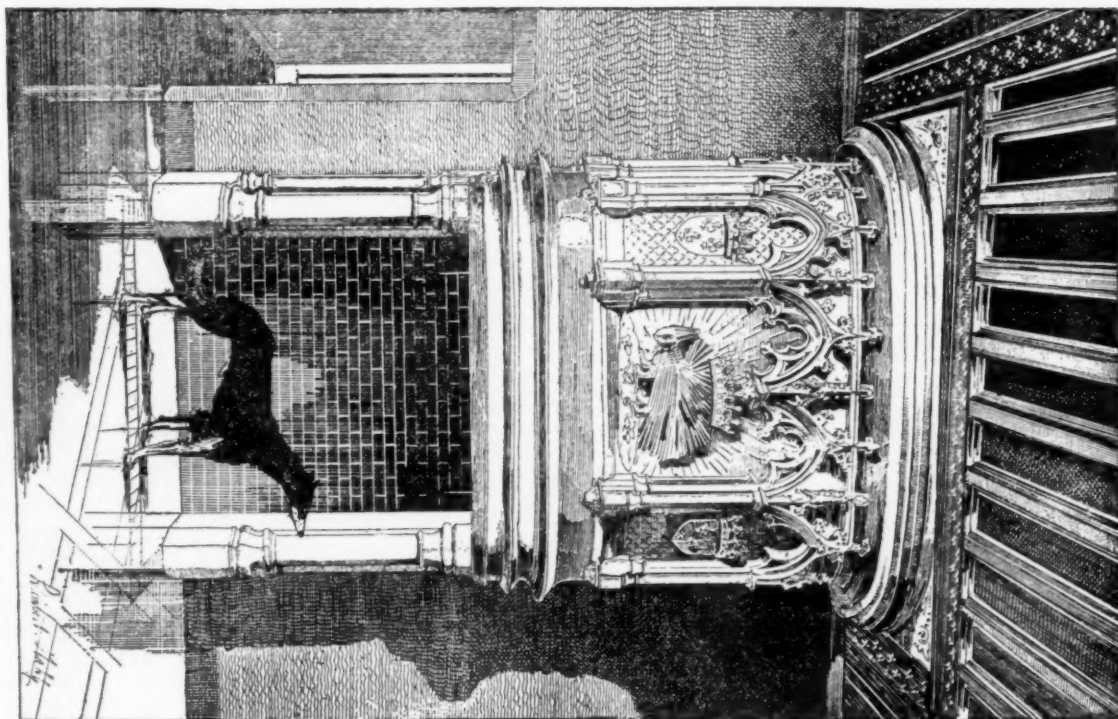


FIG. 8. Fireplace from the Château de Blois.



sharply defined by two horizontal mouldings. The arrangement of the upper part is not happy. There is a fatal indecision in the general disposition adopted. The three-branched pot-hook at the back shows how vessels for cooking were suspended over the fire.

We give (Fig. 6), as a matter of curiosity, a fireplace from the house of Jacques Cœur at Bourges. The supports and the lower part of the mantel, with its frieze of carefully-wrought

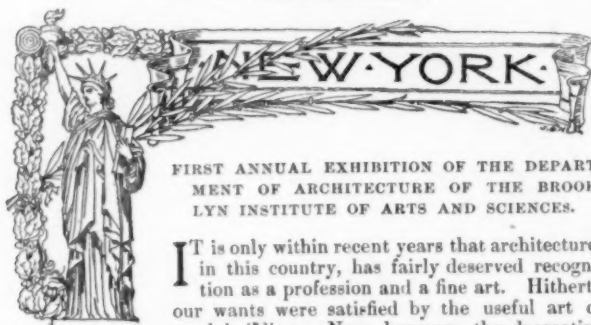
covered battlements and dormer windows with small figures in warlike attitudes.

The decoration of the hood was a reef on which the later mediæval artists often stranded in a most disastrous fashion. Figure 7 represents a fireplace in the Ducal Palace at Dijon; this is the most ornate of all the examples thus far cited, but the imitation window occupying the greater part of the hood is in too flagrant violation of common-sense to please

even the most irrational beholder. On the other hand, the delicately constituted supports and the mantel, which are traversed by very slender mouldings common to both, in accordance with the traces of the end of the Gothic period, are well joined and are of noble aspect.

The architect of the Louis XII portion of the Château de Blois was better inspired than his *confrère* of Dijon. In the fireplace which we reproduce in Figure 8 blind arches are introduced, but there are no mullions; this disposition is not objectionable. The relative proportions of hearth and hood are very good; the mouldings of the mantel deprive it somewhat, it is true, of the tranquillizing rigidity which it exhibits in general. The reader can judge whether this is a defect or otherwise.

[To be continued.]



FIRST ANNUAL EXHIBITION OF THE DEPARTMENT OF ARCHITECTURE OF THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES.

It is only within recent years that architecture, in this country, has fairly deserved recognition as a profession and a fine art. Hitherto our wants were satisfied by the useful art of good building. Now, however, the decorative art of fine building, as well, is extensively practised, and generally recognized among people of refinement and in institutions of learning. In this cause the Department of Architecture of the Brooklyn Institute of Arts and Sciences has founded a permanent school, and now this year, in offering the first public exhibition ever held in Brooklyn, they have made an exceedingly interesting beginning in their series of annuals.

Brooklyn, though a great city, with an immense population, is yet largely suburban or provincial in its buildings. Perhaps, indeed, this may largely be the true expression of the city's sphere. Still, metropolitan features are beginning to appear, as is indicated by the tendency of the more recent structures.

Exhibitions, such as this, in bringing together large collections of drawings of the best work, not only place the architect's profession in a favorable light before the intelligent public, but also educate it to a better understanding of the possibilities in architecture, and cultivate an appreciation of the value and meaning of art in design. Moreover, these occasions afford to the architects themselves, as well as to the public at large, the best opportunities for studying the recent buildings from a comparative standpoint, and observing the general tendency and modification of style. Such observations, so far from being suggested to the visitor, are, by the manner of indiscriminate hanging now in vogue, rendered impossible, or, at least, unsatisfactory. The present mode of arrangement is simply a copy of that used in exhibitions of paintings, where no distinct lines of demarcation can be drawn, while variety and picturesque grouping are essential. The New York League places the purely decorative work apart from the architectural. Why not carry the classification farther, and sub-divide each, so far as convenient, into its natural parts? If our hanging-committees would arrange the ecclesiastical designs either together, or at least in the same neighborhood, and likewise distinguish between the mercantile buildings, the theatres, city and country houses, and whatever other divisions the drawings at hand might suggest, the result, though possibly not so varied and entertaining to the superficial visitor, would probably be more satisfactory to careful observers. This studied desire to please, rather than to interest and instruct, is largely responsible for making our exhibitions mainly inferior imitations of the Water-color Society. Let architecture, as an industrial art, come before the public distinctively as such, and give adequate representation to each of its departments.

Plans are hardly to be found at all in the Brooklyn rooms, while detail and working-drawings are entirely absent there, as has been the case at other similar exhibitions. It is easy to understand that these are, for several reasons, difficult to obtain. Yet, if they were demanded, they would doubtless be forthcoming. While perspective drawings are mainly tentative and problematic, the working-drawings constitute the most serious part of office-work. Surely the real instruments, according to which the building is erected, cannot fail to add a feature equally as interesting as it is useful.

Conspicuous among the drawings in the Institute's rooms are those of the Cathedral of St. John the Divine. The successful design by Heins & LaFarge is represented in water-color. It is the same drawing which has been on view in other places, and has been talked of and written about at length. Happily an advertiser in the catalogue has inserted an excellent half-tone reproduction of the façade of the Cathedral of Paris, thus affording the best criterion by which to judge the drawings at hand. With this before us, one feels the lack in the

Heins-LaFarge design of those broad horizontal lines which so pleasingly unite the features of Notre Dame. However, the end of the nave, which is so successfully masked in the old building, is here brought forward and pierced by great arched windows, which leave but a meagre and unsatisfactory wall-space above. Nevertheless, from the interior this effect will be grand and imposing.

Evidently the façade of St. John the Divine has been considered secondary to the towering pyramidal mass at the intersection of the nave and transepts. This treatment, the one adopted in almost all the English cathedrals, will make the new edifice exceedingly effective from the distant views secured to it by reason of its conspicuous site. The four flanking towers at the centre seem to be a disturbing element, since their office has hardly been made clear. They are not high enough to secure an effect by defining themselves against the sky, and are still too great to perform any minor office as decorative features.

The cathedral drawings by Carrère & Hastings are about the most clever pieces of draughtsmanship ever produced in this country. Though masterly and intelligent in a high degree, still they seem to fail in producing a homogeneous impression. The eye wanders from the tremendous towers of the façade to the great central mass, and back again to the towers. Each is too important to be dominated by the other, while the connecting have seems a comparatively insignificant part of the structure.

McKim, Mead & White are represented by a drawing of the principal façade of the Agricultural Building, World's Columbian Exposition, rendered in parallel perspective. The frame has been slightly bowed, thereby tending to increase the perspective effect in the same way in which the Pisans, according to Professor Goodyear, sought to accomplish this object by curving the plan of their cathedral. The cathedral's curves are not obvious on sight, however, and, likewise, this picture-frame should be masked with some kind of drapery. Still, a drawing of such size, rendered in the simplest outlines, can hardly be expected to convey an adequate impression of the finished work.

The prize "Harbor Tower," by Mr. Johnson, which was recently published would possibly make a fitting centennial memorial to be erected on Governor's Island in honor of the discovery of America.

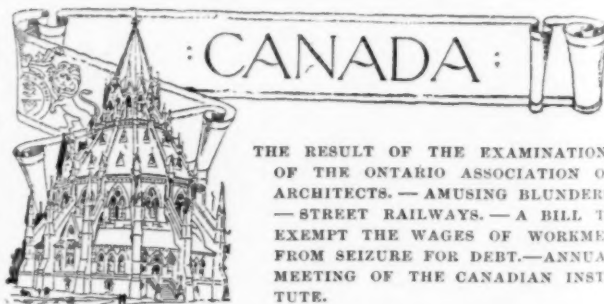
Among the water-color perspectives, there are, as usual, a number out of which Mr. Hawley gets even more glory than do the architects themselves. The most stunning of these is probably that of the Twenty-third Regiment Armory, by Fowler & Hough. Another is the large competitive design for the Rhode Island State-House, by Cady & Co.

One of the most delicately artistic perspectives is Mr. Hopkinson Smith's rendering of Mr. Tubby's competitive design for the Brooklyn Savings Bank. The foreground figures in the picture are, however, made so interesting and full of life that, instead of simply contributing to the architectural effect, they, in truth, draw attention from it.

The auxiliary arts have also received a fair representation at the Institute exhibit. They consist chiefly of stained-glass designs, wrought-iron work, enamels, book-binding, plaster models, furniture designs and interior decorations. Conspicuous among these is the magnificent Gobelin tapestry made from Mazerolle's painting, "La Cascade," and regarded as the finest work of modern times. The scene represents a nymph of the stream asleep on a rock. It is, indeed, difficult to believe that such delicate and transparent flesh-tints can be produced in fabric.

Mr. Parshley occupies considerable wall-space with a collection of photographs of domestic buildings, which, for intelligent choice of position, strong and effective lighting and clear details, are surely not surpassed by any of the foreign work circulated in our market.

Altogether, the present exhibition has undoubtedly deserved the creditable measure of success which it has achieved, and its annual return will be anticipated with pleasure.



THE RESULT OF THE EXAMINATIONS OF THE ONTARIO ASSOCIATION OF ARCHITECTS. — AMUSING BLUNDERS. — STREET RAILWAYS. — A BILL TO EXEMPT THE WAGES OF WORKMEN FROM SEIZURE FOR DEBT. — ANNUAL MEETING OF THE CANADIAN INSTITUTE.

THE result of the examinations of the Ontario Association of Architects has been published and may be considered very satisfactory on the whole. No doubt the candidates would be inclined to say that it would have been more satisfactory from their point of view if they had all got through, but it was not at all likely that they would all pass, even though the examiners naturally took into consideration all the difficulties under which students labor. Nineteen candidates presented themselves for the final examination

and of these thirteen were successful. The proportion of those who passed in the three examinations, first and second intermediate and the final was just about two-thirds. The examinations were conducted on the principles of the University examinations and consequently the candidates are not allowed to know the number of marks attained by each; the record simply divides them into two classes, those who were successful and those who failed. There were one or two amusing incidents arising partly from a misunderstanding of questions or from the nervous agitation from which candidates in general suffer on coming up for a first examination, and the President of the Ontario Association of Architects took occasion to allude to them in a speech made at the annual dinner of the Toronto Architectural Sketch Club (the Students' Association). One question alluded to the construction of a roof, the roof being described as " $\frac{1}{2}$ pitch." A candidate asked if that meant "half an inch to a foot," or "half pitch and half tar." Another stated that it was possible to load a clay soil to the extent of eight hundred and thirty-seven tons to the square foot.

To a question about testing the quality of the atmosphere a student answered, "Get up on the roof and pour peppermint down the soil-pipe." But these are apparently accidents: on the whole the papers were carefully attended to and those who passed did so very creditably. A first examination is always a severe ordeal for a candidate and a "pluck" is sometimes very beneficial to the plucked. The Province may congratulate itself on the event, as tending in the direction of placing a distinguishing mark upon those who may in the future be trusted to do their work well and for the safety and comfort of the public.

There is a question which is agitating the minds of civic officials in most cities of the Dominion at the present time. It is how to run their street-railways—what motive power it is best to use. At present most of the street-railways are operated by horse-power, to the great destruction of horse flesh and to much discomfort of the passengers. Ottawa has adopted the overhead-wire and pole system and it is found to work very satisfactorily at a minimum cost, except during thunder storms when the cars stand still at whatever spot they happen to be. Montreal and Toronto are both proposing to make a change and are investigating the merits or demerits of the "trolley" and "storage" systems. So far, the conclusion has pretty well been reached that with all its disadvantages, the "trolley" is the only really practicable method. But it takes a long time to convince aldermen and it is absurd how much they must see and be told before they can be brought to realize the truth. The Toronto Corporation after obtaining no end of evidence from engineers, decided to send a deputation to various cities in the United States to see for themselves what the engineers had told them, and the mayor and a few others had a holiday at the city's expense. They returned convinced in their own minds that the engineers had spoken the truth but, notwithstanding that, it was thought best to send two prominent engineers to other places to make further inquiries. How long this sort of thing will go on no private citizen can form any opinion, and in the meantime the streets, already in a disgraceful condition, get worse and worse every day, as the new road-beds must be waited for till a definite decision is reached.

The building trade is uncommonly dull for the season of the year, although the "permit-books" show an increase of business over past seasons. What works, however, that there are, are of a substantial character, and the speculative building, which has resulted in a good deal of distress among the perpetrators, has, in the larger places at any rate, died out for the present.

The public are still alarmingly ignorant concerning the profession of architecture, notwithstanding all the advantages within the last few years put before them by which, with ordinary intelligence, one would have thought they might have learned something, at least. A local building-and-loan association employs a builder (one of the speculative class) to value plans for loans and the works as they proceed. The manager, on being asked whether this was advisable, and whether it were not more to the interest of the company to employ an architect, said he did not think he could do better. The inspector was a very practical man, and had, moreover, "been in an architect's office for full two years, and, therefore, knew all about architecture." The inspector turned out to be a brother of the manager.

Mr. Stephens, member of the Dominion Parliament for one division of Montreal, is bringing before the House a bill to exempt from seizure for debt the wages of workmen. Such a measure has often been talked about, and not a few will be very glad to see it carried into effect, for, without doubt, it presses in the cruellest manner upon the unfortunate men. The mere seizure of the amount of the debt would not be so hard or unjust, but the procedure runs into considerable expense, all of which is added to the debt, and the mechanic has to meet the whole by starving for a few weeks to make up the loss. Tradesmen, no doubt, should have the means of collecting their dues, but it is a question as to how far those who encourage a man to go into debt for the sake of selling their goods should be allowed to bring ruin and starvation upon their victim. But this is not the place for a dissertation on the subject of credit.

The trials of the Connolly Brothers for their conspiracy to defraud the Government in connection with the Esquimaux Graving-dock, the Quebec Harbor Works and the Baie des Chaleurs Railway (accounts of which have already appeared in these letters) has been postponed until the fall, on account of the serious illness of an im-

portant witness, Mr. Perley, late Government engineer, who fell from his honorable career into traps laid for him by the firm, who induced him to take bribes in their interest. A great deal of sympathy is felt for Mr. Perley, as, although he has to bear the brunt, it is not morally certain that he was solely and entirely to blame in the matter. The fall of the Minister of Public Works brought him down in his train, and it is said that his illness is caused by the shame and disgrace. He was taken ill immediately after the disclosures, and has not yet recovered. Robert McGreevy, a member of the firm, brother of the "influential M. P." who cut off his nose to spite his face, has been tried and sentenced to one year's penal servitude. His companion, Mr. Murphy, the alleged cause of all the trouble, is still in New York, and safe from the clutches of Canadian law.

The Canadian Institute held its forty-third annual meeting on the evening of Saturday, May 7, when the various committees reported, and the officers for the ensuing year were elected. The value of such an Institute to the country may be gauged in some measure by the variety of subjects taken up for consideration by committees, as, for instance, "Standard Time," "Protection of Game," "Parliamentary Representation," besides archaeology, astronomy, biology, botany, economics, engineering, ethnology, fine arts, geography, history, literature, philology, pisciculture, zoology, political science and other miscellaneous subjects. The report of the librarian shows that the Canadian Institute is kept thoroughly posted through the scientific works of other countries, some 4,278 books and pamphlets having been received during the year from kindred institutions in all parts of the world, and a resolution was adopted on the librarian's report, to the effect "that the thanks of the Institute be tendered to the press for their courtesy in reporting so fully the meetings of the Institute."



ARCHITECTS' FEES IN GERMANY, SWEDEN, SWITZERLAND AND FRANCE.—THE SCHEDULE FOR OFFICIAL ARCHITECTS IN PARIS.—PROGRESSIVE RATES.—BURNING OF THE CHURCH AT AVON NEAR FONTAINEBLEAU.

THE matter of payment for professional service is a very important question with which the members of the Société Centrale des Architectes Français are greatly concerned. Our confrère, M. Roux, this year has made a very serious study of this subject, which has excited a lively discussion. It is not the first time, by any means, that an attempt has been made to throw light on a question which, nevertheless, has always remained unsolved, and which is a source of difficulty between architects and their clients. As M. Roux remarks, the suggestion put forward on the 1st of February, 1890, by the Conseil des Bâtiments Civils has always been applied in an incomplete manner. This recommendation, founding itself on usage, fixed the rate of the honorarium at five per cent. Unfortunately, the public and the magistrates have almost always considered that this was a law, and not merely a recommendation, and have only very rarely allowed fees in excess, a variation which was nevertheless foreseen in the sixth article of the recommendation, where is considered the matter of works at a distance, or which demand a greater number of drawings and models.

The Conseil des Bâtiments Civils, with its very broad recommendation opened the door to all kinds of ratings. Thus, less than twenty years afterwards, French architects sought to introduce modifications which had been found indispensable. The Société Centrale, from its foundation interested itself with the question, but no conclusion was reached. Congresses were held, which arrived at no result, and even to-day we search for a solution, and discuss the matter without arriving at the end; while, nevertheless, the uniform rate of five per cent is in many cases recognized as insufficient. The imperfection of our present mode of payment is prejudicial to all architects, whether Parisian or provincial; but in spite of this, we are divided into two camps—those who wish to preserve the uniform rate of five per cent intact, in accordance with the recommendation of the Conseil des Bâtiments Civils, and those who wish that it should only be considered in the light of a document, and who demand a variable rate proportionate to the importance of the work.

At bottom, as M. Roux very well said, there is a closer agreement between the two parties than appears. For those who are in favor of maintaining the five per cent nevertheless admit the necessity of a higher rate for works of small importance or for those which present very great difficulties. The five per cent is for them a minimum, as special arrangement can be made with their clients for any work which deserves a higher rate. Those of the other party, however, distrusting the benevolence and generosity of clients (perhaps they are not wrong in this) demand that the commission shall be based on a progressive and definite rate per cent.

The partisans of the five per cent tariff pretend that in the totality of works intrusted to an architect, it is certain that there are some that are overpaid at the rate of five per cent, while others at the same rate are not sufficiently paid; but they figure that in this arrangement the laws of compensation apply. M. Roux answers this by saying that if such compensation exists for the architect (which has not been proved), it certainly does not exist for the client. In short, let us suppose an architect, who has to execute at the same time a hundred thousand francs' worth of inclosing walls for one client and a house of the same value for another client. Let us admit that compensation exists, so far as the architect is concerned. It does not exist, however, for the clients, and the first one really pays in some measure for the second one's work.

There are often invoked in favor of the maintenance of the five per cent rate established usages and recognized judicial decisions. So far as concerns established usage, this is not equitable, for the usages in vogue in 1892 are not the same as those of the year 1800. Tastes and customs have changed, and the architects have to answer and give satisfaction to exigencies more numerous and complicated than at the beginning of the century. As to judicial decisions, ought they not to be in agreement with equity? Now, is equity satisfied by a uniform rate?

The real difficulty is to succeed in establishing a proportional rate which is not too complicated. The first step necessary is to study what has already been done toward this. In Germany, the fees of architects and engineers are regulated in accordance with a tariff comprised in a certain number of tables and paragraphs. A classification of structures is made according to the greater or less importance of the work, and consists of five classes. The structures are classified by the importance of the work into nine categories, ranging in cost from 3,000 to 750,000 francs. The special superintendence, including the expense of draughtsmen and use of office equipment, is not included in the architect's fee, but is paid as a special charge by the client, as well as the regulating of the accounts and the measurement of the work. The rate for German architects has been the prototype of all analogous foreign tariffs. The tariff of Swedish architects is almost identical. The difference which does exist arises from the fact that in Sweden the architects are not concerned with the verification and regulation of accounts. The tariff of the Genevese architects and engineers consists only of two classes of work with a rate graduated up to 300,000 francs in cost. The Dutch tariff repeats the German.

Now let us see what has been done in France up to the present time. The Société Scientifique et Industrielle de Marseilles (Section of Architecture), at the International Congress of 1878, presented a study of the question of fees in France, taking as a point of departure the tariff of German engineers and architects. The principal divisions were: (1) principles of determining the fees of architects; (2) classification of the *séries* and fixing of fees according to the classes and *séries*; (3) minor details of the work of the architect and fixing of a rate in accordance with each detail; (4) sundry observations.

The tariff adopted by the Société des Architectes et Ingénieurs des Alpes Maritimes has been based on that of the German architects and the schedule of the architects of Marseilles. Finally, the City of Paris adopted for fees of official architects a tariff which presents the peculiarity that the rate diminishes in proportion as the expense increases, and the figures of gradation established follow according to their classification, and are added one to another to arrive at the total. The application of the principle of this progressive rate for 500,000 francs' worth of cost gives the following fee:

200,000 francs at six per cent =	12,000 francs.
200,000 francs at five and a half per cent =	11,000 francs.
100,000 francs at five per cent =	5,000 francs.

Or a total of 500,000 francs = 28,000 francs, or five and six-tenths per cent on the price of the work.

For 720,000 francs this schedule works as follows:

200,000 francs at six per cent =	12,000 francs.
200,000 francs at five and a half per cent =	11,000 francs.
200,000 francs at five per cent =	10,000 francs.
120,000 francs at four and a half per cent =	5,400 francs.

Or a total of 720,000 francs = 38,400 francs.

That is to say, 5.833 per cent on cost of the work.

All the tariffs which we have examined are proportional tariffs. Now let us cast an eye over tariffs at a simple rate. The greater part of the societies in France are partisans of the employment of a simple rate without fractions, but all recognize the necessity of increasing the rate when the amount to be expended does not exceed a certain limit. They admit the application of the uniform rate of five per cent beyond this limit for ordinary works. For some this limit is 7,000 francs, but for the greatest number it is 10,000 francs. But the thing that is plainest from the study of the question of rates is that the principle of proportionality is demanded by everybody. Therefore, declares M. Roux, all that is necessary is to establish a proportional scale, which may be applicable throughout France, and our confrère then gives himself up to too long a study of the question to be here explained, but one which contains very excellent and just ideas. Unfortunately, a question so delicate induces differences of opinion when it comes to the point of adjusting details. M. Boileau, architect of the Bon-Marché and of the Monument to Gambetta, not only favors the maintenance of a uniform tax of five

per cent, but he is also of the opinion that the architects' fees should be regulated on the total sum less the rebate consented to by the contractor. On this point there is almost complete unanimity of opinion in opposition to M. Boileau. What are, in short, the most frequent causes of these rebates? They occur because the published price lists (*séries de prix*) are not in accord with the market-prices of materials and labor. A certain contractor, having abundance of material, may consent to a greater rebate than another. In every case, if the rebates are profitable to the clients, they on the contrary increase the work and the responsibility of the architect, who must watch with so much the greater care the contractors employed. When we see, to-day, contractors making a rebate of forty or fifty per cent, one has a right to believe that they will do all in their power to escape from the conditions which they have imposed on themselves. Therefore, the architect is obliged to double his visits to the yard and to establish a clerk-of-works there. In short, the architect's duty is to defend the interests of his client. Consequently it is not fair that his interest should be contrary to his employer's, and it is evident that if he is paid in accordance with the rebate, there is nothing to encourage him to exact that rebate.

Such is the question of the architects' honorarium in France. You see that we are in this respect in a pitiable condition, in constant struggle with our clients, and this in spite of established regulations. It is high time to find something more satisfactory. The Société Centrale is studying the question, but as its members are not in accord with one another, I very much fear that it will be difficult for it to formulate a recommendation.

I finish this letter with a bit of bad news for friends of our Monuments Historiques. A fire has just wholly destroyed the interior of the old Church of Avon, near Fontainebleau. It was in this church that were to be found the tombs of Monaldeschi, courtier and lover of Queen Christine of Sweden, whom she caused to be assassinated in the Palace of Fontainebleau in 1557; the painter Ambroise Dubois, the naturalist Daubenton, and the mathematician Bezout. The fire, which must have caught in the evening, finished its work at its leisure during the night. The alarm was only given in the morning, and everything which could serve for the nourishment of the flame had already been burned. The high altar, which dates from Louis XIII, the adjacent chapels, the choir, the sacred vases, the chasubles, the stoles which had been given by Anne of Austria, all were completely destroyed.

CONSTRUCTION.—VII.

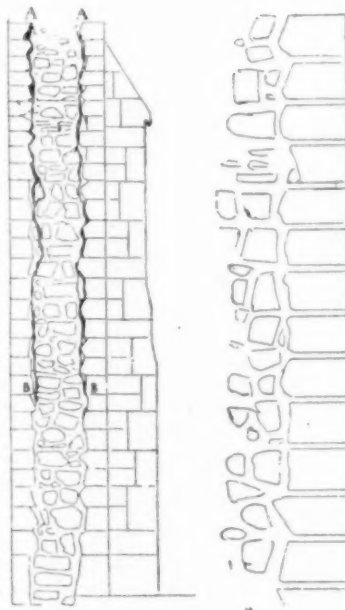


Fig. 30.

Fig. 30b.

WE must, before going further, inform our readers concerning the processes of construction, and the nature and dimensions of the materials employed. We have seen, at the beginning of this article, how the early Romanesque constructors built their masonry, composed of rough stones, enclosed between the facings of freestone, or of dressed ashlar.

The builders of the twelfth century added some modification to these first methods. Building edifices more vast in extent and taller than those of the Romanesque period, and seeking to diminish the thickness of the interior supports and of the walls, it was necessary for them, on the one hand to find a mode of construction more homogeneous and capable of resistance; and, on the other hand, to avoid,

in monuments already of great height, the expense of labor which the carrying up of materials of great size would have occasioned. Henceforth they gave up the use of large facing-stones (except in particular instances or in some exceptional edifices) and preferred to build with small facing-stones, resembling rubble rather than the cut-stone. As far as possible, the greater part of the stones then used to form facings or vousoirs of archivolts, transverse and pointed arches, are in pieces small enough to be carried upon a man's back, and laid by a mason like our ordinary stones. The method once

¹ From the "Dictionnaire raisonné de l'Architecture Française," by M. Viollet-le-Duc, Government Architect, Inspector-General of Diocesan Edifices, translated by George Martin Huss, Architect. Continued from No. 854, page 83.

adopted, this little facing is very well made, very judiciously combined; it is a middle course between the Roman construction in large facing-stones, and that of rough stones included between brick or stone walls. In adopting the small facing-stones in large edifices, the builders of the twelfth century had too much sense to lay these low and shallow courses with free joints, like certain Romanesque constructions; on the contrary they separated these courses by beds and joints of thick mortar (from 0.01 to 0.02 c.), in order that these beds might form a link between the interior masonry and the facing. This method was the Roman method, and it is a good one.

The reader will understand, in fact, that if (Fig. 30) these courses are laid without mortar in front of a masonry of rubble and mortar, the rubblework having settled because of the drying of the mortar under the pressure, and the courses of stones, set directly one upon another, being unable to diminish in volume, a vertical rupture *A B*, will take place behind the facing, which will not be long in falling. But if (Fig. 30, *b*) we have taken care to leave between the courses of stones a bed of thick mortar, not only will this bed, made fast to the masonry, hold the stone-facings, but it will also permit the facing to undergo a settlement equivalent to that of the interior mass.

The early Romanesque builders, especially in countries where one can procure large hard stones, as in Burgundy, Franche-Comté, and Alsace, upon the Saône, and the Rhône, have not failed to mimic the Roman facing, by setting broad, high squares of flagging, so to speak, without mortar, in front of the filling: but they paid dearly for this desire to make their constructions appear other than they were. There took place in the majority of these edifices, ruptures between the facing and the filling, longitudinal crevices which caused among almost all of them serious disorders at least, and often utter ruin. These effects were the more frequent and dangerous, as the edifices were more elevated. Better advised, and taught by experience, the architects of the twelfth century, as much for reasons of economy and facility of execution, as to avoid this want of homogeneity between the facings and the filling, adopted the construction in courses very shallow and separated by thick beds of mortar. These beds had not only the advantage of settling down and binding the facings to the filling; but being made of mortar of a fat lime they became hard gradually, and, while waiting for perfect solidification, the structures had time to settle down, undergoing even certain changes of form, without occasioning any breaks in the masonry.

The buildings raised from 1140 to 1200, in Ile-de-France, Beauvais, Soissons, Picardy, Champagne and Normandy, are built with facings surprisingly small; for already these edifices are vast, of complicated and yet very light structure. To employ cut ashlar in such constructions as the principal material was highly audacious; to succeed was the work of very skilful men. If one examines with care the facing of the portions belonging to the twelfth century in the Cathedrals of Noyon, Senlis and of a great number of churches in the departments of the Oise, the Seine, the Seine-et-Oise, of the Seine-et-Marne, of the Marne, of the lower Seine, etc., he is astonished that builders have dared to raise monuments so light and of so great height, with means that seem so feeble; and yet the stability of these edifices has long since been assured, and if some among them have undergone sensible alterations, that is due almost always to particular accidents, such as fires, want of repairs, or subsequent overloading.

Of all these monuments, one of the most perfect, and the best preserved is the Cathedral of Noyon, built from 1150 to 1190. Except the smaller pillars, the large capitals, the abutments, and some exceptional portions, the whole building is composed only of ashlar having little resistance.

One will obtain an idea of this construction from our Figure 31, which gives a part of the two interior divisions of the nave.

The isolated pillars of the gallery on the first story, those of the little triforium above, and those separating the high windows are monoliths of hard stone set against the stratum.

As to the small triple columns *A*, which before the rebuilding of the vaults in the thirteenth century, received the transverse arch at the intersection of the pointed and wall arches, they are composed of large pieces, held contrary to the cleavage, at intervals, by cramps in the form of a T.

But these pillars were set up after the structure had entirely settled down, and they are really only a decoration, and support nothing; the course of the capital and the abutment, whose extremities are held fast in the masonry, being sufficient to sustain the voussoirs of the transverse arch.

We have indicated in *B*, the starting-point of the old pointed-arches of the great vaults, and in *C*, the wall-arch behind the pointed-arches.

It will be remarked that, here, as in the majority of the churches built at that period, in the provinces bordering on Ile-de-France, and notably, in the Beauvoisis, the piers which support the extremities of the pointed and transverse arches are much heavier than those which support only the transverse arch.

In other words (see the plan), the piers *D*, are composed of a cluster of pillars, while the intermediate piers *E*, are only monocylindrical on the ground-floor, surmounted by the cluster of pillars *A*.

The extreme lightness of such a construction, the facility with which all the materials which compose it, can be cut, lifted, and set in place, explain how, even with feeble resources, one could think of

building edifices of great extent, and raised high above the ground. To-day when we have formed the habit of using enormous masses of stones of huge size in our least important edifices, and of employing forces of ten times greater resistance than is necessary, we should not dare to undertake to build a cathedral as large as that of Noyon, with means apparently so feeble, and we should expend fabulous sums in executing what in the twelfth century they could do with comparatively the smallest resources.

We find these constructions expensive, because we will not employ the processes then in use.

Yet the cathedral of Noyon has stood for seven centuries and, provided it can be repaired suitably, it can last five hundred years longer; now twelve hundred years appears to us a reasonable duration for a building, since the great social revolutions to which humanity is subject, will destroy them anyhow, even if they are able to continue for a longer period.

Besides offering advantages of economy, of facility in getting materials, and of execution, the structures built with small materials

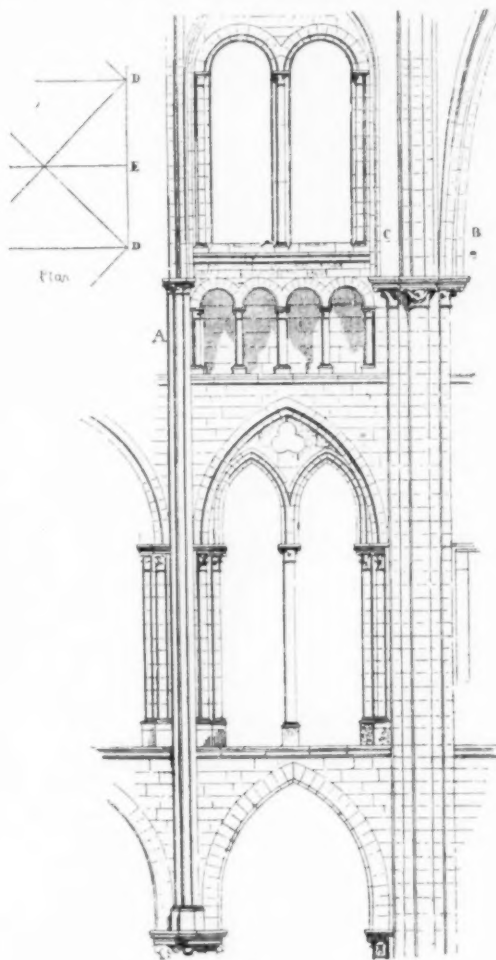


Fig 31.

were also perfectly suited to the system adopted by the architects of the twelfth century.

These light buildings, showing on their ground-plan considerable voids as compared with the solids, and submitted to oblique pressures, and to the laws of equilibrium which took the place of the Roman laws of inert stability, demanded in all the members which composed them a certain elasticity.

There, where the builders, less imbued with the new principles then admitted, sought to reproduce forms that the lay artists of the twelfth century had adopted, without exactly knowing the reason for their existence, while using material of large dimensions, were produced in the buildings fractures such that the equilibrium was soon broken.

If the arches were not perfectly independent of one another, if upon one point they had placed materials of great height and size, and if beside them the structure was made only of stones in small pieces, the parts, being rigid, or too firmly attached to the whole, or too heavy, presented a resistance, which had no other result than to cause breaks and crevices; while the too-solid parts of the structure crushed or dragged down the weak parts.

Let us, observe again, that, in these monuments, the piers, of a slight horizontal section, receive all the weight and that by reason of the small surface of their base they ought to settle much more than the walls, for example, which support nothing, since they are

relieved of the weight of the roof, and the upper masonry by the wall-arches.

If, in this system, there is complete solidarity between these weighted points of support and the unweighted filling, enclosures, and walls, there will necessarily be a rupture.

But if, on the contrary, the builders have taken care to have every weighted point preserve an independent function, and be able to move and settle freely; if the accessory parts are only enclosures independent of the effects of pressure or thrust, then ruptures cannot take place, and the looseness of the masonry is favorable to the endurance of the structure instead of being injurious.

The Romans, who opposed only passive resistance to the pressures, had perfectly admitted this principle of looseness, of liberty between the weighted parts of vaulted constructions and those which are not loaded. The great halls of the ancient baths are in this matter triumphs of combination. The whole system consists of piers supporting the vaults; the walls are only enclosures built afterwards, which one can take away without in any way injuring the solidity of the general framework of the building. Here are principles very natural and very simple; then why not always put them into practice? These principles the Gothic builders have carried much farther than the Romans, because they had, as we have said many times, adopted a system of construction where every force is active, and where there are no inert resistances, as in the Roman constructions, to act by their compact mass.

The builders of the twelfth century, raising their large edifices on plans whose solid walls cover little surface, and with light materials, in opposing to oblique thrusts active resistance in place of passive obstacles, were not slow to perceive that it was always necessary to find somewhere that inert stability. If they raised flying-buttresses against the walls of the vaults at the points of their pressure, these flying-buttresses ought, in order to fill their rôle effectively, to find an immovable impost; that impost was found in an exterior support, a sort of pier raised on the outside of the buildings, and on which all the pressures are concentrated. To give to these supports a horizontal section broad enough to preserve the immovability of their mass at a great height, was to encumber the outside of these edifices with heavy masonry which kept out the light and air, and which became very expensive. The builders had no longer the recipe for that mortar which was the principal agent in the great Roman constructions, and the piers which they might have raised, would not have had the necessary cohesion. It was essential then, to find the means of substituting for the inert resistance of the Roman supports a force quite as powerful, but derived from a different principle. This was to load the supports destined to maintain the pressures until they

attained a weight sufficient to resist the action of these pressures. It is not necessary to be a builder to know that a prismatic or cylindrical pier built with courses of stone placed one upon another, and having more than twelve times its diameter, cannot stand upright unless it is weighted at its upper end. In this well-known law of statics the Gothic architects believed that they had found the means of erecting edifices whose supports might be slender, provided they were loaded with a weight capable of rendering them rigid enough to resist oblique and contrary thrusts.

In fact, let us suppose a pier *AB* (Fig. 32), acted upon by two oblique and contrary thrusts *CD* and *EF* acting at different

heights; the stronger thrust, that of *CD*, being 10, and that of *EF* being 4. If we load the top of the pier *B* with a weight equivalent to 12, not only the thrust *CD* is annulled, but still more so that of *EF*, and the pier will remain upright. Not being able to load the piers of the naves with a weight great enough to annul the thrusts of the great vaults, the builders resolved to oppose to the pressure *CD* a flying-buttress *G*. Hence the weight *BO*, increased by the pressure *CD*, becoming 15 for example, the pressure *EF* is annulled.

If the flying-buttress *G* opposes to the thrust *CD* a resistance equal to this oblique pressure and neutralizes it completely, the thrust *CD* becomes a vertical pressure upon the pier *AB*, and the only thing necessary is to sustain the oblique action of the flying-buttress upon the exterior support. Now, if this oblique action is

in itself 8, it is not increased by the whole of the thrust *CD*, but only by a slight part of that thrust. It is something like 10, or 12 perhaps, in certain cases. The exterior support *H*, opposing already, by its own mass, a resistance of 8, it will be sufficient to load it with a weight, *K*, of 5, in order to maintain the general equilibrium of the building.

We shall take care not to solve by algebraic formulas these problems of equilibrium that practice is incessantly modifying, in proportion to the nature of the materials used, the size of their pieces, the quality of the mortar, the resistance of the ground, the action of external agents, and the greater or less care applied to the construction. Formulas are good to exhibit the knowledge of him who gives them, but they are almost always useless to the practical worker; the latter allows himself to be directed by his instinct, his experience, his observations, and that feeling, innate in every builder, which shows him what he ought to do in each particular case. We do not hope to make builders out of those to whom nature has refused that quality, but to develop the instincts of those who possess it.

One cannot teach good sense or reason, but one can learn to make use of the one, and to listen to the other.

The study of the Gothic construction is useful because it does not adopt those absolute formulas which are always neglected in execution by the practitioner, and whose least danger is to cause men to receive error with that confidence that truth alone should inspire.

If the Gothic construction is not submitted to absolute formulas, it is the slave of certain principles. All its efforts and improvements tended to convert these principles into laws, and laws they obtained as the result.

It was equilibrium; forces of compression opposed to forces of divergence; stability obtained by weights reducing the different oblique forces to vertical loads, and as a consequence, the reduction of the horizontal sections of the supports; such are these principles, and they are still those of true modern construction; we speak not of that which blindly seeks to reproduce edifices built under conditions foreign to our civilization and our needs, but of the construction that considers our modern needs, our social conditions.

If the Gothic builders had had at their disposal cast-iron in large pieces, they would have availed themselves eagerly of this sure means of obtaining supports as slender as possible and yet rigid, and perhaps they would have used it with more skill than ourselves. All their efforts tend, in reality to the balancing of forces, and to considering the supports, henceforth, only as slender supports kept vertical, not by their own breadth of base, but by the complete balance of all the oblique thrusts which act upon them. Do we ourselves do otherwise in our domestic constructions and in our great institutions for the public use, where the needs are so imperious that they silence the teachings of routine? And if any fact ought to surprise us, is it not to see to-day, in the same city, the erection of houses, markets, depots and warehouses, which rest upon slender supports, and cover considerable surfaces, while leaving to the solid walls, a scarcely appreciable foothold; and to see, at the same time, structures where the stone, collected in profusion, is heaped up, block on block in order merely to cover surfaces comparatively small, and to support only floors exercising no oblique pressure? Do not these facts indicate that architecture has strayed from the path marked out for it by our needs and our modern spirit? That it is seeking vainly to protest against those needs and that spirit? That the time is not distant when the people, wearied by an art which tries to disregard their needs under pretext of maintaining classic traditions for which they care little, will set aside the architect among the archaeologists, good for enriching our museums and our libraries with their learned compilations, and for amusing certain societies with their barren discussions. Now, we repeat, Gothic construction, despite its defects, its errors, its attempts and perhaps because of all these, is a pre-eminently useful study; it is the surest initiation into that modern art which does not yet exist but is struggling, because it establishes the true principles to which we ought still to submit to-day; because it has broken with antique traditions, and because it is fertile in applications. It matters little whether a bell-tower be covered with ornaments which are not to the taste of such and such a school, if this bell-tower have a reason for its existence, if its function be necessary, if it permit us to take up less room on the public way.

It matters little that the pointed arch shocks the eyes of the exclusive partisans of antiquity, if that arch be more solid and have more resistance than the semicircular, and we save a considerable amount of stone. It matters little whether a column has twenty or thirty diameters, if that column suffice to carry our vault or our flooring. Beauty is not, in an art wholly conventional and logical, linked forever to one single form; it can always reside there when the form is but an expression of satisfied need, of judicious use of the material given. Because the multitude sees in Gothic architecture only its ornamentation, and because this ornamentation no longer belongs to our time is this a proof that the construction of these edifices can no longer find an application? One might just as well maintain that a treatise on geometry is worth nothing because it is printed in Gothic characters, and that students reading in this book that "the angles opposite the vertex are equal to each other," are learning mere folly and are being misled. Now, if we can teach geometry with books printed yesterday, we cannot do the same in construction, and we must necessarily seek these principles where they are traced—in the monuments; and this book of stone, strange



Fig. 32.

as are its type and its style, is as good as any other, in reality, as to the ideas that it has suggested.

In no other order of architecture do we find these ingenious and practical means of solving the numerous difficulties which surround the constructor living in the midst of a society whose needs are complicated to excess. Gothic construction is not, like antique construction, immutable, absolute in its means; it is supple, free, and as inquiring as the modern mind: its principles permit the use of all the materials given by nature or industry in virtue of their own qualities; it is never stopped by a difficulty; it is ingenious: this word tells all. The Gothic builders are subtle, ardent and indefatigable workers, reasoners, full of resources, never stopping, literal in their methods, eager to avail themselves of novelties, all qualities or defects that place them in the front rank of modern civilization. These builders are no longer monks submissive to rule or tradition; they are laymen who analyze everything, and recognize no other law than that of reason. Their faculty of reasoning scarcely halts at natural laws, and if they are forced to admit these, it is in order to conquer them by opposing them one to another. If that is a fault, does it become us to reproach them?

We must be pardoned for this digression, since it is necessary in order to explain the meaning of the constructions of which we are about to give numerous examples. Knowing the tendencies, the independent spirit of the Gothic builders, their patient labor amid a society which had scarcely begun to be organized, our readers will better appreciate their efforts and the feeling that stimulated them. Perhaps, like ourselves, they will find in these daring innovators the bold modern spirit, perplexed but not baffled by routine and the prejudices of system, or by exclusive dogmas.

We have seen at the beginning of this article that, if the Roman construction is in all points excellent, wise, harmonious, like the social organization of that people, when once discovered, it proceeded steadfastly in the same path, following invariably the same laws, and employing the same means of execution to the end of the later empire.

It was good, it was admirable, but it could not undergo a change. The principal strength of the Roman people lay in preserving their social organization despite the most evident symptoms of dissolution. Their architecture proceeded in the same way; one sees, under the last pagan emperors, the execution debased, the taste degenerating, but the construction remaining the same; the Roman edifice is always Roman.

Except for the spherical vault upon pendentives, which appeared at Byzantium when the Roman Empire was nearing its end, there is no progress, no change, no effort. The Romans built as bees make their cells: it is marvellous, but the hives of to-day are as full as the hives of the times of Noah. If we gave to the builders of the Baths of Titus cast-iron, forged or plate iron, wood and glass, and asked them to make a hall, they would tell us that no one could build with these materials. The modern spirit is different: tell it to build a hall, with a section of twenty metres, out of pasteboard, and it will not reply that the thing is impossible; it will try, it will invent means for giving stiffness to the pasteboard, and we can rest assured that the hall will be built.

The Roman marks out the plan of his edifice with great intelligence. He takes the necessary bases, and proceeds with assurance: there is no anxiety during the execution. He is certain of the result beforehand; he has taken all the necessary precautions, he erects his building with security, nothing can oppose his projects; he has known how to guard against all accidents, and he sleeps peacefully while his edifice is raised upon immovable bases. What else does he lack? Room? He takes it. The materials? He finds them everywhere; if nature refuses them to him he manufactures them. The labor, the transportations, the money? He is the master of the world. The Roman is a superhuman being: he has something of the measured grandeur that one attributes to the Deity; nothing can fetter his power. He builds as he wills, and where he wills, on the site that he chooses, with the aid of workmen who are blindly obedient to him. Why should he set about creating difficulties for himself? Why invent machines able to carry the water of rivers to a great height, when he can seek their source in the mountains, and bring them into the city by a natural slope, over vast plains? Why struggle against the regular order of things in this world, when the world, both men and things, belongs to him?

The mistake of the early periods of the Middle Ages was in believing that, in the state of anarchy into which society had fallen, one could repeat what the Romans had done. Moreover, although this period of transition follows the traces of Roman traditions, what powerlessness! what wretchedness! But soon there arises the spirit of modern society; to this vain desire to revive an extinct civilization succeeds the antagonism between men, the strife with matter. Society is broken up, the individual is responsible, all authority is contested, because all the powers neutralize one another, and are victorious turn by turn. They discuss, they investigate, they hope. Among the débris of antiquity, it is not the arts that they are going to exhume, but philosophy, the knowledge of things. Already, in the twelfth century, it is among the Greek philosophers that the chosen intellects seek their weapons. Then that society, still so imperfect and so wretched, is on the right road; its instincts serve it well; it takes from the remains of the past what may throw light on the future and help men to go forward.

Vainly the clergy struggle against these tendencies; despite all

the power at the disposal of clerical feudalism, it is itself dragged into the controversy. It sees rising about it each day the spirit of examination, discussion, criticism. Furthermore, at that period, everything which tends to abase one power is supported by a rival power. The national genius profits skilfully by these rivalries; it gathers form and courage; always materially subjugated, it makes itself morally independent, and follows its own course through the struggles of all these powers, too little enlightened to exact from the intelligent throng rising about them anything else than a material submission. Many others before us have said, with more authority, that political history, the history of great powers, as it was formerly written, presents only one narrow side of the history of nations, and, in fact, illustrious authors of our own time have shown that we can know the life of the people, their development, the causes of their change and their progress, only by searching into their own hearts. But what no one has yet written is the history of those energetic, active, intelligent men, strangers to politics, war and trade, who, in the midst of the Middle Ages, took so great a place in the country; of those artists or artisans, if one prefers, organized into corporations; obtaining extensive privileges through the need that people had of them and of their services; working in silence, no longer under the vaults of cloisters, but in the *atelier*; selling their material labor, but keeping their genius independent and ready for novelty; keeping themselves closely united, and marching together toward progress, in the midst of that society which made use of their minds and their hands without comprehending the liberal spirit which animated them.

Let others undertake a task merely outlined here by us; it is a noble one, and sure to awaken sympathy. It embraces questions of the highest order; perhaps it might throw light upon certain problems of our day which occupy, not without cause, all clear-sighted minds. A thorough knowledge of the past is, in our opinion, the best means of preparing for the future; and of all the classes of society, that one whose ideas, tendencies and tastes vary the least is certainly the laboring class — that which produces. In France, that class demands more and other things than its daily bread: it demands the satisfaction of its self-respect; it demands the right to keep its individuality; it wishes difficulties to solve, for its mind is still more active than its hands. If it needs material occupation, it also needs moral occupation; it wishes to know what it does, and that people approve what it does. Every one admits that this spirit reigns among our soldiers, and assures their preponderance. Why not, then, recognize its existence among our artisans? To speak only of buildings, workmanship has declined among us at the periods when men have tried to submit individual labor to diverse Classic rules established by an absolute power. Now, when workmanship declines, social crises are never far off in France. Of all the industries, that of building certainly occupies the greatest number of hands, and demands from each man a rather high degree of intelligence. Masons, stone-cutters, lime-makers, carpenters, joiners, locksmiths, roofers, painters, carvers, cabinet-makers, upholsterers, with the subdivisions of these different classes, form an innumerable army of workmen and artisans acting under one directing force, being disposed to obey it and even to second it when it is enlightened, but soon out of control when that directing force is opposing its own nature. Our workmen and our artisans hear and follow only those who can tell where they are going and what they want. The word *why* is perpetually in their mouths or in their glances, and there is no need of remaining long among workmen engaged in building in order to know with what mocking indifference they labor at things for which they see no reason, and with what zeal they execute works whose practical utility they perceive. A stone-cutter does not work as carefully over a block which he knows is to be hidden in masonry as he does over a stone to be in sight, whose useful function he knows. All the injunctions of the overseer can do nothing against this feeling. It is, perhaps, an evil, but it is a fact easily verified in the building-yard. *Regard for appearances* is the common weakness of France, and, not being able to overcome it, one must make use of it. People declare that we are Latins, in our language, perhaps; but in our manners and tastes, in character and spirit, we are not so any more to-day than in the twelfth century. Coöperation in the common work is active, devoted and intelligent in France when men know that this coöperation, feeble as it may be, will be seen, and hence appreciated; it is languid, lazy and careless when men suppose it overlooked in the general mass. We beg our readers to examine well this national spirit, too long disregarded, in order to understand the meaning of the examples that we are about to place successively before their eyes.

To familiarize ourselves with an art whose resources and practical means have been forgotten, we must first enter into the spirit and the innermost feelings of those to whom that art belongs. Then everything is deduced naturally, everything harmonizes, and the aim appears clearly. We do not pretend, moreover, to disguise any of the defects of the systems presented; this is not a plea in favor of the Gothic construction, but a simple exposition of its principles and their consequences. If we are well understood, there is no sensible architect who, after having listened to us with some attention, will not recognize the uselessness, to say no more, of imitations of Gothic art, and who will not understand at the same time the advantage that one can derive from the serious study of that art, and the innumerable resources presented by that study so closely allied to our genius.

[To be continued.]

SHOULD GAS-COMPANIES DO ALL GAS-FITTINGS?¹

BRONZE CANDELABRA FORMERLY IN THE CATHEDRAL OF LYON

IT is the deplorable lack of instruction and supervision that is given to the gas-fitting workmen that is primarily responsible for so much imperfect gas-fitting. After a fitter has completed his term of apprenticeship with a plumber, he should at once connect himself with a gas-company, there to find that he knows little more than how to cut and thread pipe and screw it together. There is where the gas-fitter gets his first experience in complaints, such as trapped or too small services, trapped risers and house pipes, bad light, pipe too small, bills too large, and a vast number of other annoyances.

A gas-company knows what is essential to promote and

better its own interests through the care of its principal tributary—the consumer—while a gas-fitter does not.

The "complaints" that go to the gas company's office never go to the plumber's office.

Sometimes the architect or builder or both are at fault in a measure for the imperfect gas-fitting done by plumbers. The architect will require the gas-fitting to be done in compliance with the rules of the gas-company; the contractor or builder to whom the architect's specifications will be issued, will have a practical knowledge of the general construction of the building, such as the carpentering, masonry, etc., but, generally, has no such knowledge of the plumbing or gas-fitting, and consequently these branches do not receive the proper supervision that is accorded the others, and the requirements of the contract are not fulfilled. In the erection of apartment-houses or flats, no provisions are made for supplying artificial gas as a fuel; and as no other fuel will be permitted, what are the results? A gas-stove is to be set; the pipes in the room in which the stove is to be used are too small for supplying the stove; then it is necessary to reach another point of supply, which is generally at the meter, where the piping is larger. The meter is in the hallway, some distance from the stove, and it is necessary to traverse the hallway, injure the building by cutting through partitions, and have an unsightly pipe in a conspicuous place in the hallway. The occupant may vacate the flat and remove the gas-pipe he had put in, "but the scent of the rose will cling to it still." The next tenant would be obliged to go to the same trouble and expense. At any rate, the neglect of this particular point is of some consequence to the owner of the property, the tenant and the gas-company. The same can be said of the piping of an ordinary dwelling-house, which is being done practically the same to-day as it was in the earlier days of gas-fitting, and this, I think, tends to retard the progress of the introduction of gas-stoves and gas-appliances.

There are a few large residences in this city that are so imperfectly piped that when a special occasion requires the lighting of the gas throughout, the gas-company is called upon to make examination beforehand, to see that sufficient light can be had. On one particular occasion a three-story dwelling was to be lighted from top to bottom, and the gas-company was called upon to make an examination. The day preceding the event the company made its visit, and found service and meter in proper condition, but the lights were very small. The burners and fixtures were all overhauled with very little improvement. Two large services supplied the house, one for illumination and the other for a gas-range. As the time was too short to repipe the entire house, something else had to be resorted to, so a pipe, the same size as the service, was extended from the meter back through the basement wall to the rear of the house, and then a hose extended from this pipe to the top floor, on the outside of the building, putting a fitting in the hose at each floor, and attaching a smaller hose to this fitting, carrying the hose through the window and attaching to piping in the ceiling, over the fixture in each rear room. This being done at each floor, gave a good supply from the rear, and overcame the difficulty. This plan would be rather an expensive operation to resort to on every like occasion, but if it were not done it might cost the gas-company a consumer.

A large manufacturing establishment erected new factory buildings in this city during the past year, and solicited the gas-company to do the gas-fitting for them, saying "they had experienced the results of the incompetency of plumbers, by the insufficient light in their old quarters, caused by imperfect gas-piping, and thought the gas-company would be the proper persons to do this work." They did not care to award the gas-fitting to the plumbers. The gentlemen were informed that the gas-company had entered into an agreement with the plumbers and gas-fitters, under which neither was to encroach upon that part of the work which belonged to the other,

the company confining itself to the service work only; and that while the company would like very much to comply with the gentlemen's request, it felt in duty bound not to break faith with the plumbers and gas-fitters (though, by the way, this compact was never observed by the plumbers).

The gentlemen greatly regretted this state of affairs and requested the company to furnish plans and specifications for the piping of their new buildings. This the company did, the plans were accepted, and the piping was done accordingly, practically under the supervision of the gas-company. These buildings contain some seven hundred lights.

Another instance, but showing more of the "combine" element, as an argument in favor of our affirmation, transpired in the piping of a church. The edifice was erected some years ago, and before gas-mains were laid in that district, and consequently had never been piped. When the gas-mains were finally laid, the church people wanted gas; a gentleman called upon the gas-company and said that he had visited the gas-fitters to obtain the lowest possible estimate on the piping for the church, and the estimates were so very much higher than his calculations that he had about concluded not to have the work done, when he thought "the gas-company might be able to do the work."

This gentleman was also informed of the agreement then existing between the gas-company and the plumbers. But he accepted a proposition of the company "to send an agent to him, to give him an estimate on the piping." The estimate given by the company was a little more than one-half what had been proposed, or estimated, by the plumbers, and was not figured at cost, nor less, to the company. The gentleman then secured the services of an idle fitter, purchased his material, and for the occasion, went into the gas-fitting business himself, and had the piping done very reasonably, and in conformity with the gas-company's instructions.

During the past summer some plumbers had been called into a hospital, for the purpose of making some alterations in the gas-piping, and after turning off the gas at the meter, a pipe was found from which they could not turn off the gas. The gas-company was called upon to turn off the gas at the street. The gas-company sent their agents to the premises, and after an investigation discovered a three-fourths inch pipe, which, upon being traced, was found to be about eighty feet in length, passing through several rooms in the basement; the ceiling of one room had been plastered after the pipe was laid, thus concealing it. However, the pipe was finally traced from end to end. One end was connected to the service, and the other was found to be plugged with an ordinary cork. This pipe was immediately removed. Had the cork fallen out of the pipe, and an accident resulted from the escaping gas, in all probability the gas-company would have suffered both a loss of gas and a lawsuit.

EFFLORESCENCE ON BRICKWORK: A CURE.

THE white, semi-crystalline powdery efflorescence that appears on new bricks after being placed *in situ* has engaged the attention of builders and experts for a considerable time; nevertheless, no rapid effectual remedy has yet been promulgated for preventing the unsightly white patches appearing on a newly-erected wall. The result of some experiments the writer has conducted during the last twelve months may be of value to all builders, as the writer believes he has found the true remedy for the effectual removal and permanent prevention of this disfiguring efflorescence.

In the first place, a few words on the probable causes of the white appearance may not be out of place.

Bricks are naturally porous, and, therefore, readily imbibe moisture and gases. The mortar in which they are set contains two very active ingredients for the incipient evolution of organic life and crystalline formation of mineral substances—viz, oxygen and lime (an oxide of calcium). The yellow or red color of the sand mixed with the lime in the preparation of mortar is due to the presence in varying quantities of oxide of iron. This salt—oxide of iron—is one that readily gives up a part of its oxygen to any suitable body with which it may be in contact, or it readily acquires a further proportion of oxygen from the air if placed under suitable conditions. The lime also is a body in which the union of the metal (calcium) with the oxygen is not very permanent, the metal uniting with any other suitable compound substance, as, for example, carbon from the air, to form carbonate of lime—a combination of calcium, carbon and oxygen, CaCO_3 , which is a body that is also unstable in composition, readily breaking up and forming new combinations of salts of other metals. Besides the sand—silica colored with oxide of iron—and the lime, there are present in mortar small portions of other bodies, notably sodium salts of some kind. Now sodium (Na) unites with oxygen to form soda (Na_2O) and also with the iodide CO_2 (carbon dioxide) to form carbonate of soda, Na_2CO_3 . (There are several other formulas for this salt, as it varies in the proportions of its constituents, but the above simple form will do for our purpose.) Now, carbonate of soda can exist in the crystalline form when water is combined with it, or it can be a dry anhydrous powder; and this salt when it loses the CO_2 radical becomes Na_2O (oxide of sodium or soda) and if the elements of water have been present in the carbonate, a deliquescent salt, sodic hydrate (NaHO) can be formed.

¹ Extract from a paper by Mr. W. H. Anson, read at the annual meeting of the Ohio Gas Light Association, March 16, 1892.

Without going farther into chemical questions, the term deliquescent is applied to a body capable of imbibing moisture, and hence becoming semi-liquid. Suffice it to say that it is with the salts of soda we purpose to deal.

Let us imagine that the soft porous brick has imbibed water from a passing shower of rain, that it dissolves some of the sodium salts in the water, and thereby becomes impregnated with a solution of a salt of soda. Now, as the surface of the brick dries, this salt of soda, or hydrate of sodium, will become dry and converted into the anhydrous sodic oxide (Na_2O) (every one has seen a piece of ordinary mortar crystallized, and washing soda fall to a white powder after some days' exposure to the air) if the weather be dry. This is the white efflorescence that appears on the surface of the brick. If the weather be damp, it will not be positively dry (anhydrous) but appear in minute crystals (as a crystalline carbonate?). In any case, there the white efflorescence is, and it is a positive eyesore to every builder, for the white patch on the surface of the newly-built wall spoils all architectural beauties by its glaring whiteness and irregular patches. So long as any soluble salts of soda remain in the mortar to be dissolved out by the water imbibed by the porous brick, so long will this white efflorescence continue until the supply of soluble soda salt has been dissolved out and brought to the surface.

The nearest approach to a successful remedy the writer has come across amongst the various proposals for removing this disfiguring white efflorescence is hydrochloric acid (HCl). This liquid combines with the Na_2O to form water and chloride of sodium (viz, $2\text{HCl} + \text{Na}_2\text{O} = \text{H}_2\text{O} + 2\text{NaCl}$, sodic chloride, i.e., common salt).

As this sodic chloride that is formed is a soluble salt, its presence is not manifested, as it is soluble in water, and, therefore, washed away by every shower of rain. If the efflorescence is due to the presence of NaHO (sodic hydrate) the hydrochloric acid will form sodic chloride and water, as before, only half the quantity of acid being required to effect the reformation of salts.

The remedy, therefore, would seem to point to saturating the bricks with this acid—a process that, however, would be expensive, and dangerous to the workmen using such fluid.

Acting on the hint conveyed by the fact that the excess of sodic hydrate in soap-making is expelled from the soap by salting it—i.e., strewing the surface of the soap as it floats on the ley with common salt—i.e., sodic chloride—the writer applied a solution of common salt to the white efflorescence on some bricks that were badly stained therewith. In every instance where such fluid was applied the white efflorescence was instantly removed, and, what is more, has never reappeared, and in obstinate cases three applications, or one application well saturating the bricks with the common salt solution, has sufficed to effect the desired result.

The chemical reaction that takes place is represented below:

NaCl (common salt) + NaHO (sodic hydrate) produce Na_2O (sodic oxide) and HCl (hydrochloric acid). Now, theoretically Na_2O is the body we wish to expel or convert into something else, and, therefore, we are actually forming the body we are endeavoring to expel, and, *ipso facto*, the acid would be the best body to effect the desired result. One fact, however, stands strongly in evidence against such theory, and that is the remarkable non-appearance of the white efflorescence after the application of the salt solution. This may be accounted for by the fact that the combination between hydrogen and chlorine (HCl) is stronger than between sodium and chlorine (NaCl) and, therefore, the chemical reaction represented above as occurring between the efflorescent and acid occurs only to a limited extent, whereas in the application of the sodic chloride (NaCl) solution, the chlorine in the sodic chloride readily forsakes that body to unite with the hydrogen (H) in the sodic hydrate, and that although sodic oxide is formed thereby, the simultaneous production of hydrochloric acid also neutralizes the effect of the sodic oxide efflorescing. As a solution of common salt is much cheaper than hydrochloric acid, the writer would suggest that the bricks should either be dipped in a pail of such solution before being laid *in situ*, or else be well washed—impregnated—with it afterwards.

—H. C. Standage in the Builder.

CONCRETE IN HARBOR WORKS.

THE property in developing great adhesive and cohesive strength under water, which Portland cement possesses in such a remarkable degree, even when submerged while in a plastic condition, was utilized early in the history of that material, and has permitted the foundations of sea, river and dock walls, breakwaters, etc., to be laid under water without either coffer-dams or the costly operation of pumping. Although there are great advantages connected with the use of concrete blocks for under-water work, there can be no doubt that freshly-made plastic concrete has been successfully used for the same purpose, even in situations where it is exposed to the disturbing effects produced by waves and tidal or other currents.

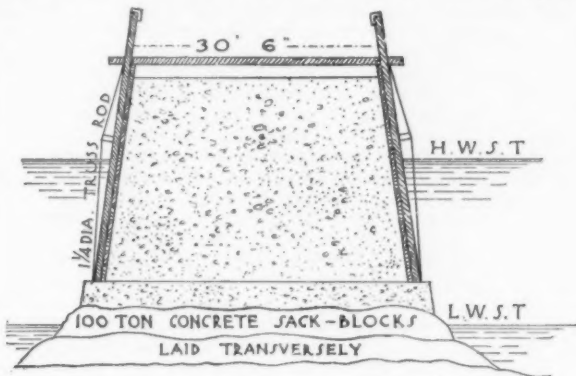
The harbor works at Newhaven, on the coast of Sussex, present an excellent example of the extensive use of plastic unset concrete, or, as it is frequently called, concrete *in situ*, this material having been almost exclusively used in the construction of that massive breakwater and other works at that port.

The breakwater has at present a total length of about 1,500 feet, terminating in a depth of about fifteen feet below L. W. S. T.; the

top of the breakwater has a width of 30 feet, is ten feet above high water, and is surmounted by a covered way and parapet running along the outer side, both sides battering 1 in 8.

The breakwater, which, in a west-southwest direction, is unsheltered from the force of the Atlantic, is founded on the rough natural sea bottom, and the foundation course has a width of 50 feet; the lower portion of the structure, from the bottom up to a level of two feet above low water, consists of 100-ton sacks of concrete deposited while plastic; the canvas with which the concrete was enveloped was of jute, weighing about 27 ounces to the square yard. The sacks were dropped into place by a specially designed steam hopper barge having a well 42 feet long, 6 feet deep and about eight feet wide. The sack-blocks in the finished work became flattened to a thickness of about 2 feet 6 inches.

With the exception of this sack-work, the breakwater is built of plastic concrete laid *in situ*, the profile-framing was formed of half-balk timber trussed with 1½-inch round iron rods (see annexed figure) spaced five feet apart along each face of the breakwater, and secured at the bottom in wrought-iron sockets, and at the top with



timber crossheads 12 inches by 6 inches; the sheeting consisted of three-inch planks planed on the inside and jointed. It was found economical to build the breakwater in working lengths of 40 feet. At Newhaven, spring tides rise 20 feet and neap about 15 feet; the concrete used in the construction of the breakwater was generally one part cement to seven of shingle and sand, but, in fine weather, concrete of one to nine was used in the hearting and on the sheltered side.

The sectional area of the breakwater, including the covered way and parapet, is about 50 square yards, and its construction occupied five years, from 1880 to 1885. The average rate of progress would, therefore, be about 15,000 cubic yards per annum; the average cost of the concrete in the breakwater was 22s. 4d. per cubic yard. The sand and shingle for the concrete were obtained from the adjoining foreshore. Summarizing for convenience of comparison, we obtain the following results:

Quantity of concrete deposited in place per year.....	15,000 cubic yards.
Total cost of concrete work.....	1l. 2s. 4d. per cubic yard.

In addition to the breakwater, concrete *in situ* was also used at Newhaven in the construction of two extensive sea-walls and a quay-wall 900 feet in length; this material has, therefore, been more extensively used in these works than in any others of a similar character, and its power to resist the physical and chemical action of the sea will be a matter of great interest in harbor engineering.

At Blyth, on the coast of Northumberland, plastic concrete was used in the construction of a quay wall 712 feet in length and founded at a depth of 15 feet below low water. The plastic concrete was deposited under water in the usual manner; that is, with a hopper-bottomed box, which in this case has a capacity of 16 cubic feet. A diver was also employed, who directed the lowering of the concrete, and afterwards trod it into place.

The concrete below low water consisted of six parts of broken stone and sand to one part cement, by measure; above that level, the proportion was seven to one, and, in addition, large stones were worked into the concrete. The net average cost of the concrete was 15s. 9d. per cubic yard, which does not include plant, this latter item costing 1,276l. The addition to be made to this account would amount probably to about 2s. per cubic yard. The stone and sand required for the concrete were obtained from ballast brought to the port by ships. — *Engineering*.

A LONG-DELAYED STATUE TO PAUL JONES PROPOSED. — April 24, 1778, the sloop-of-war "Ranger," commanded by Commodore John Paul Jones, engaged in conflict with His Britannic Majesty's ship "Drake," and the result was a victory for the American rover. The "Ranger" was the first vessel to fly the Stars and Stripes in English waters. These statements are made in the preamble of a bill introduced recently by Senator Manderson—a bill which provides for the erection of a statue of the late Commodore John Paul Jones. The statue is to be located at the southwest corner of Lafayette Square, facing the Navy Department, and is to be similar in its general design to the Lafayette statue. The appropriation is \$50,000, and the author of the bill is Capt. R. W. Meade, United States Navy. — *Washington Star*.



ANOTHER COMPETITION SCANDAL.—THE UNFINISHED SYDNEY HOSPITAL TO BE COMPLETED.—THE WOMAN'S COLLEGE COMPETITION.

SYDNEY, N. S. W.

DULL times still prevail, but there has been, notwithstanding, some little excitement caused among architects by several events of considerable importance to the profession here, which have occurred during the last few weeks.

In the first place, the Board appointed by the Government to adjudicate in the Rossville Asylum competition has sent in its report, and recommends that the first prize of £300 be awarded to Messrs. Sulman & Power; while Messrs. J. Kirkpatrick, G. D. Payne, J. J. Clark and McKinion & Weitzel are recommended for the second, third, fourth and fifth premiums respectively. No sooner had the announcement been made through the columns of the daily press than a protest was at once lodged with the Minister appealing against the award of the first premium, on the grounds that Messrs. Sulman & Power's design was sent in later than the hour mentioned in the conditions, after which time, it was clearly stated, no design would be received. Every one entering the competition had to express his willingness to abide by these conditions, which he was further required to sign, thus constituting a contract between himself and the Minister, under whose authority the document was issued, so that if a breach of any one of these conditions has been committed, those protesting may have legal authority for an action which is morally unjustifiable and utterly despicable. In justification, however, it is said that there is much behind this, and that a nice legal point was seized upon to gain time while evidence was being collected to bring forward in support of a graver and more tangible charge.

Being probably in doubt what to do in this case, the Minister seems to have remembered Napoleon's maxim, and has, therefore, done nothing.

Following closely upon this difficulty is the Sydney Hospital trouble. This is the deplorable outcome of another competition which took place some twelve years ago. The subject is too lengthy to be here discussed in detail. Suffice it to say that the Directors of the Hospital at that time called for competitive designs for a new building, on which they were prepared to spend £45,000. The first premium was awarded to Mr. Thomas Rowe, F. R. I. B. A., who was forthwith empowered to superintend the erection of the building.

In the first place, the design chosen could never have been carried out for anything like the stipulated sum; neither, for that matter, could any of the others taking part in the competition, but, at any rate, Mr. Rowe asserts that the directors were fully aware of this, and that so far from expressing any wish to keep the cost within their stated limit, no sooner had he been appointed their architect than they began to modify, improve and enlarge the selected design, and no question of the ultimate cost ever entered into their deliberations. The building then proceeded until £200,000 had been expended, when the work was stopped for want of funds. Half as much, again, it was estimated, would be required to complete it, and the Government of the day was not inclined to give any further pecuniary assistance. So matters rested until last year, when a Royal Commission was appointed to inquire into the desirability of the site for hospital purposes. Acting on the recommendation of this commission, the ministry determined to complete the building, which for years had continued to disfigure Macquarie Street in a half-finished, half-ruinous state. They conceived that the best way to do this, however, would be to dispense with Mr. Rowe's services and get another architect. This they have accordingly done, and Mr. J. Kirkpatrick has been appointed to the position. Mr. Rowe is naturally wroth at this treatment, and threatens to bring the matter into the law courts; and Mr. Kirkpatrick is accused of a breach of professional etiquette in taking the position without first ascertaining Mr. Rowe's views on the subject. A meeting of architects under the auspices of the Institute of Architects of New South Wales was held to consider the matter, but nothing definite was done, and so this pretty squabble rests.

Another instance of the misconduct of competitions has also lately been brought to light by the *Australian Building and Construction News*. A limited competition for the Woman's College in connection with the University of Sydney was recently held. Six architects were asked to compete and the designs are now being considered.

The board appointed to adjudicate on them consists of five gentlemen of whom the Government architect is one. The others are the Secretary to the Council of the Woman's College and the Director, the General-Manager and the Official Valuator of the Australian Mutual Provident Society. It would be curious to learn what especial qualifications these gentlemen have for such a position and why the majority of the board should all be members of this Society; but as the *Australian Builder* points out this would not be of so much

importance if it were not for the fact that two of the three are clients of Mr. Sulman, F. R. I. B. A. who is one of the competitors. Of course it is not insinuated that Mr. Sulman, who by the way, is Lecturer in Architecture at the University, is to blame for this; the appointments having been made after the designs were sent in; but at any rate, it is perhaps unnecessary to say, the decision of this curiously constituted board is awaited with a certain amount of eagerness.

Truly vexation and weariness of spirit is the lot of those who engage in competitions. "The Strand," a new arcade between George and Pitt Streets, was lately opened with some ceremony. It is large and "there is money in it"; for the rest, it is a stuccoed atrocity, the result of a competition, too!

BOOKS AND PAPERS.

ONE of the great pleasures that one familiar with Paris enjoys when revisiting it after a long absence, is the discovering where and how new monuments and statues have been placed, how interesting they are in themselves and how judiciousness and artistic good sense have been shown in their bestowal. Our own feeling is that Paris can assimilate an indefinite number of monuments and statues without giving to the habitué of the boulevard or to the foreign bird of passage any sense of surfeit, so it struck us as peculiar when our Parisian correspondent expressed misgiving as to the possibility of finding resting places for a number of statues and monuments which must shortly be provided for.

In cosmopolitanism, if in nothing else, New York apes Paris, attempts to live more on the streets than is the custom elsewhere, attends more closely to styles and fashions, cultivates to a certain degree the café habit and in a limited way eats its ices and drinks its cobbler *à fresco* in front of the café. It is devoted to its theatres, has its balls and is persistent in attention to picture exhibitions, and it, too, seeks to decorate itself with statues and monuments. But this last it hardly does in the true Parisian vein. In Paris the sculptor's work is placed with a view to its being seen, in New York—in most cases happily—the effort seems to be to put it where it shall not be seen.

The checker-board system of urban topography does not adapt itself to successful urban decoration and is properly to be held responsible for some of the misplacing that has taken place. In a general way there are only two monumental subjects in New York which are so judiciously placed that they would not be in as proper position elsewhere as where they are. The Worth Monument at the junction of Broadway and Fifth Avenue and the Washington on the Sub-Treasury steps could hardly find more suitable positions. All the others might be interchanged, without loss certainly, and perhaps with gain.

The accepted solution seems to be to send everything to Central Park where they will be out of the way, at least, and to Central Park most of them have gone and when they have reached that chosen spot have kept going as far as their strength held out and then stopped short, and rooted themselves anywhere and anyhow. Thanks to being mounted upon a steed of an impulsive nature, Bolivar managed to go farther than the others and, if one reads his attitude aright, was even then desperately put out that his animal was too fagged to carry him farther.

Considering that New York is so cosmopolitan and so willing to let every people under the sun—save her own—decorate her capacious person, it is curious to see what a singularly second-rate result has been achieved. Egypt, Italy, France, South America, Germany, England and Scotland have been drawn on not only for the sculptors but for the subjects as well, a circumstance which we hardly think should have been the case with a city so rich and who could so easily have found citizens of her own or events in her history worthy of being turned into urban decorations. What special connection is there between New York City and Bolivar, Garibaldi, Lafayette, Thomas Moore, Franklin, Walter Scott, Robert Burns, Shakespeare, Lincoln, Farragut, Humboldt, Beethoven, Mazzini, Schiller, Webster, or with the Pilgrims that their memorials should form not the trimmings to the mantle of art in which she wraps herself, but the largest part of the mantle itself?

Washington, of course, Seward, Hamilton, Morse and one or two others hold a rightful place and in a broad sense belong amid their surroundings, but for a city, wealthy, energetic and assuming to be cultivated, to allow itself to be decorated with reproductions of foreign works of art of doubtful value, simply because some group of homesick and hardly naturalized aliens think well to offer them for her acceptance is one of the most curious evidences of the half-baked way in which a democracy attends to its public duties.

The little book of gelatine prints¹ which reveals the poverty of sculptural decoration in New York is an interesting record to study.

CREMATION GROWING IN FAVOR.—Cremation is growing in popularity among the French. Last year 3,741 bodies were cremated, and the second crematorium in the Père Lachaise cemetery had to be enlarged.—*New York Evening Post*.

¹"Public Statues and Monuments of New York." Palliser Palliser & Co., New York, 1892. Price, \$1.50.



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

THE CENTURY CLUB-HOUSE, NEW YORK, N. Y. MESSRS. MCKIM, MEAD & WHITE, ARCHITECTS, NEW YORK, N. Y.

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

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

[Issued with the International and Imperial Editions only.]

COMPETITIVE DESIGN FOR THE CARNEGIE LIBRARY, PITTSBURGH, PA. MR. W. HALSEY WOOD, ARCHITECT, NEWARK, N. J.

COMPETITIVE DESIGN FOR THE CARNEGIE LIBRARY, PITTSBURGH, PA. MR. W. E. GREENAWALT, ARCHITECT, NEW YORK, N. Y.

THE CATHEDRAL, COUTANCES, FRANCE.

THIS magnificent edifice, which is situated in the highest part of the town, dominates the surrounding country, and also serves as a landmark for the mariner. One of the "Historic Monuments" of France, it is dedicated to Our Lady, and dates mainly from the eleventh century, although portions of it were not built until some time later. In 1056, Geoffroy de Montbray, Bishop of Coutances, consecrated this structure, which is in the form of a Latin cross, and measures about 310 feet in length by nearly 110 feet in width. It has three principal entrances, the grand western portal and two side ones, which are surmounted by two towers quadrangular in shape at their base, but terminating in pyramids of octagonal form. The height of these towers, including the pyramids, is about 250 feet. At the crossing, a large octagonal tower, flanked by turrets, rises above the cathedral: it is known as "le Plomb," and has been the subject of many encomiums.

The interior presents some beautiful stained-glass windows, dating from the fourteenth, fifteenth and sixteenth centuries, the monumental tombs of two bishops and a fine altar in the Renaissance style, erected in 1750. The interior of the central tower is very curious and the woodwork of the organ, and an ancient fresco in good preservation add to the details which are worthy the attention of the visitor. The sculptures in the tympanums of the side doors represent respectively the Virgin sitting on a throne adored by angels, and Jesus Christ surrounded with the symbols of the four evangelists.

A view from the east end is shown in one of the sketches of the *American Architect* Travelling-Scholar published this week.

[Additional Illustrations in the International Edition.]

DETAILS OF A SMALL DOOR FROM THE MOSQUE OF BREYT EL-EMYR.

[Steel Plate Engraving.]

In order to protect the interior of mosques, and with the purpose of closing off certain portions of secondary importance, Islamism conceived that, in imitation of the ancients in their temples and Christians in their churches, it would be necessary to use some system of enclosure or enclosing doors of one or more valves and of different number and sizes, whose outer and inner faces might, according to circumstances, receive a decorative treatment more or less rich. From appearances, the nature of these valves was quite various. Some were made of sculptured wood, painted and gilded, or of inlaid work in compartments. They were likewise composed of metal; that is, of iron or bronze.

These works, which, at least, give an idea of the state of art at the time of their execution, furnish indisputable proof that the casting of metals, more particularly the casting of bronze, was at a certain date practised and cultivated by the Arabs. There are a few mosques at Cairo whose principal doors are yet ornamented with applied bronze-work and niello-work damascened with gold and silver. Some of these doors date from a very remote epoch. The most elegant and complete are those of the Mosque El-Youcoufy, the damascened work of which has disappeared, but still there are traces of it left. The work at the Mosque El-Rhangah still contains figures of animals in its angles. These figures were probably designed by the designer, but they have been obliterated in other compartments by a too-scrupulous carver. The arrangement and the ornamentation of these doors scarcely vary. In all the general elements of a leading scheme, from which little variation is made, are discovered, for the same constituent parts generally fill the same places. Except for the inscription, the disposition is the same as that of certain panels in marble and faience work, and on the greater part of the rugs of that epoch. The bronze doors which ornament the Mosques at Cairo are not of solid bronze, but are of wood, with applied ornamentation of bronze. The doors of St. Sophia, trans-

ported from Constantinople to Venice, where they decorate the Church of San Marco, are, on the other hand, of solid bronze. At the mosque of Cordova there are five bronze doors, or rather, doors covered with pieces of this metal, and formerly there were twenty-one of them.

DETAIL FROM THE HOTEL DE CLUNY, PARIS, FRANCE.

[Gelatin Print.]

INTERIOR OF ST. MARK'S, VENICE.

It would be easy to show how the appreciation of St. Mark's was subjected to laws of development. A century ago the building was not understood. Goethe, who explored Venice in what he considered was a thorough fashion, does not appear to have derived any aid towards his own culture (which was the principal business of his life) out of the wondrous medley which is formed by the cathedral and its contents. It is evident from his journal that he found it more profitable to study the Renaissance buildings. Probably Goethe would consider that Forsyth was not far in error when he described the interior as "dark, heavy, barbarous, nay, poor, in spite of all the porphyry and Oriental marbles and glaring mosaics that should enrich the walls, the vaults and pavement; in fact, such a variety of colors would impair the effect of the purest architecture." The last words afford a key to the standard of criticism that was used a century ago. Refined architecture was supposed to be always white, and it is no wonder that in England whitewash brushes were in request to please fine gentlemen who had cultivated tastes.

How different a critical rule is now in use, even among cheap tourists! In their way, they feel like the late Mr. Street, although they may not be able to express their delight in such words as the following:

"The color is so magnificent that one troubles one's self but little about the architecture, and thinks only of gazing upon the expanse of gold and deep, rich color, all harmonized together into one glorious whole. The mosaics commence throughout the church at the level of the crown of the main arches, dividing the nave from the aisles, and are continued up the remainder of the wall and into the domes. Even the angles or arrises of the arches are covered with gold and mosaic, so that all architectural lines of moulding and the like are entirely lost, and nothing but a soft, swelling and undulating sea of color is perceived. The lower portion of the walls is encrusted with slabs of marble of all sizes, joined together with small rivets, and arranged without much symmetry or apparent design, except in one particular: the slabs of marble, being cut into two or more thin pieces, are then so arranged next to each other that the pattern of the marble on one piece may just meet and touch the corresponding pattern on the other, so as to make a regular kind of form or pattern."

We may be sure that Prout, when he drew the interior we give this week, must have felt how incompetent is the best draughtsmanship in black chalk to render so glorious a scene, and how the men who sacrificed so much to enrich St. Mark's with color must have had longings after the beautiful which later races cannot comprehend. He may have also doubted whether, with his materials, he could do justice to any of the perspectives of the church, and, out of reverence, limited his view by the screen, which may be said to be a work of the fifteenth century, for it was set up in 1394, and is modern if compared with other objects in St. Marks.

PULPIT, RAVELLO CATHEDRAL. MR. J. A. SLATER, ARCHITECT.

BISHOP'S THRONE, RAVELLO CATHEDRAL. MR. J. A. SLATER, ARCHITECT.

DESIGN FOR OXFORD MUNICIPAL BUILDINGS. MR. A. W. BREUILL, ARCHITECT.



THE ROOF OF THE ST. PANCRAS STATION. — The large arch which constitutes the truss adopted in the St. Pancras station owes its origin to the floor beneath it. The level of the rails being of a sufficient height above the adjoining streets, it was decided to utilize for traffic purposes the whole of the area beneath the station, and in order to economize the space to the utmost it was determined to employ iron columns and girders, instead of brick piers and arches, to support the platforms and rails of the passenger-station. That decision, together with the manifest advantage of having the entire area of the station free from obstruction, gave rise to the particular construction of roof adopted. In iron roofs, as usually constructed, the depth of the principal is about one-fifth of the span; but at St. Pancras, by adopting one arch, extending across the station, the height from the tie beneath the rails to the crown of the arch became the effective depth of the truss, and this height being about two-fifths of the span all the horizontal strains arising from the dead weight of the roof, its covering, accumulations of snow, etc., would be about the same in the arch of 240 feet span with a depth of 24 feet. Excepting, therefore, such additions as might be necessary of retaining the form and figure of the arch, the actual sectional area at the crown and for about two-thirds of

the entire arch does not require to be greater than in an ordinary truss of 120 feet span. There are several other advantages belonging to the arch, one being that, as the weight of the roof is carried at the floor line and does not rest on the tops of the walls, there is no necessity to make the side walls thicker, for not only is the weight on the tops of the walls avoided, but also the rocking motion from the expansion and contraction of an ordinary roof, which, though it may be mitigated, is not prevented by the use of roller-frames at the feet of the principals and appliances of a like nature. It was also apparent that the arch might be made of riveted plate-iron work like that of an ordinary railway bridge, and that expense would be avoided. Again, as to the question of the contraction and expansion of the arched roof, the ties being beneath the ballast, the temperature would vary so little that no provision would be necessary, and for the arched part of the roof, which would alone be subject to appreciable change, the only effect would be a slight rise or fall in the crown. All the arrangements of roller-frames or slings, required in ordinary roofs to provide for the effect of variations of temperature, would therefore be avoided by the adoption of the arch; and, lastly, by having a single arch the cost not only of the columns and their foundations would be saved, but also that of the longitudinal girder required to connect them at their upper extremities, with a valley drain between the roofs, vertical drain-pipes and other provisions for taking off the water from the area between the centre lines of the two roofs. The question then remaining for consideration was, what depth and form of rib and what additional material must be employed to make an arch sufficient to retain its form under all conditions of stress arising from its own weight, from snow and from heavy gales of wind? The results arrived at were—first, that the depth of the rib must be sufficient to contain all the lines of pressure generated by the dead load, by snow and by the pressure of the wind; second, that the sectional area of the metal should be sufficient to sustain the whole stress without producing a strain on the iron exceeding 3 1-2 tons per square inch; third, that the arch should be rivetted together with proper joint-plates throughout, so as to give it the advantages of complete continuity. The probable additional cost of principals so constructed of 240 feet span, as compared with principals of two spans of 120 feet and their columns, was estimated at about 6,000. The total area roofed-in is 18,822 square yards. The distance between the side walls is 245 feet 6 inches, and the clear space of the roof 240 feet. The main ribs are 20 feet 4 inches from centre to centre, except at the two ends, where additional ribs are put in to carry the gables or screen ends. The arch is made slightly pointed at the top; first, because it was considered that this form possessed some advantage in resisting the lateral action of the wind; and, secondly, because it was considered to have a better architectural effect by giving a defined apex to the interior of the roof. The radius of curvature was diminished at the haunches to give increased head-room near the walls. — *The Architect*.

THE TOWER BRIDGE.—The Tower Bridge has now approached a stage which will render it an object of much interest during the next month. The upper footway is thrusting out from each of the lofty towers, and on each side overhangs the water below to the extent of about one-third of the space to be covered, leaving a gap of perhaps 60 or 70 feet between them. Viewed from London Bridge it looks to be most perilous work, the overhanging portions of the platform looking as though the weight of two or three workmen at the outer extremities would be sufficient to bring it all down. The engineer in charge of the work on the spot says, however, that these frail-looking projections might be carried out for a thousand feet without danger, and though as they grow out towards the middle of the river they do, of course, exert great leverage on the towers, these lofty iron structures have not been deflected from the perpendicular by the sixteenth of an inch. The enormous girders which are to constitute the framework of the lower platform—that which is to open up from the centre—are now in course of construction, the shore ends of them being in position. These two gigantic bascules will have to be built up in a perpendicular position, as they would otherwise, of course, obstruct the waterway. At present the growth of the two halves of the upper platform is the most interesting point, and this is being watched by large numbers of people from London Bridge. — *Invention*.

THE LION OF ST. MARK.—That symbol of the Venetian Republic—the famous Lion of St. Mark—which, after being restored, was replaced yesterday on its column in the Piazzetta at Venice, is made of bronze. There is a tradition among the Venetian people that its eyes are diamonds; they are really white agates, faceted. Its mane is most elaborately wrought, and its retracted, gaping mouth and its fierce mustaches give it an Oriental aspect. The creature as it now stands belongs to many different epochs, varying from some date previous to our era down to this century. It is conjectured that it may have originally formed a part of the decoration of some Assyrian palace. St. Mark's lion certainly was not originally, for it was made to stand level upon the ground, and had to be raised up in front to allow the Evangelist to be slipped under its forepaws. Last year the granite column on which the lion stood was seriously off plumb, and the authorities decided on its rectification. The work was entrusted to Signor Vendrasco, who by passing a copper bar through the axis of the shaft and by balancing the whole shaft upon the rod, compelled it to return to the perpendicular. The work was attended with no little danger and difficulty, but within three days was entirely successful, Signor Vendrasco being able to say "I am master of the column; she obeys me as I choose." — *Pall Mall Gazette*.

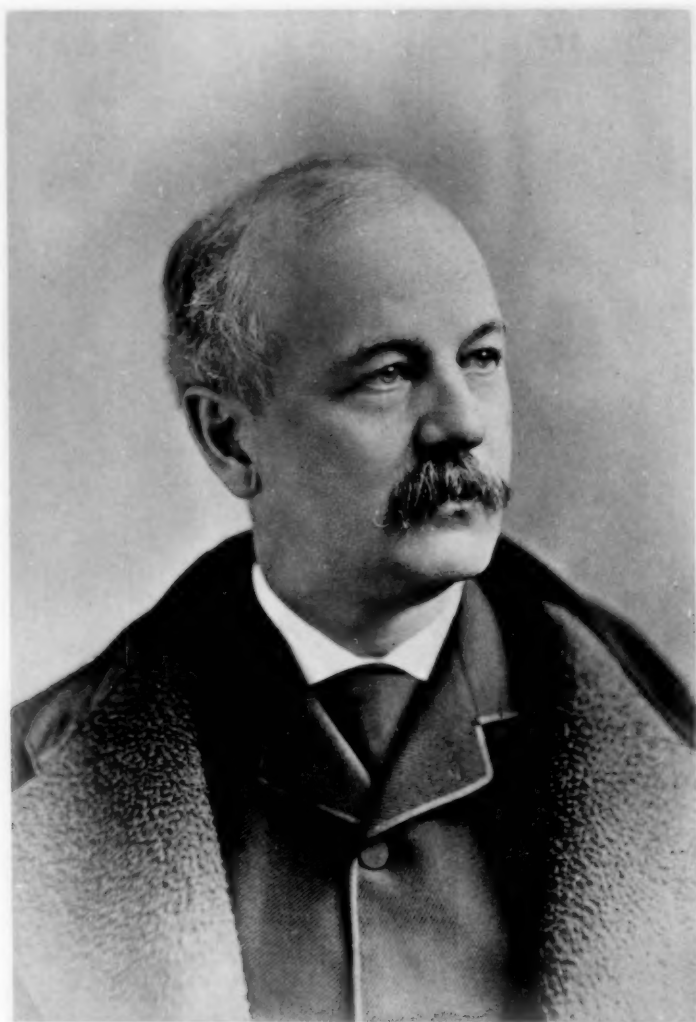
RUINS OF JAVANESE ARCHITECTURE.—The architectural ruins of Java surpass those of Central America. At Chandi-Sewa are found the remains of what was once an assemblage of two hundred and ninety-nine temples, arranged in five parallelograms, one inside of the other. In the centre of all is a large temple in the shape of a cross, surrounded

by forty flights of steps, richly ornamented with sculptures and containing many apartments. Eighty miles to the eastward is the temple of Boroboda, consisting of a central dome fifty feet in diameter, around which is a triple circle of seventy-two towers, the whole building being six hundred and twenty feet square and one hundred feet high. In the walls are niches containing four hundred cross-legged figures larger than life. The amount of human labor and skill expended upon the pyramids of Egypt sink into insignificance when compared with that which was required to complete this sculptured temple in the interior of Java. Forty miles southwest of Samarang, on the same island, is an extensive plateau covered with the ruins of temples, to reach which four stone stairways were constructed, each containing more than a thousand steps. Traces of more than four hundred temples are found there, all of them decorated with rich and delicate sculptures. In eastern Java the ruins of forts, palaces, baths, temples and aqueducts are to be seen everywhere. — *Home Journal*.

HIGH CHIMNEYS.—A chimney 350 feet high is being built for the Omaha & Grant Smelting Works, in Denver, Col. It will be an octagonal stack, 55 feet in diameter at the base, placed on a concrete foundation 18 feet deep, imbedding 20 tons of steel rails. There will be two stacks, one within the other, with a ladder-way between. The stack will be banded with 4 1-2 inch wide steel bands every 20 feet, covered by the brickwork. The contract price is about \$53,000, and it is to be finished in 130 days. The other high chimneys in the United States are as follows: At the Fall River Iron Works, 340 feet and the Clark Thread Mill stack, in Newark, N. J. The stack at Freiburg is 400 feet high, counting from the ground. — *Mechanic and Electrician*.

TRADE SURVEYS

A LARGE volume of business is being done throughout the country, as shown by railroad traffic returns, bank loans and deposits, by imports and exports, and by the placing of contracts for material for new work and for merchandise for general distribution. Behind this there is evidence of unusual conservatism upon the part of business men generally. No attempt is being made to increase production, and prices have not yet shown the slightest hardening tendency. There is a growing impression that mid-summer will be more active than mid-summers usually are, but this opinion cannot be accepted as a sound one until more plausible reasons are assigned for it. Among the reasons given are the fact of the abundance of money and low price of it, the holding back of a multitude of enterprises which have been waiting for plenty and cheap money, the opening of an active period for railroad work, and the distribution of funds among farmers. It is true that ground-work has been laid for larger sales and a still larger volume of business. A number of industries have been running as near the minimum limit as is compatible with safety. A greater restriction has been in progress than the public generally has been aware of. Railroad corporations have been restricting outlays to the very farthest limit. Rolling-stock has been compelled to do double duty by excellent railway management. Manufacturers have avoided making unnecessary extensions, and have resorted to enormous novel economies to save loss on account of reduced work. The aim for a year past has been to drift along with as little disturbance of conditions as possible. Mid-summer may not bring as much increase in business as is looked for, but conditions justify the belief that an improvement of greater or less magnitude is at hand. In fact, already inquiries and purchases are being made in anticipation of that, and especially so in the iron trade, lumber trade and in hardware and certain lines of paper. It has been the theory with a large number of business men for a year or two past that some time or other in the near future an improving tendency would set-in in this country which would carry prices not only back to where they were two or three years ago, but that a movement of a speculative nature would bring about an enhancement of values which would greatly benefit all who would be in a position to profit by it. While such a result is not impossible, it is certainly not a very near probability. Close figuring in the consumption of iron and steel shows that it would take very little impulse to absorb more than ten million dollars per year. That impulse would be imparted by a movement to build within two or three years the railroad mileage that is now projected, and which amounts to 28,500 miles. The proper financial conditions would stimulate this very sort of work, and it would be accompanied by a revival of lake-craft building, to say nothing of a revival in coastwise tonnage construction. A score of facts could be readily enumerated, all of them plausible and probable, to justify the anticipation above hinted at; namely, a general expansion of business, out of which would grow higher prices. Such an expansion might not be very prolonged, but it would be necessarily of such duration as to arouse all the halting energies of the people. The financial condition of British and European banks is certainly favorable, but it is made so by purchases of gold amounting to nearly one hundred million dollars within the past year. It has been stated heretofore that this persistent gold policy by Europeans might result in a protective policy upon the part of this country if it should turn out that injury will be inflicted upon us by it. There is a natural ebb and flow of gold, and this we can stand, but the artificial stimulus, due to peculiar notions by European financiers, may make it necessary for us to resort to some special protection. Money is said to be in abundant supply for all legitimate demands, but that is to be understood in a special sense. The agitation for more money throughout the West is serious and determined, and the people of that section cannot be induced to believe the reiterated statements of Eastern writers upon financial subjects. Another question which is concerning a good many financial and banking interests in this country is the policy of commercial and importing interests to fix the price of American commodities, beginning with gold. With a decline in the available supply of wheat, the price of wheat has declined in foreign ports; this is simply an instance. The lack of our ability to control prices is something which the American business man cannot understand. It is probable that the heavy export demand for American products will continue for months to come, but this fact does not secure against the possibilities of fluctuating prices. There is a feeling among a great many intelligent Americans that we are more than ever liable to outside influences and conditions. What the remedy is, it is impossible to guess. These things indicate that conditions are arising which may call for the earnest consideration of the best legislative and diplomatic minds of the country.



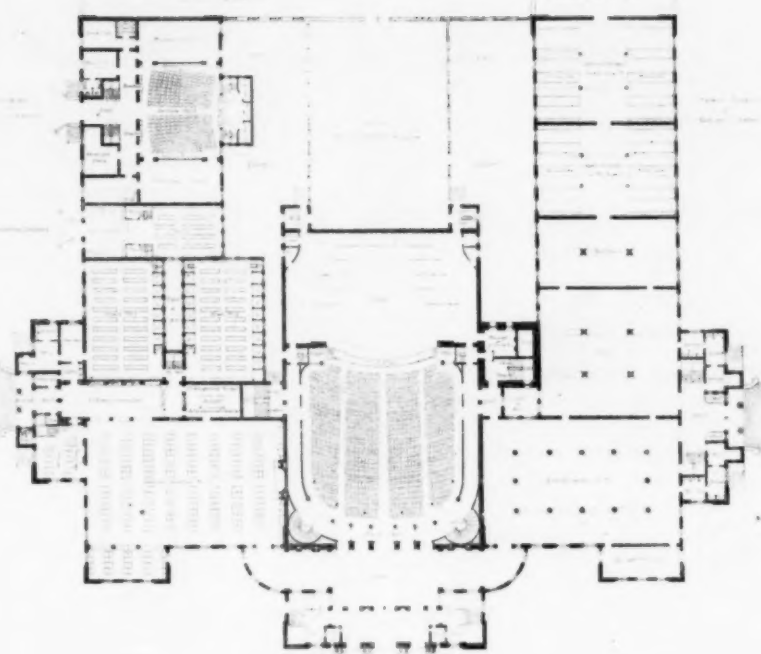
With best Christmas,
Greetings to you & yours
I am

Yours sincerely
J. R. Good



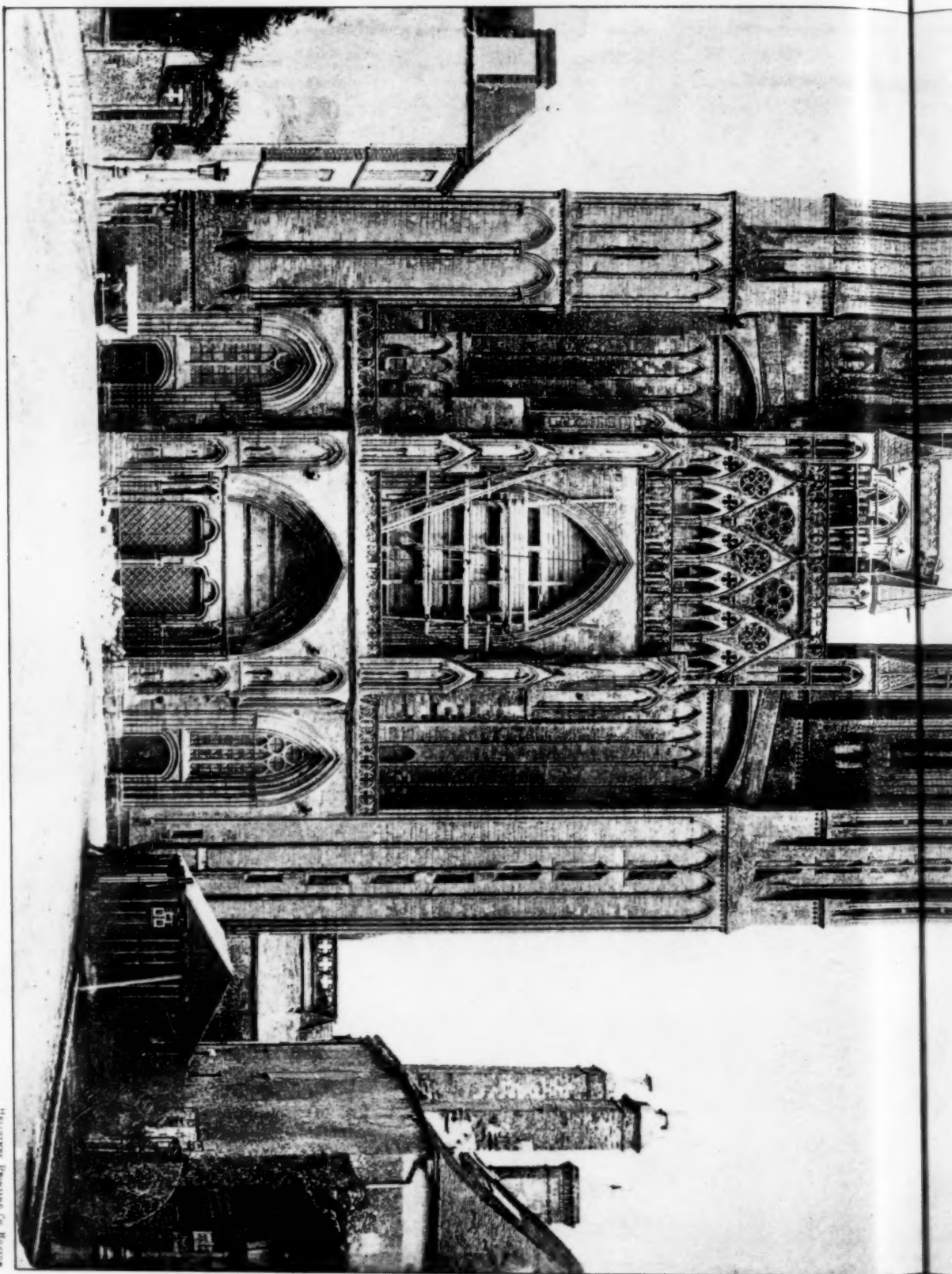
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Perspective View



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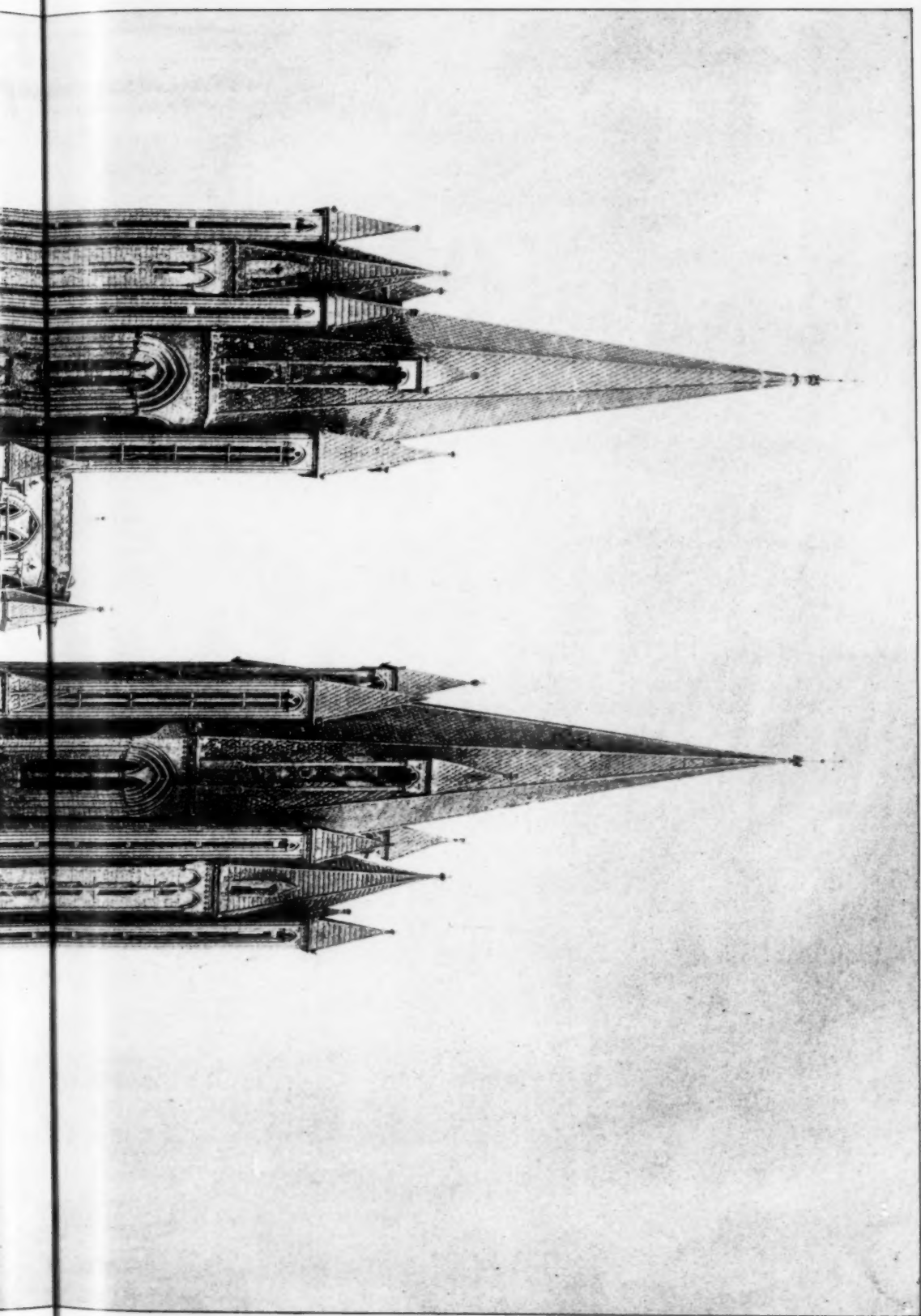
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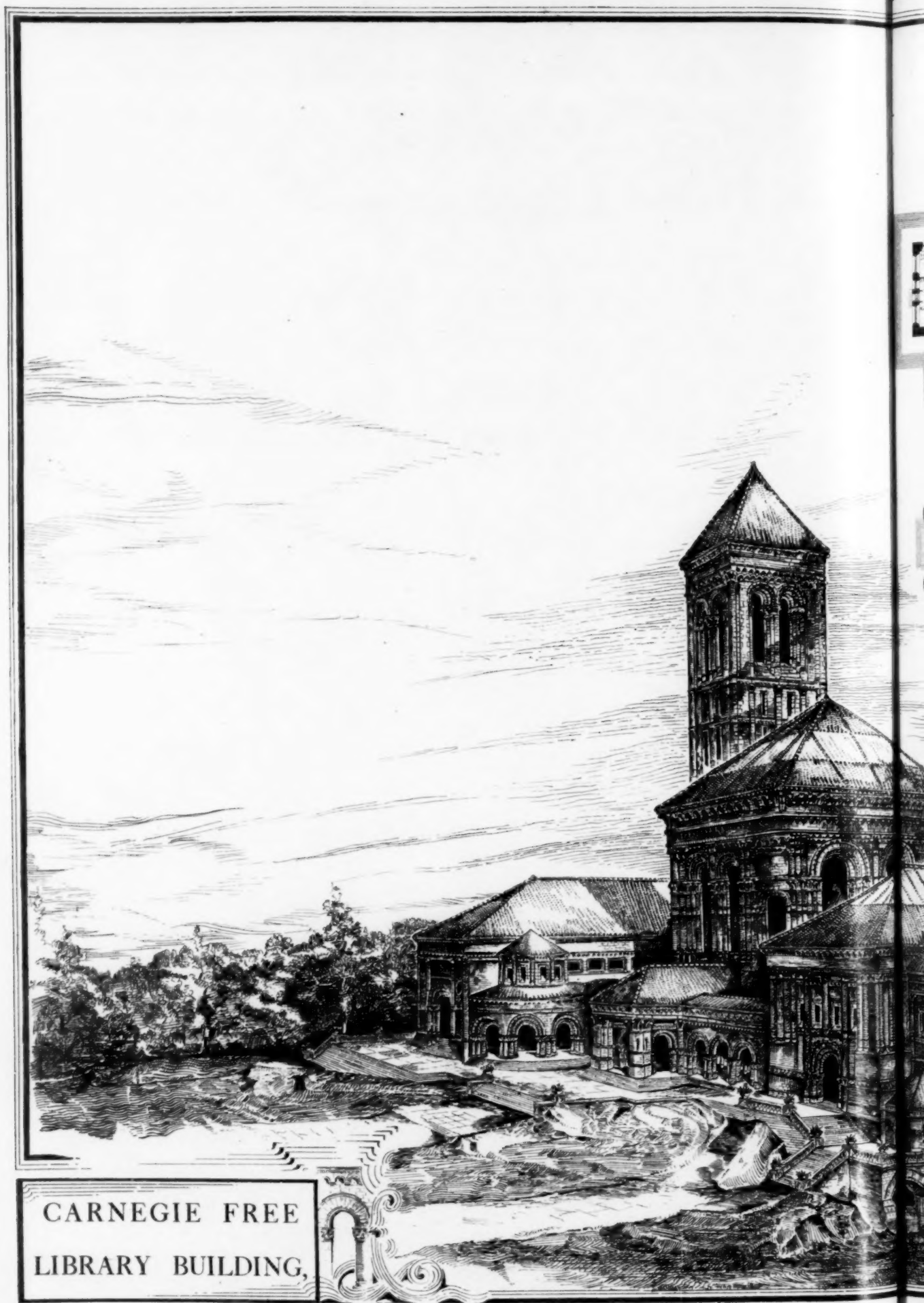
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