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THE regular annual attempt has been made in the Massachusetts Legislature to have the full privileges of the mechanic's lien law extended to persons who furnish materials for building, so that they can have a lien against the building for which they furnish materials without giving written notice to the owner before the materials are furnished, as they are now required to do. It is not likely that any such law can be passed, unless through inadvertence, or as a "rider" to some statute of a different character, as the injustice of extending to a rich class of wholesale merchants the exclusive privileges granted to poor workingmen, in recognition of their poverty and helplessness, is too glaring for any one to overlook. There is absolutely no reason why a man who trusts another for lumber or hardware should have any facilities for collecting his pay that the law does not equally afford to the man who sells dry goods or groceries on credit. It would be, no doubt, convenient for the lumber-dealers to have the State of Massachusetts relieve them of the trouble of inquiring into the solvency of their customers, by guaranteeing the payment of all their bills, through a levy on the property of the person on whose land the lumber was used, regardless of the circumstance that he had already paid the contractor for the same lumber; but the list of persons who would like to sit back in their arm-chairs and have the State collect their bills for them includes a good many people besides lumber-dealers and hardware-men, and the fact that the latter have already a valuable privilege, in the right to claim a lien by giving notice, certainly does not entitle them to anything more.

WALKING-DELEGATES, like Death, love a shining mark. It will be remembered that Mr. John R. Downey of New York, who does all the building for the Astor family, and is now erecting for them two great hotels, the Waldorf, at the corner of Fifth Avenue and Thirty-third Street, and the New Netherlands, on Fifty-ninth Street, was, a few months ago, made the victim of a quarrel between the Cabinet-makers' and the Carpenters' Unions, which was fought out, on a small pretext, in the buildings under his care. The differences of the carpenters and cabinet-makers having been adjusted, it has suited the walking-delegates to stop all work on the same hotels, perhaps the most important buildings now in process of erection in New York, until a quarrel between the Pelham Hoisting Engineers and the Eccentric Engineers is

fought to a finish. It will be remembered that Mr. Pelham, who owns most of the hoisting-engines in New York, and employs about a hundred engineers, thought that he would get along more peacefully with the unions if he had his men, who comprise nearly all the hoisting-engineers in New York, form a union of their own, and he agreed with them that he would employ no one who had not been admitted to their union. The Eccentric Engineers, who also have a union, heard of this, and, true to the union principle of preventing any one else from earning an honest living, declared war upon the Pelham union. The Board of Walking-delegates took their part, and decreed that no mechanic under their control should work in any building where a Pelham engineer was employed. As Mr. Downey had five of the Pelham men, the first assault was made upon him, in order to compel him, in his own interest, to urge Mr. Pelham to come to terms with the unions. This manoeuvre, of using any available man as a cat's-paw with which to strike a blow at one less accessible, has become a favorite one with the walking-delegates, who make daily advances in the art of terrorism, and have learned, like the Parisian dynamiters, that a decent man is much more likely to be moved by the fear of being the innocent cause of suffering to others than by the prospect of harm to himself.

WE commend the following extracts from the same issue of the Boston Herald to the authorities in Philadelphia and elsewhere who may be thinking of introducing on the streets they control the overhead electric system of street-car propulsion. A little newsboy was killed by one of these modern cars of Juggernaut on Friday last, but the case will probably be "settled out of court," for those who are in control of this blood-stained monopoly are shrewd enough business men to see the advantage of not allowing these accidents to be thoroughly ventilated in open court. The overhead trolley-wire and electric surface-cars constitute the most uncivilized convenience known to our times.

THE TROLLEY SYSTEM.

"An effort is being made to introduce the trolley system in place of horses on the street car lines of Philadelphia. There is a powerful protest against the change, however, and the remonstrants allege that wherever the trolley system has been introduced in a large city, it has so fully demonstrated its objectionable qualities that it has excited general discontent and a desire to get rid of it at any cost. Boston is one of the large cities where the trolley has been introduced, and it is proper to say that the allegation of the Philadelphia citizens is not true. On the contrary, the system is giving satisfaction, and it is rapidly being extended here."—*Boston Herald*, March 10, 1892. [Editorial Column.]

"Bowdoin Square was the scene of a lively scampering of pedestrians about 4 o'clock yesterday afternoon, caused by the burning of a trolley wire. An electric car had just crossed the double switch line opposite the Bowdoin Square Theatre, when the wire that leads down Cambridge Street caught fire, and the end dropped into the street. The wire was at white heat, and rapidly melted, till the power post at the corner of Cambridge and Bowdoin Streets was reached, when the fire enveloped the post and burned in a very lively way till its force was spent.

"Fortunately no one was hit by the burning wire, but the shouts of warning that went up from people at a safe distance and the speed with which those in the vicinity of the wire tried to escape created quite a commotion. The car referred to was in danger of catching fire, and District Chief Engineer Cheswell ordered the chemical engine to the spot, but its services were not needed."—*Boston Herald*, March 10, 1892. [News Column.]

MR. JOHN CRUMP, a well-known architect of Philadelphia, died last week at the age of sixty-five. In addition to the active practice of his profession, Mr. Crump for many years conducted the Colonnade Hotel, perhaps the best and most noted hotel in the City. Among his principal works are the Union League Club in Philadelphia, the Chestnut Street Theatre, the Chamber of Commerce and the Hospital of the University of Pennsylvania.

FERDINAND BARBÉDIENNE, the most renowned bronze-founder in the world, died March 22. Barbédienne was born at Saint Martin de Fresnoy in 1810. He entered very early into the business of bronze-working, and in 1833 began to reproduce on a small scale the masterpieces of ancient and modern statuary. These reproductions, which

were beautifully modelled and executed, met with immense favor, and in a short time his business increased to such a degree that he was obliged to keep more than three hundred men employed to fill his orders. Besides these reproductions of statuary, Barbédienne made ornamental objects in bronze, and interested himself greatly in all forms of artistic workmanship in metal. The Japanese bronzes excited his sincere admiration, and he did much to spread the knowledge of them in Europe, and performed a similar office for the Chinese cloisonné enamels. Wherever his productions were exhibited, they received the highest praises, and he received many honors and marks of esteem from his own and other Governments, and from artistic societies and institutions.

A curious industry has grown up in France within the last few years, the development of which may in the end throw some light upon the vexed question of color in statuary. The quarter of Paris known as Saint-Sulpice has long been noted for its manufactures of religious objects, and among these, as is to be expected in a Roman Catholic country, are many statues of saints. Since the establishment of the Republic, it is said that there has been in France a great revival of interest in religious things, and the shrewd manufacturers of Saint-Sulpice, most of whom, according to a writer in *La Semaine des Constructeurs*, are Jews, have utilized the opportunity to put on the market immense quantities of images of the saints, and particularly of the Virgin, which are made on a regular system, catalogued, and sold, with no more religious feeling than if they were so many sacks of potatoes. As might be expected, the descriptions in the catalogues of these goods are sometimes rather amusing. A Blessed Virgin carved in sycamore wood, with chemisette of batiste, corset, underskirts, silk stockings and slippers, a red velvet dress, embroidered with stars, enamel eyes, with real eyelashes stuck into the wet paint of the lids, and a set of assorted wigs, suitable for all ecclesiastical occasions, costs fifteen hundred francs. A cheaper sort, with a less elaborate trousseau, and a close-fitting dress of cloth, may be had for nine hundred francs. Articles of much more moderate price are made by moulding in papier-mâché.

THIS sort of traffic has grown to such a pitch as to excite the unfavorable attention of the more enlightened Catholic clergy, as well as of the friends of art, and several societies have been formed to try to resist its influence. In Belgium, the crusade against bad taste and ignorance in religious representations is carried on principally by what is called the "Academy of Saint Luke," an association divided into several local societies, which endeavor to keep the worst productions of the image-manufacturers out of the churches in their district; and an independent body, known as the "Guild of Saint Thomas," has been doing a similar work. In France, through the efforts of one of the most distinguished Jesuit priests, Father Clair, an association has been founded, known as the Society of Saint John, which has for its motto, "*Divites in virtute pulchritudinis studium habentes*," and pursues its object by opposing the use of manufactured art for ecclesiastical purposes; and an "Academy of Saint Luke," similar to that of Belgium is in process of formation. The good Father Clair urges, like so many other reformers of art, that pictures and statues of a religious tendency can only be properly made by persons of a religious character, acting under the influence of spiritual enthusiasm; and he hopes to found an association of artists, working together under pious influences, in some spot isolated from the world, which will be able to turn out such figures of saints and angels as Fra Angelico or Overbeck would have made.

IT needs no prophet to predict that this scheme will fail. There are already quite enough people who paint and carve under what they suppose to be a high religious fervor, and who are by no means pleased to find that persons less spiritually gifted fail to appreciate their productions. It is doubtful whether the Muses of Painting and Sculpture devote much time to the supervision of ecclesiastical art, but it is still more doubtful whether they do not pay as frequent visits to the poor Jewish girls who paint the cheeks and fit the wigs of the Saint-Sulpice Madonnas as to the ascetic individuals who imagine that they resemble Fra Angelico because they wear gowns with hoods, and pray a great deal. Certainly, Raphael, or

Murillo or Donatello had not much of the ascetic about them, yet this did not prevent them from representing elevated subjects with sufficient spirituality, and no frame of mind is less favorable to the production of a real work of art than that of conceit over one's superior sanctity. If we are to believe that the future of art lies in the direction of colored sculpture, there might be a much worse school for the cultivation of this kind of art than the workrooms of the church image-makers. Naturally, a beautiful and touching figure would be more salable than a smirking or coarsely painted one. The humble customers of the image-shops may be taken-in as to the value of the clothes or the fit of the dress of a new Madonna, but no amount of argument, or quotation from Ruskin, or disquisition about the Pre-Raphaelites, will deceive such people in regard to the sweetness of the smile with which the Queen of Heaven comforts the hearts of her worshippers; and, in their own interest, the vendors of these products would be led to encourage and reward those of their work-people who could impart most beauty and expression to them. Any one who has seen the best work of the Parisian doll-makers will acknowledge that there are great possibilities in this way, and there is no reason why some new Giotto may not yet arise, who will create a revolution in art, by instilling into the wooden and papier-mâché images of Saint-Sulpice as much life as his prototype did into the stiff conventionalism of the Byzantine models.

THE New York insurance companies have formed an association, similar to that which lasted so long and did so much good a few years ago, and the art of building is already beginning to feel the effect of the overwhelming force which such an association can exert. It was to be expected that the new association would raise rates, and this has already been done; but it has gone farther, and practically refuses to issue any policies on goods stored in the lofts of the great buildings in the business part of the city, or limits them in such a way that the owners of the goods feel themselves insufficiently protected. The consequence is that the lofts in the "down-town" buildings go without tenants, much to the discomfort of the landlord, and, if the underwriters persist in their course, it will not be long before a general remodelling of the buildings will begin. Fortunately, all our architects know how to make even a building of brick and timber practically fireproof without serious reconstruction or very great expense, and it would be a very good thing for New York to have their services brought into general requisition for this purpose. No doubt, some owners would find it hard to raise the money for remodelling, but, in the end, the amount spent in this way would be returned many times over.

AN English manufacturing chemist, Mr. Ludwig Mond, has been trying a new idea in the way of smoke-consumption. For some time, the thick, black smoke from blast-furnaces in England has been collected and led to the furnaces of the boilers, where it supplies sufficient fuel for driving the blowing-engines; but Mr. Mond has succeeded in putting in practice a plan, in his own line of business, which is even more ingenious. It is well known that a considerable amount of ammonia is formed by the distillation of coal; indeed, the ammonia collected from gas-retorts is the principal source of supply of ammonia. Hitherto, however, the ammonia from ordinary furnaces has been allowed to go to waste; but Mr. Mond has found a way of leading the smoke from his boiler-furnaces into a cooling chamber, where it is washed with a water spray. The carbon is deposited in the form of soot, but the water which flows away is charged with sulphate of ammonia, which is easily recovered by evaporation. As the draught of the chimney is checked by the process, it is necessary to use a forced draught, and the consumption of coal is about twenty-five per cent greater than it would be with a natural draught; but, according to Mr. Mond's figures, the consumption of one hundred and twenty-five tons of coal, which costs him about a hundred and fifty dollars, besides furnishing him with one hundred and twenty-five dollars' worth of power, yields, in addition, four tons of sulphate of ammonia, which he can sell for two hundred and forty dollars. As the demand for sulphate of ammonia, which is one of the best fertilizers known, is unlimited, it would seem that this experiment might open a way for the universal utilization of soft-coal smoke in manufacturing cities, to the great advantage of their inhabitants.

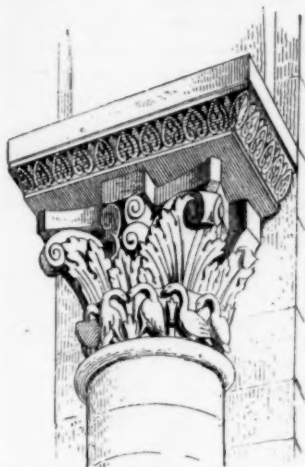
CAPITALS.¹—VI.

Fig. 69. From the Abbey Church of Saint-Benoit-sur-Loire.

THE architecture styled Romanesque is not always presented with the same characteristics or the same style. The cause of this lies in the diversity of its sources. Here it appears as the derivative of a corrupted Roman style; there the architect was swayed rather by Byzantine art. The Rhenish artists gave the preference to the cubic capitals referred to above. Storied capitals occur in great numbers at the beginning of the Romanesque era, and give place but slowly to the foliated type in which the figures and animals that at one time made up the entire capital no longer appear, except incidentally, and in the latest examples are merely the result of a happy accident. It seems, in fact, that this kind of ornamentation originated in the Byzantine ivories, and it was also very widely repeated in Oriental textures.

We present here a capital from the ancient Church of Saint-Benoit-sur-Loire; the general form recalls the Corinthian capital, but the birds sculptured above the astragal are a survival of the tradition of the storied capitals (Fig. 69). The capitals of the nave of the Church of Saint-Germain-des-Prés at Paris were storied and covered with bas-reliefs portraying scenes from the Old and the New Testaments; they were coarsely enough executed, but with more character, certainly, than were those substituted for them in the restoration. Twelve of them are to be seen to-day in the Cluny Museum (Fig. 70). The choir, which was reconstructed at the end of the twelfth century and done over in the early part of the thirteenth, contains, on the contrary, some fine capitals with foliage enrichments, among which circulate in a masterly and well-balanced order griffins and winged lions, some with human heads. They surmount the circular and isolated columns around the choir, and are without question among the latest specimens of storied capitals.

The two capitals of Saint-Benoit and Saint-Germain-des-Prés offer a peculiarity to which we desire to draw attention. As they are derived from the Corinthian type, they have preserved some of its significant elements; in that of Saint-Benoit, though the vase is no longer visible, the large and small volutes occur, and also the abacus with concave faces and a rough hewing of the flower on it; in that of Saint-Germain-des-Prés, the vase is still to be seen, and the antique abacus is maintained, although with a somewhat modified trace. Above the abacus, however, there is in both capitals another abacus, covering the whole, under the form of a thick, sculptured and moulded bandeau, on which the summer of the arches rests; it must be remarked, in addition, that it projects beyond the summer, and that the latter is plumb with the old abacus; this is especially noticeable in the capital from St. Germain-des-Prés, and the disposition was perpetuated for a long time. The effect is particularly happy, and the cutting of the old abacus certainly relieves the capital, by the play of light and shade, from the heaviness that it would otherwise have. The origin of the disposition is doubtless to be sought in the custom that long prevailed of adopting capitals borrowed from Roman edifices in the construction of pillars; the abacus in the form of a bandeau was afterward introduced to obtain a broad foundation for the summer. This ensemble was imitated



Fig. 70. From the Choir of Saint Germain-des-Prés.

when the ancient capitals were wanting. Other modifications followed; the angles of the massive abacus were chamfered off, and the astragal was made in the same block of stone as the capital.

When the antique capital was wholly abandoned sculptors acted with more freedom. We give one of the capitals from the triforium of the nave of Laon Cathedral; the bandeau forming the abacus is destitute of the fine decoration with which it is usually covered, and is merely broadly profiled, producing a bold shadow softened down by reflections; the foliage begins to exhibit new and indigenous forms with pronounced and sinewy details (Fig. 71).

A second capital from the Cathedral of Laon displays more elegance and delicacy of execution (Fig. 72); all trace of the

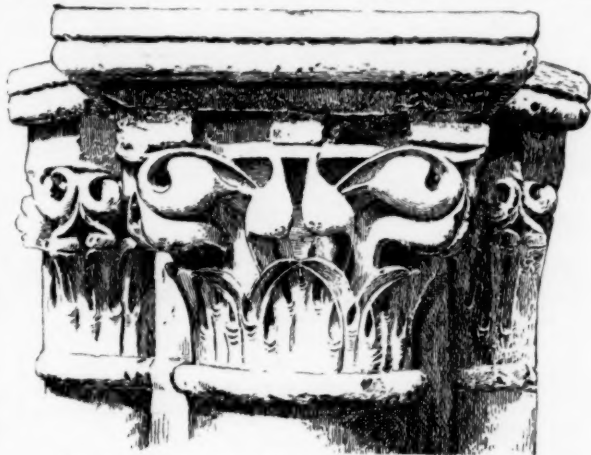


Fig. 71. From the Triforium of the Nave of Laon Cathedral.

antique abacus disappears or becomes merely a flat band, square in plan, and having its profile closely united to that of the true abacus; the vase is retained, and will continue to be. Let it be noted that this crowning bandeau marks the limits of the cubical block within which the capital is confined with all its foliage, and its vertical arrises continue those of the summer. The foliage of these capitals rolls over and develops with charming grace, and even suggests in its composition and by the style certain elements of the budding Greek Corinthian. Still, though somewhat slender in its proportions, we have not as yet the capital of the thirteenth century in its finished shape; the carving is from the chisel of an inventive and fastidious sculptor, rather than from that of an artist executing a type that is fixed and has been adopted for its recognized merits. Our next illustration, which is also taken from the Cathedral of Laon, shows at length the foliage ornamentations to which the term crockets has been applied (Fig. 73). They are folicles curving over and terminating in large buds,



Fig. 72. From the Triforium of the Nave of Laon Cathedral.



Fig. 73. From the Cathedral of Laon.

the composition of which is certainly obtained from a close study of the natural buds of very small plants. The effort to restrict the capital always to the cube whose dimensions are determined by the flat band surmounted by the abacus is still apparent, but the crockets of the first row take advantage of the space gained by the corbelling of the capital to develop broadly, and the angle crockets, which have disappeared in the original that we exhibit, could, thanks to the mouldings, also develop freely and furnish a powerful support at the angles without passing beyond the prescribed bounds.

¹ From the French of Adrien Joigny, in Planat's *Encyclopédie de l'Architecture et de la Construction*. Continued from No. 848, page 197.

However, some confusion still exists in the execution of this capital; the crockets are too numerous and the *ensemble* is bunched. We give, as an example of capitals with crockets of finished form and composition at the beginning of the thirteenth century, one from the triforium of the nave of Notre Dame at Paris (Fig. 74). On a finely profiled astragal, belonging to the block of the capital, as remarked above, rests a slender vase which spreads out abruptly in the upper part and bears on its last circular moulding a square plinth, slightly chamfered



Fig. 74. From the Triforium of the Nave of Notre Dame, Paris.

and surmounted by a high abacus; the latter is also chamfered but hollowed out by a deep moulding designed to give a greater degree of accentuation. Four powerful crockets embellish the capital at the angles of the abacus; these spring out above the astragal and are complemented with folicles that cover the vase; four others of similar composition adorn the four faces, curving over before reaching the third section of the vase. The freedom of the general disposition is remarkable and the strength of the execution relieves all fear as to the corbelling demanded by the breadth of the summer.

In the Middle Ages the column played a rôle entirely different from that in ancient architecture; it was no longer the necessarily monolithic support (we have remarked that it always carefully guarded the appearance of being such, even when it



Fig. 75. From the Nave of Notre Dame, Paris.



Fig. 75a. From the Nave of Notre Dame, Paris.

had to be made up of several pieces) of an architrave exerting only a vertical pressure upon it. The problem to be solved in the ancient constructions from the standpoint of equilibrium was the simplest of all, and the column might receive forms and proportions in a way canonical. The use of the column and, consequently, of the capital having been maintained, from habit or imitation, throughout the Romanesque period, the new

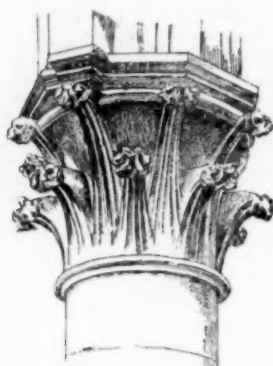


Fig. 76. From the Choir of Notre-Dame, Semur-en-Auxois.

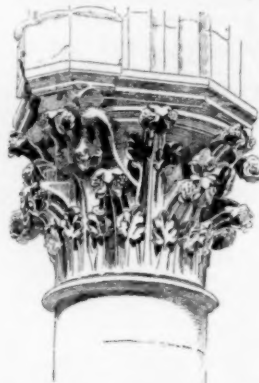


Fig. 77. From the Nave of Notre-Dame, Semur-en-Auxois.

style that declared itself in the second half of the twelfth century retained the capital as an element traditionally indispensable to every construction. But the definitive introduction of vaulting and the consequent necessity of providing against the various oblique thrusts resulting therefrom forced the architect

to consider the column as nothing more than a simple pillar whose height, diameter and pose were especially dictated by conditions of equilibrium relative to the arches and vaults. Romanesque art had long been gradually abandoning the proportions of the ancient columns and one had ceased to expect to see them. A pillar could be circular and the capital seemed

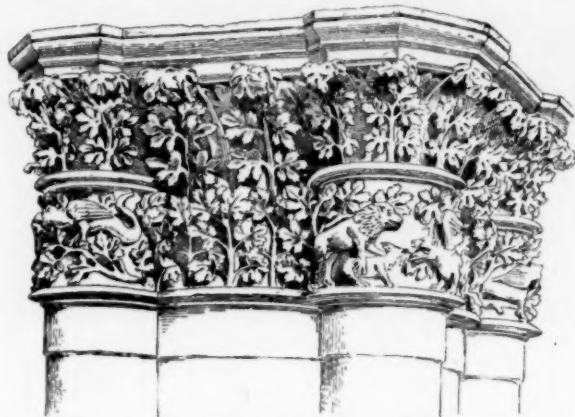


Fig. 78. From the Cathedral of Rheims.

a convenient arrangement for the support of the summers of the arches. Little by little these arches were multiplied and separated, with a special rôle assigned to each; they came together above the abacus only. Thus it is, for example, that the capitals of the monocylindrical columns of Notre Dame at Paris are constructed. The abacus is square and chamfered at the angles; the capital is in two courses, each with its row of leaves terminating in fine crockets. We give one of the two columns to each of which a smaller one is joined so as to help support the three grouped bases of the colonnettes whose capitals carry the transverse ribs and ogives of the upper vault (Figs. 75, 75a). The secondary capital corresponds only to the upper course of the larger one and its crockets are less powerful. All the other capitals of the cathedral are single and it is only by resorting to a slight corbelling that the three grouped bases of the colonnettes of the upper vault are made to rest on the abacus. As this pillar is of a later date than the others, we find in it a first attempt at improvement.

In the pretty church of Semur-en-Auxois, constructed at the end of the first third of the thirteenth century, the arches of the *pourtour* of the apse being closer together have been gathered into an octagonal summer (Fig. 76). The capital, though comprising two rows of leaves with crockets, is of a single course and a slight addition to the abacus suffices to form a rest for the base of the colonnette of the upper vaulting-rib. In the nave where, besides the transverse rib, there are two ogives, the three bases appear also to be supported in their corbelling by one of the crockets, accompanied this time by two figures of monsters of a very clever disposition (Fig. 77).

In the Cathedral of Rheims (Fig. 78) the large columns are cantoned by four smaller ones, where, to avoid the break that occurs in the astragals of the cantoned columns in Notre Dame at Paris, the astragal of the main column is adopted for the others, making five united capitals of equal height; but there is a secondary astragal in each



of the lesser capitals with—as if to distinguish it—sculptured animal figures filling in the space between the two mouldings. Lastly the abacus is square for the large column and octagonal for the smaller, and the plan offered by its general trace exactly circumscribes the trace of the arches leaving no unoccupied space on it.

It will be remarked that the crockets of the capitals of Semur-en-Auxois project beyond the vase quite prominently and that in the capital of Rheims there is in addition an imitation of the indigenous flora. These are so many indications of that struggle for improvement in which these great artists were

constantly engaged and which, unfortunately, soon led them to rate the reasoning faculties above feeling and inspiration. The golden age of the Gothic capital had passed.

We will cite but one other example — the beautiful capitals surmounting the light isolated columns of the refectory of the abbey of Saint-Martin-des-Champs, now the library of the Conservatoire des Arts et Métiers (Figs. 79, 79a). One can but admire the rich development of the leaf crockets which are calculated to impart to the construction an appearance of power



Fig. 79a. From the Refectory of the Abbey of Saint-Martin-des-Champs, Paris.



Fig. 80. From the Cathedral of Bayeux.

and force which the dimensions of the column would not have warranted. This fine edifice belongs to the early part of the thirteenth century and is ordinarily, although incorrectly, attributed to the architect Pierre de Montereau.

The circular abaci, which were soon to find a place in the mullions of the windows, are, so far as the principal capitals are concerned, peculiar to Normandy and are widely scattered through England. We give an example from the Cathedral of Bayeux (Fig. 80). It is impossible to make an exhaustive study here of the various modifications wrought in the Gothic capital at different times and in different places. We refer the reader for this to the admirable work of Viollet-le-Duc entitled "*Dictionnaire raisonné de l'Architecture française du XI^e au XVI^e Siècle.*"

(To be continued.)

ON THE OLDER FORMS OF TERRA-COTTA ROOFING-TILES. I—II.

JAPAN.

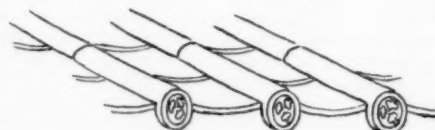


Fig. 22.

mon use, the pan tile (Yedo tile) is also commonly seen. In Tokio the normal tile reveals along the eaves either a simple tegula or one with turned margin, with decoration in relief; the eaves imbrex is always closed by a circular disc having in relief the Tokugawa crest, or the crest of some Daimio (Fig. 22). An eaves imbrex is shown in Figure 23. The usual tile in Tokio, as well as in Kyoto, is a slight modification of a pan tile known as the Yedo tile. This tile like the Belgian form has one curved and one flat surface. The tiles of this kind bordering the eaves have in one form the plain flange, the lower edge of which, instead of following the curve of the tile, is straight (Fig. 24). Figure 25 represents a roof covered with this form of tile.



Fig. 23.



Fig. 24.

In the usual form of this tile, however, the eaves tile carries upon it an imitation of the eaves normal tile; the circular disc of the imbrex portion projecting beyond that portion representing the tegula (Fig. 26). In Nagasaki the pan tile bordering the edge of the gable is bent abruptly downward.

It may be observed as a curious feature that in Japan the pan tile laps to the left as seen from the ground, while in all other countries,

with rare exceptions, it laps to the right. (Here is added another of the curious instances of reversal which some writers seem to be so fond of connoting.) The temples and castles in Japan are usually covered with the normal tile. When the roof is covered with metal, as is often the case, rounded ribs are introduced to carry out the appearance of the ridges made by the imbrices, even to the circular discs and turned margins at the eaves. In the province of Iwami a simple pan tile is made with a glazed surface. A glazed ridge-tile is also made in this province, angular in section, so as to rest like a saddle on the roof (Fig. 27A).

Two hundred years ago a pan tile, brown glazed, was made in the province of Bizen. A temple at Uyeno in Tokio, burned at the time

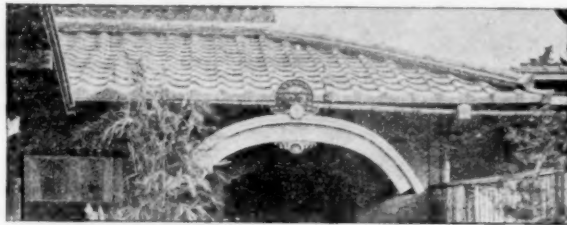


Fig. 25.

of the Revolution in 1868 was covered with these tiles (Fig. 28). The Tokio tile is made of a dark gray clay, smooth and presenting a nearly black surface; it is quite thick though light.

I know of no roofing-tile that approaches the Japanese tile in perfection of finish: they are also much higher priced than any other tile known to me. In comparison, the Chinese tile seems roughly made, is thin, and often warped. The India tile is equally poor in workmanship. So accurately made are the Japanese tiles that roofs may be seen covered with a broad, slightly curved tegula, no imbrex being used (Fig. 29). These tiles, like all Japanese tiles, are bedded in mud, and in this instance the edges of the tiles are so straight as to

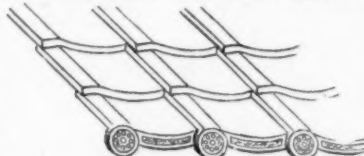


Fig. 26.



Fig. 27.

meet together quite perfectly. Simple tegulae are often used as ridge-tiles on a thatched roof (Fig. 27B).

In the better class of tiled roofs it is customary to point with white plaster a number of courses of tiles from the ridge, the hip and the eaves, and in some cases the whole tiled surface is treated in this way.

The Japanese ridge is often a very complex and remarkable structure, sometimes of ponderous proportions, with supplementary ridges running down on the hips, and even divergular ridges near the eaves. These are, or ought to be, built up of tiles and plaster, but oftentimes the bulk of the mass is made up of a carpenter's device consisting of a framework covered with boards, the sides plastered white and having all the appearance of a solid mass of plaster and tiles (Fig. 30). The terminal ridge-pieces are often marvels of the tile-maker's art.

Mr. Kashiwagi, a Japanese antiquarian of Tokio, told me that he had records of green-glazed roofing-tiles of the normal type being used in Japan over a thousand years ago; whether made in Japan or imported is not known. Ninagawa figures in his work on Japanese pottery fragments of what he considered the first glazed pottery made in Japan, and these show a green glaze.

In the following figures are shown, by way of comparison, a Japanese (Nagasaki) tiled roof (Fig. 31) and the roof of the Temple of Hera, at Olympia (Fig. 32), as restored by Graeber. The terminal ridge-tile, the imbrex closed by a circular disc (not, however, represented in Fig. 31), the plain tegula at the eaves with simple margin, present striking resemblances between roofs separated by nearly three thousand years in time and thousands of miles in space. (For further information regarding tiled roofs in Japan see Morse's "*Japanese Homes and Surroundings.*")

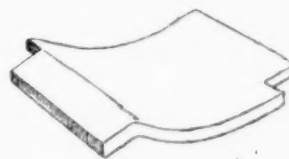


Fig. 28.

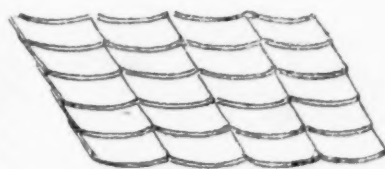


Fig. 29.

¹ Continued from No. 848, page 200.

INDIA.

So far as museum specimens and photographs have enabled me to judge, the roofing-tiles used everywhere in India are of the normal type (usually *imb.*). Judging by the form of the imbrex as

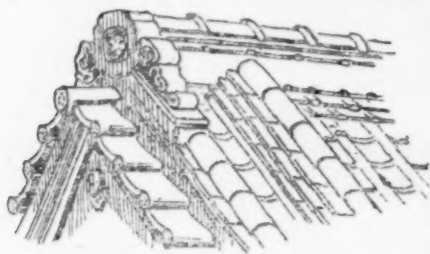


Fig. 30.

shown in photographs of Bombay houses, it would seem that in their manufacture a tapering cylinder of clay is turned on a potter's wheel, and then cut in halves longitudinally, and these halves are used as tegula and imbrex. As an evidence of this, in the Bombay roof the tiles bordering the eaves terminate as cylindrical tiles, the tapering end entire and projecting slightly beyond the eaves, while the larger end is cut half-way through to accommodate the overlapping and inverted tiles that cover the under courses, as shown in Figure 33. (Sketched from a photograph in the India Museum, London.)

In Madras the normal tile (*teg.*) is used. In some cases the eaves have two thicknesses of tegulae below and three above (Fig. 34). The tiles used at Poona, near Bombay, are a variety of the normal type (Fig. 35), the tegulae being flat with upturned edges. This tile is 23 centimetres long; the exposed edge is 14 centimetres wide and tapers rapidly to a width of 9 centimetres, with rounded ends. The imbrex is semi-cylindrical, 28 centimetres long, 10 centimetres across at the exposed end, and tapers to a width of 6 centimetres. These tiles are light-colored, porous, and very roughly made. The specimen figured is in the great Indian collection made by Dr. Jagor, now in the Museum für Völkerkunde, Berlin. From a few photographs that I have seen of Indian houses there seems to be no modification of the eaves-tiles for architectural effect.

The English buildings in Agra and an English church in Bombay, and doubtless English buildings in other parts of the empire, are covered with the ordinary pan tile.

CEYLON.

At Colombo the normal tile (*imb.*) is seen, the eaves-tile having a double imbrex. At Candy, the famous temple is roofed with plain tiles having square ends, presenting in the photograph the appearance of a shingled roof. Other buildings near the temple are covered with the normal type (*imb.*).

PERSIA.

Judging by the few pictures and descriptions available, the normal tile (*imb.*) seems to be the one in common use. In former times, judging by the high skill attained by the Persians in brick enameling, and the wonderfully glazed, flat tiles for interior decoration, the palaces and mosques must have presented a most beautiful and brilliant appearance. In the article "Tiles" in *Encyclopædia Britannica*, it is stated that the roofs of some of these important structures "are covered with magnificent, lustrous tiles decorated with elaborated painting, so that they shine like gold in the sun. They were especially used from the thirteenth to the fifteenth century." From this statement one gets no idea of the form of tile used.

The high attainment reached in relief work and colored enamels by the early Persians may be seen in the wonderful wall made of brick brought back from Persia by M. Dieulafoy, and displayed in a

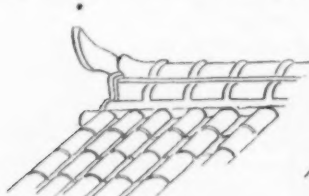


Fig. 31.

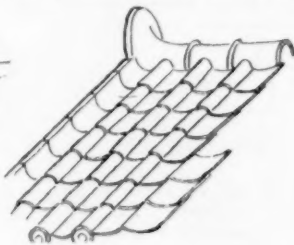


Fig. 32.

special room at the Louvre. On this wall are depicted in colored enamels a number of archers, known as the Susa archers.

TURKEY.

Photographs of buildings in Constantinople and other places show the universal use of the normal tile (*imb.*); the semi-cylindrical ridge-tile accompanies it. The Constantinople tile seems slightly more angular in section than that of Italy.

SYRIA.

In Jerusalem and Jaffa, the normal tile (*imb.*) seems the only roofing-tile in use. The joints between the tiles are often pointed with plaster.

EGYPT.

When a tiled roof is seen, it is covered with the normal type (*imb.*). The courses are laid close together, as in the modern Greek roof, and, as in the Greek roof, the interstices between the tiles at the eaves are filled with plaster.

GREECE.

The normal tile is the only form seen in Greece and the adjacent islands. The usual narrow form (*imb.*) common to the Mediterranean countries is also the prevailing form in Greece. In many instances the two elements of the tile are less cylindrical than those of Italy. Greece is the only country in Europe in which the broad, curved tegula with narrow imbrex is seen. In Eleusis, roofs covered with this typical normal tile occur. In Messenia the wide tegula is used as an imbrex, as in China. On the old cathedral at Athens, a Byzantine structure dating back to the early part of the thirteenth century, a large curved tegula with narrow imbrex is found (Fig. 36); all the courses are thickly plastered and bear the marks of great age, and at the eaves the imbrex is supported some distance from the tegula by a mass of stucco. The dome is also covered with the same kind of tiling, the tegulae being cut tapering as they approach the apex of the dome, the imbrices standing out as prominent longitudinal ribs from the apex of the dome to its base. There is also another Byzantine church in Athens roofed with the same kind of tile.

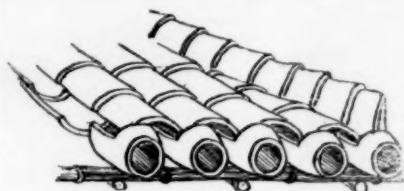


Fig. 33.



Fig. 34.



Fig. 35.

more flattened than is usual with this form, and at the eaves the upper and lower elements are separated by a considerable space and filled with white stucco. This presents the appearance of an imbricated edge along the eaves. With the exception of certain examples in Spain this is the only attempt, so far as I have been able to ascertain, at the ornamentation of the eaves-tiles seen west of China. In some places in Greece, as at Eleusis, for example, the tiled roof shows broad bands of white painted tiles at the ridge, hip and eaves, with an intermediate band in the middle of the roof, other bands cross these at right angles to the ridge. In the photographs rectangular areas of dark tiles show between these white bands. A treatment of the roof presenting a similar appearance is often seen in Japan and Siam, in these cases white plaster being used. At many places, as at Delphi, Dimitzana and Catania it is customary to place upon the tiles angular fragments of stone; these are placed parallel to the ridge, hips and eaves. Occasionally the same treatment may be seen in Constantinople and Stamboul.

In none of the various forms of normal tile seen in Greece to-day is there an eaves tegula with turned margin, or an eaves imbrex closed by a circular disc. In all other respects, however, the normal tile approaches nearer the Asiatic tile, as seen in China, Cochinchina, Korea and Japan than does that of any other country west of these regions unless we except the rough example from Poona, India, where the tegula is wide.



Fig. 36.

ANCIENT GREECE.

A general idea of the roofing-tiles of ancient Greece may be gleaned from the article "Tiles" in the *Encyclopædia Britannica*. Under this title the terra-cotta and massive marble tiles used on monumental buildings are briefly described and figured.

In a memoir entitled *Terrakotten am Geison*, etc., by Dörpfeld, Graeber, Borrmann and Siebold, a minute description is given of the terra-cotta roofing-tiles, ridge and terminal ridge-tiles, antifixæ, etc., of certain ancient Grecian temples. Of particular interest is the description of the roofing-tiles found on the site of the Temple of Hera at Olympia. This temple is one of the earliest examples of Greek architecture dating back, at least, eight or nine centuries before the Christian Era. It will be noticed that this earliest known roofing-tile which Graeber designates as the normal tile, has a wide

curved tegula, and a narrow semi-cylindrical imbrex (Fig. 5) being identical with the Oriental one (compare Fig. 11). The size of the tegula was 1.50 metres in length by .50 centimetres in breadth. Graeber says that this tile, common in the Middle Ages, is still much used to-day; it is particularly associated with convent roofs. I have before remarked that this normal tile of Graeber's differs from the

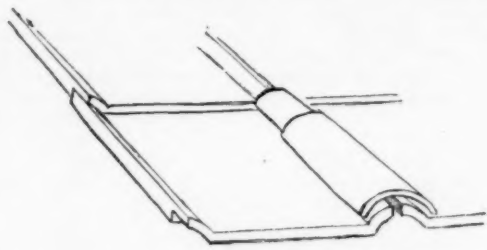


Fig. 37.

normal tile in that region to-day in having a wide tegula and narrow imbrex. The nearest approach to this in the Middle Ages is the one seen on the old cathedral at Athens.

Graeber states that these early roofing-tiles of the Temple of Hera were covered with a black glaze, he also says that glazed tiles have been determined from Argos and Mycenae. The tiles, however, on the Temple of Hera at Argos were not glazed. It is also stated that a few monumental buildings in Sicily, Italy, Peloponnesus and Athens reveal the use of roofing-tiles. Beside this primitive normal tile described by Graeber, there is another form of tile which must be regarded as an outgrowth from the normal tile, inasmuch as a narrow imbrex covers the line of junction between two adjacent tegulae. In the last mentioned form the tegula is rectangular in shape, flat, with lateral edges turned upward as shown in Figure 37. Graeber describes two varieties of these, one found in Greece in which the upturned edge stands at right angles to the flat portion as shown in Figure 38. In the earlier forms of this variety the reflexed edge is low and is accompanied by a semi-cylindrical imbrex. At a very early date, however, the angular imbrex makes its appearance, and from the time marble tiles were adopted from the terra-cotta form, this becomes the definitive shape of the imbrex. The other variety is peculiar to Sicily: in this the upturned edge preserves a convex surface; this form is also found in lower Italy, but is not exclusive, as other varieties also occur in that region. Figure 37 represents the Sicilian form.

In the Boston Museum of Fine Arts, are fragments of tiles from Assos, Asia Minor, dating not farther back than the Roman epoch. The following figure (Fig. 38) is a restoration showing the appearance of this tile in position. It will be seen that the eaves tegula has its margin turned down and bears upon its face an ornamental design in relief. The eaves imbrex has its end closed, not by a circular disc, but by a broad ornamental piece standing erect with anthemion decoration in relief. These designs vary greatly in different fragments, but are all of the same general nature. The roof imbrex continues the same width over the ridge spanning it like a saddle, and has a similar process projecting upward at the crest with decoration in relief on both sides. A ridge-tile of the form of a plain imbrex probably covered the junction of the tegulae at the crest. This treatment of the ridge-tile has no parallel in the Orient so far as I know. In another form the ridge-tile is semi-cylindrical bearing a leaf-like crest decorated in polychrome; on the lower edge

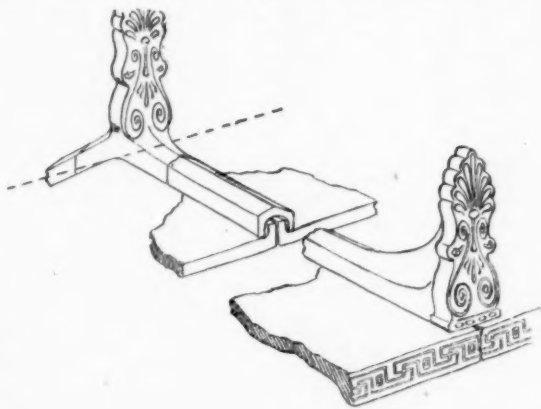


Fig. 38.

a portion is cut out to admit the ends of the semi-cylindrical imbrices as they approach the crest (Fig. 39). This figure is copied from Boetticher's work on Olympia (p. 207) and represents a tile from the treasury of the Gelonians (Sicilians) at Olympia. In the minute investigation, made by Graeber, of this subject he often alludes to the great variety in the minor details of the roofing-tiles seen on

these ancient sites. Referring to Olympia, he says: "still more striking than the diversity of the clay material is the multifariousness of the kinds of construction presented by the antique roof in Olympia. The terra-cotta roofs there offer such a wealth of forms that one has well-nigh to doubt that all of them sprang from a handiwork native to Olympia, or to the district of Elis, and to believe rather that they represent an aggregation similar to that in a museum of all the constructions customary in Greece, Lower

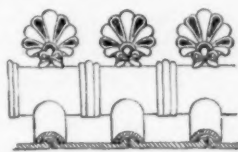


Fig. 39.

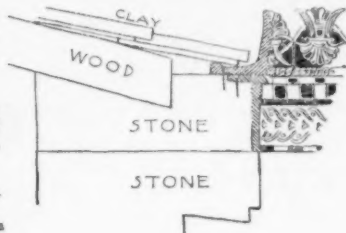


Fig. 40.

Italy and Sicily, and this supposition has verified itself, for further studies showed that at the places in Greece and Italy, which we visited, certain particular kinds of construction are used almost exclusively, and that the variety and multiplicity of forms found at Olympia occurred nowhere else to the same extent."

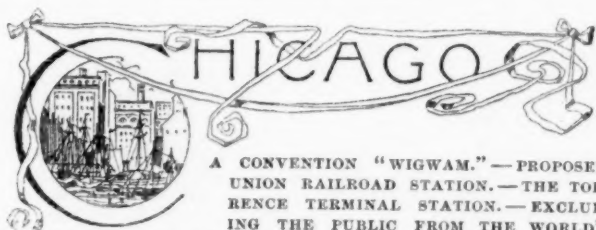
Speaking of the marble roof, Graeber says: "The general system and scheme of the antique marble roof is well known through many publications. This system, however, has not been invented for the marble roof, but had its prototype in the clay-tile roof. The antique roof had to pass through centuries of evolution till it attained that perfection which we admire in the Parthenon of Athens, and the Zeus Temple of Olympia and many other edifices. As regards elegance, one may even say subtlety of perfection, the Greek tile roof ranks even above the marble roof."

I cannot forbear quoting further from this valuable memoir of Graeber's. He says in regard to the attachment of tiles on the roof: "A securing of the tiles on the rafters by means of nails did not take place; only the lowest tile, next to the gutter, was always secured by iron or bronze nails to the rafter. All tiles with nail-holes, therefore, belong, without exception, to the gutter, and just so little did the tiles have projections for hanging them to the laths as it is assumed erroneously of the marble roofs, but they rested directly on the rafters, and maintained themselves in their position in part by their weight, in part by supporting themselves through the next lower tile by means of the cutting on their lower surface. This may have occasioned, under certain circumstances, a heavy strain; for instance, a sliding down, involving even the lowest gutter or moulding tiles." And he refers to the condition of things at the Zeus Temple at Olympia as due to the sliding down of the tiles in this manner.

Graeber presents a restoration of the edge of the roof of Temple C. Selinus, Sicily (Fig. 40). Here the elevated process or antefixa of the eaves imbrex is now detached, and forms a separate piece, which is nailed to the stone coping, and the turned margin of the eaves tegula is also separate, and is nailed to the face of the coping-stone. These various elements were moulded in relief and beautifully decorated in polychrome. This temple is supposed to date from 600 B. C.

Reference has been made to the marble tiles following the form of the later terra-cotta tiles. It has also been shown that the pan tile of Europe has been derived from the normal tile by combining in one piece the upper and lower elements. It is interesting to observe that in the marble tiles of ancient Greece the same combination is shown in some where the imbrex and flat tegula with upturned edge are combined, and, curiously enough, the lap is to the right, as followed by the pan tile of Europe. EDWARD S. MORSE.

[To be continued.]



A CONVENTION "WIGWAM."—PROPOSED UNION RAILROAD STATION.—THE TORRENCE TERMINAL STATION.—EXCLUDING THE PUBLIC FROM THE WORLD'S FAIR GROUNDS.—"FLOATS" FOR THE OPENING CEREMONIAL.—JOHN BROWN'S FORT.—THE COUNTY COURT-HOUSE.—EXHIBITIONS.

IN spite of the fact that March came in like a lion and has been disporting himself after the manner of this king of beasts ever since, our almanacs tell us that spring is not far off, with the things that belong to it in a large city—here mud and moving-day and, this year, the preparation for a Democratic convention. Most people are surprised to find there is no fitting hall in which to hold he meetings, it being generally believed that the Auditorium is

sufficiently large for all such purposes. Such, however, is not the case, and the old Exposition building, which in past years has done such good service upon similar occasions, is slowly being torn down. It is therefore proposed to build in the immediate neighborhood of this old building a structure which shall be capable of seating eight thousand people. The local committees are hard at work arranging for the construction of a wigwam; this will not present any architectural beauty, but will offer the greatest amount of comfort and convenience to so large a gathering of people. This temporary structure is to be on the Lake Front, between Washington and Madison Streets, and will be about 250 by 400 feet. Its shape is to be that of a parallelogram, with several entrances on Michigan Avenue. The speaker's platform is at the west end of the building on the Michigan Avenue side. Directly in front of this is the section containing one hundred and fifty seats for the representatives of the press. Underneath the platform and press galleries, will be the telegraph-offices, while surrounding them will be the space, cut off by railings from the rest of the building, for the eight hundred and fifty delegates. These will be seated on a level, this section as well as all of the others having its own special entrance. The galleries and the reserved-seat sections surround in a semicircle the divisions designed for the delegates, and consist of two sections, each section having two entrances on the north and south sides of the building, and having a seating capacity of three thousand each. As mentioned above, the entrances to these galleries will be on the north and south sides of the building and the stairways leading up to them will be perfectly straight. The front row of seats in the reserved-seat division will be but slightly elevated and will slope upward until they reach a height of 21 feet above the floor. The gallery above will have the same slope.

No special seats will be assigned to the alternates. Each section will be liberally supplied with aisles and additional exits will be provided to serve in case of an emergency.

The interior will be finished in dressed pine, which will be covered with decorations and bunting. The bare columns supporting the galleries will be draped with flags and the roughness will be so covered with bright colors as to give the hall a gay appearance. On the exterior the building will somewhat resemble a very symmetrical lumber pile, containing, however, for such a structure the unusual feature of windows. These windows will be numerous, to give abundance of fresh air, though there will be no openings on the lake side on account of the nearness of the railroad tracks, with the noise of incoming and outgoing trains.

It begins to look now as if some of the noise and dirt of trains, with which this desirable portion of the town is burdened, might be lessened, by the removal of the station now at the foot of Lake Street. Ever since the great fire, owing to certain litigation, this station, merely the old ruins of the former depot, has served in the place of something better, and very poorly served its purpose too. Now, the Illinois Central, the Michigan Central, the Big Four and the Western Michigan propose building a union depot at Twelfth Street, east of Michigan Avenue. The station, it is said, will form quite an architectural feature, will be three stories high at the northern façade, having an additional height in an imposing tower. The site of the proposed structure is at the southern end of the open space known as the Lake Front, and is so situated that the effect of any good architectural feature of the building will not be lost. An examination of the soil, preparatory to the breaking of ground, is being made, and as soon as that is finished, excavations will be begun, and it is said that the new structure will be completed by the first of next December.

The great feature here in the way of railway architecture, in the next few years, will be the station for the Torrence Terminal Road, the scheme of which has been mentioned before in these letters. The plans are just completed for this structure, which will be only the second of its kind in the United States. It is reported that \$3,500,000 will be expended on the edifice. The style, it is said, of the main building, will be English Renaissance. Eighty feet south of this building a train-shed will extend 1,000 feet along State Street. On the corner of Twelfth and State Streets, there will rise a tower 60 feet square. The distance from its flagstaff to the ground will be over 400 feet. A clock, with dials 19 feet in diameter, will be placed in the tower, while below the clock will be a frieze, 16 feet wide, decorated emblematically of railway construction. The first and second stories will be of brownstone, and above this the walls will be of terra-cotta. Two entrances will admit to the main waiting-room from State Street, while there will be two more through the tower. Passengers for the suburban trains will reach their trains from the south end of the main building, through the court between the latter and the train-shed.

The fronts of the ground or first story of both the main building and the train-shed will be cut into stores, with the exception of the space used for entrances. The main waiting-room is a large room over three hundred feet long, well arched with a skylight overhead, the light reaching this skylight through a court, by which the offices above are lighted. Off this room there will be a suburban waiting-room, ladies'-parlor, dining-rooms, barber-shop, news-stands and other rooms. Off the main waiting-room will be a loggia, eighteen feet wide by over a hundred long, beneath which will be a carriage-entrance to the elevators and steps leading up to the grand waiting-room. The upper part of the building, including the tower, will be cut into offices, of which there will be one hundred and six on each

floor. There will be sufficient room on each floor for the general office of every road entering the depot. A feature of the interior finish will be the absence of plaster and the substituting in its place of enamelled tiles, to better facilitate the thorough cleaning of the rooms. Across the covered court, between the main building and the train-shed, will be fourteen tracks, so arranged by means of transfer-tables that trains moving can immediately be transferred from one track to another, so that they can arrive and depart continuously without interruption. At the north end of the shed, there will be eight elevators for receiving and delivering baggage to the baggage-room beneath as received from the incoming trains. At the south end will be the same number for handling out-going luggage.

The great steel trusses of the shed will have a clear span of nearly three hundred feet, and will be elliptical in form. They will rise to a height of a hundred and twenty-five feet, will be placed forty feet apart, and be arranged in pairs. The platforms of the train-shed will be of Portland cement, and the tracks will be twelve inches below the platform level.

It is reported that the structure will be fireproof, and that all of the modern conveniences necessary to make the depot one of the finest in the world will be used in connection with the building. It is calculated that two years will be consumed in its construction.

The chief item of interest to the general public from World's Fair headquarters is that it, the general public, is no longer to be permitted to indulge in indiscriminate visiting on the Fair grounds. Heretofore, permits have been issued to any one who might apply for them at the Exposition headquarters in the Rand & McNally Building. It is said that, this being generally known, visitors became so numerous as to actually hinder the progress of the work, and recently, on a pleasant Sunday, thirty-two thousand passes were taken up at the gates. Besides this, it was necessary for thirty policemen to use their best endeavors to keep visitors not blessed with passes from making their entrance into the grounds through the improved portions of Jackson Park, which have not yet been fenced off. Consequently, the Committee on Grounds and Buildings has authorized the issuance of the following order, which will be posted at the Exposition headquarters: "No passes will be issued from this office except on the written request of a director of this corporation."

The National Commission and Board of Directors have finally selected the twenty-four "floats" which will form the procession of centuries, to be shown in Jackson Park on the occasion of the dedicatory ceremonies next October. These floats will be drawn around through the canals and lagoons in the Park. Their total cost will be over ninety thousand dollars, with an average expense of nearly four thousand each. They will be as follows: The Stone Age, representing the cliff-dwellers and the Toltecs; the Bronze Age, representing the Aztecs and the mound-builders; the Aboriginal Age, representing the American Indians; Columbus at the court of Ferdinand and Isabella; departure from Palos; the discovery of America; Columbus before the court of Ferdinand and Isabella presenting natives, and the strange productions of the New World; English cavaliers and the settlement of Jamestown; Hendrick Hudson; discovery of the Hudson River; Dutch settlement at New Amsterdam; landing of the Pilgrims; illustrations of early Puritan life; Ferdinand de Soto; discovery of the Mississippi; Père Marquette, Chevalier La Salle and the Northwest; Washington and his generals; signing the Declaration of Independence. Union of the colonies; the thirteen original States, the sisterhood of the great Republic welcoming the Territories to the constellation of States. "Westward the course of empire takes its way." The genius of invention; application of steam, etc.; electricity and electric appliances; War, representing valor, sacrifice, power, death, devastation; Peace, representing tranquility, security, prosperity, happiness. Agriculture; Science, art and literature; Universal freedom of man; equal rights; law and justice; Liberty enlightening the world.

An enterprise is at present well under way, which apparently is being carried on with the idea of giving a side-show to the Columbian Exhibition, while a prominent feature of interest will be added to the list of those Chicago already has. It aims to bring John Brown's old fort at Harper's Ferry here to the city, brick by brick as was the old Libby Prison, and reconstruct it here as was that structure. In fact, the old Harper's Ferry engine-house fort, which John Brown stormed and captured, and in which he withstood his siege, has been brought here. The good taste of such a proceeding is very questionable. We have no historical association, but since we have money, it seems to say, by all means let us buy some. Besides there seems to be the question, how much of interest do these old war relics retain, after they have been rooted up bodily from their surroundings. For the untravelling public it is, of course, easier and more economical to thus have the mountains come to Mahomet, and consequently, such curiosities will never fail to attract a certain class of sightseers, even those who might have hoped some day to run across them in their original habitat, occasionally visit them, but they do so with rather a sneaking feeling in their hearts that they are countenancing a fraud; and all the sensations of association are inharmonious. "This is the spot where John Brown stood with his handful of followers while the Virginia militia gathered outside." Yes, but from this window he did not look down upon the Wabash Avenue grip-cars, or upon the crowded street of a western metropolis. How much would one care for Plymouth Rock, if the

English Puritans had purchased and removed it to some quiet nook in England? How much for the Alhambra, if by some piece of bad fortune it had been transferred into Holland, where Moorish feet had never trod? If this trade were to be carried on in a wholesale manner, the day might come when we could look for the Taj in Sheffield and Napoleon's tomb in Tokio.

It will have to be admitted that the moving of Libby Prison was very successfully accomplished so far as the actual work was concerned, and the poor old John Brown fort will probably be as successfully transplanted. It will be sheltered under a huge cast-iron shell, the shell being over fifty feet at its base and about fifty feet high. Ground has already been broken and the large arches for the framework are being put in place. In a shed at the rear of the lot are piles of weather-beaten bricks, said to have once been part of the old fort from the banks of the Potomac. Relics of the famous John Brown's raids and slavery days will fill the building, as old prison relics fill the Libby Prison.

The local papers are generally excited over an ordinance which has been passed by the City Council granting a franchise of the broadest kind to a corporation bearing the attractive, and it is said delusive title, of "Chicago Power-supply and Smoke-abating Company." While the papers are thus engaged in tirades against the action of the Council, in allowing to spring into existence what, it is said, will be the monopoly of monopolies, a great blessing, which the community may possibly escape, has been overlooked. This is no less than the decision made by the Public Service Committee of the County Board, relative to the proposed two-story addition to the Court-house. The Committee has decided to recommend that the idea be abandoned on the ground that:

"The building would have to be vacated while the improvements were being made, owing to its peculiar construction. As a further fact the roof would have to be taken off and the outside wall would have to be taken down from twelve to ten feet, to get at a starting-point and foundation, thus exposing the whole fourth floor to the elements. The Committee is therefore of the opinion that the two additional stories would not compensate for the advantages gained."

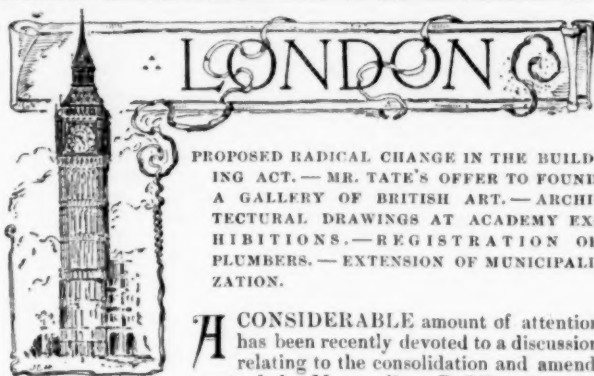
The reasons of the committee do not seem to be very convincing, but so long as the two stories are not added to the present monstrosity, no one cares by what argument the powers that be are affected. The architect, who has been consulted about this improvement, is most straightforward in his opinions. Though he gives but little weight to the objections of the committee, he suggests that to him the greatest obstacle is this, "that while the City and County Buildings are really parts of one structure, the City Building could never be raised to the proposed level of the County Building, because it was not built on piles and could not stand the extra weight. As it is, it has sunk to such a degree that there is scarcely a straight line in it." The effect of this building with one side rising two stories higher than the other would be startling to say the least, and to think of laying out upwards of two hundred thousand dollars on a building which is already such a wretched failure seems worse than folly.

Affairs in building circles seem to be in a state of tranquility, and as far as the owners are concerned, building operations seem to be in a very prosperous condition. No strike of any importance seems imminent this spring, and it is to be hoped this season will pass without the usual conflict between employer and employé. As the first of May approaches the many large office-buildings, which have been in process of construction through the past year, are nearing completion and will probably be noticed individually in a later letter.

The Art Institute has this month had an exhibition, which as being the first of its kind here in Chicago, has attracted a good deal of attention. It was the collection of perspective drawings, either in pen-and-ink or water-color, which was arranged by the American Institute of Architects, and which has been exhibited in many cities East and West. It comes here directly from St. Louis, receiving some additions from local architects. The exhibition in itself is interesting, but it is chiefly worthy of notice as being the first of its kind and exciting an interest, which if followed up by further exhibitions, might do much to enlighten and elevate the architectural taste of the public.

The Spring Water-color Exhibition follows close upon this one, in the galleries of the Art Institute, being fairly opened by the time of the publication of this letter.

WESTMINSTER CLOCK.—A correspondent of the *Standard* thinks that the makers of the proposed new turret-clock for St. Paul's Cathedral will have all their work cut out in beating the Westminster Clock, the time-keeping qualities of which, he says, "are as near perfection as we can ever hope to attain in a turret-clock, and are certainly far in excess of the practical needs of the public." The clock is in electrical communication with Greenwich, and it is stated that during a year's continual observation—with the exception of fourteen days, when the signals failed—the error of the clock was insensible on 42 per cent of the days of observation. It amounted to one second on 29 per cent, to two seconds on 22 per cent, and to four seconds on 2 per cent; for confirmation of which, see the *Horological Journal* for July, 1891. This is surely a wonderful clock, and hard to beat. The correspondent omits to explain the cause of the slight variations of the clock; but I believe that pressure of the wind on the large hand has much to do with this. Moreover, a clock mounted high in a tower, however solidly built, must be more or less affected by vibrations. Putting the Westminster clock in the most favorable position for record-breaking "going," it should give some very extraordinary results indeed.—*Building News*.



PROPOSED RADICAL CHANGE IN THE BUILDING ACT.—MR. TATE'S OFFER TO FOUND A GALLERY OF BRITISH ART.—ARCHITECTURAL DRAWINGS AT ACADEMY EXHIBITIONS.—REGISTRATION OF PLUMBERS.—EXTENSION OF MUNICIPALIZATION.

A CONSIDERABLE amount of attention has been recently devoted to a discussion relating to the consolidation and amendment of the Metropolitan Building Acts, by means of which the erection of buildings in London is controlled.

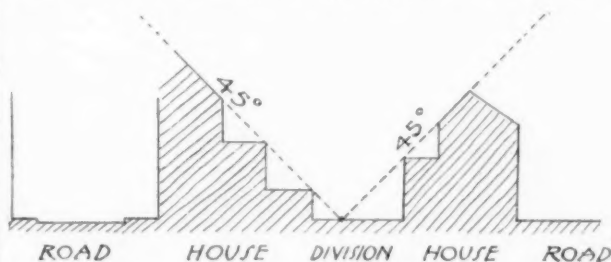
As I have before explained, Mr. Ritchie, the President of the Local Government Board, has expressed his intention of reviewing and amending London's Building Acts in the same way that he reviewed and amended the Acts relating to the housing of the poor, and the public health. The Building Act Committee of the London County Council have been engaged for many months in drawing up certain suggestions for the consideration of the Government and these suggestions were adopted at a recent meeting of the Council. Similarly the Practice Standing Committee of the Institute of Architects have also been engaged in drawing up a code of suggestions, which were considered by the Institute upon the 8th of February.

It will not be possible for me to give you the whole of the suggestions emanating from the two public bodies I have referred to, nor would any useful object be gained thereby; I propose, therefore, to select a few of the salient points under discussion, and to confine myself to them.

One of the chief questions under consideration is the question of open spaces at the rear and sides of dwelling-houses. The provisions in the existing acts which govern this question are meagre in the extreme. The act provides that "Buildings used, or intended to be used, as a dwelling-house, unless all the rooms can be lighted and ventilated from a street or alley adjoining, must have in the rear or side open space exclusively belonging thereto of at least 100 square feet." This clause only deals with houses erected on land previously occupied with buildings and it is obvious that it is entirely inapplicable to modern requirements. Take for example, a high factory, a block of offices or flats. No matter how lofty the building is, the miserably inadequate area of 100 square feet fulfils all the requirements of the act, if buildings had previously occupied the site; or, still worse, it has been decided that if the back rooms of a building are "lighted" by means of borrowed light from the front room, there need be absolutely no yard-space at all. So much for buildings upon land previously occupied by buildings. If such be not the case, a different clause in an amending act provides as follows: "New buildings begun to be erected on a site not previously occupied, in whole or in part, by a building intended to be used as a dwelling-house, must have in the rear thereof, exclusively belonging thereto, an open space above the level of the ground-floor story of the following extent: If the frontage be 15 feet or under, 150 square feet at the least," and so on by an ascending scale, varying with the frontages.

These two clauses are the only enactments in force in London at the present time governing the amount of open space at the rear of houses. Consequently, in a city where land is so very valuable, every inch of available space is taken up by buildings. There are many whole blocks of buildings in the City and East End where there is no yard-space at all, below the level of the first floor, the ground-floor being entirely built over and any deficiency of light being made good with gas. This state of affairs is productive of great evils to the health and well-being of the community, and one of the chief amendments in the new act will certainly be the strengthening of these hygienic clauses.

The difficult question is how these clauses are to be strengthened without unduly diminishing the value of land for building purposes. The County Council in their suggestions have made a proposition of a somewhat radical character. They propose that a line shall be



drawn from the bottom of the boundary wall at the back of a building plot, at an angle 45° with the horizon and that no building or part of a building shall be permitted to encroach upon this line.

This sketch diagram will help to explain roughly the operation of

the clause and there is little doubt, that if the building interests are not sufficiently strong to obstruct the passing of such a clause through Parliament, the result of such a provision would be of a very beneficial character to the community. The proposal has, however, already aroused very strong opposition and the Institute of Architects do not approve of it. Mr. E. I. Hall, who represents the Practice Standing Committee of the Institute, said at a meeting held on the 8th of February, that "the London County Council were now going to an extreme in proposing to require an open space at the rear, not only of domestic, but of all buildings, which space between the opposite backs of two buildings would be practically double the width required between the opposite fronts of buildings." He considered that the proposal would afford room for much litigation and its ultimate abrogation by evasion. Unfortunately the alternative suggestions put forward by the Institute are of a very meagre character, in fact, they practically leave the existing restrictions where they are, their chief alteration being the introduction of saving clauses to the following effect: "But in no case shall such space be less than 100 square feet in area and such open space shall be in no part of less width than 10 feet between the rear wall of such building and the rear boundary of the site." This is, of course, absurd in buildings of seventy or eighty feet high and it therefore seems that unless the Institute can show a clearer appreciation of the difficulties, the Government will be more likely to adopt the Council's proposal.

I understand that draft suggestions are being drawn up by several other bodies, including the Surveyor's Institution and the Art Workers' Guild, so it will be perhaps better to defer a detailed consideration of the various proposals until they are fairly complete.

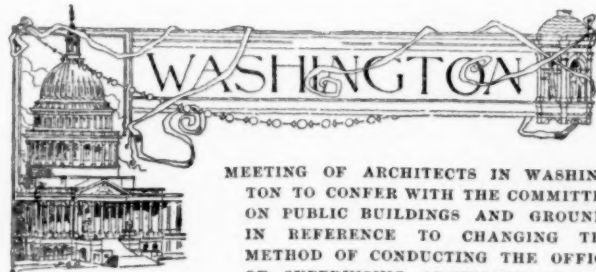
Some months ago I reported to you that an English gentleman, Mr. Henry Tate, had offered his collection of pictures to the estimated value of £70,000, to found a National Gallery of British Art. "This collection, including the works of modern and for the most part of living English painters," said Mr. Spielmann in an article upon the question, "was, with the exception of a few canvases, of the first importance, for Mr. Tate is a connoisseur of considerable taste, with a ready ear for good advice; and inspired with patriotic feelings, he desired to leave it to the enjoyment of his countrymen. Such was the munificent offer of a generous man to his country. Let us see how his country treated him. The offer was originally made to the trustees of the National Gallery, but the trustees, after full and careful consideration, regretted to have to decline the offer. The Chancellor of the Exchequer announced this decision from his place in the House of Commons, offering at the same time the eastern and western galleries at South Kensington. While this proposal was being considered, a new suggestion was mooted: that a new gallery should be erected in Kensington Gardens in close proximity to Kensington Palace. This proposition met with a considerable amount of support, but in the midst of the discussion, the Government announced that they had come to a decision in favor of the South Kensington Galleries which were pronounced to be in every way suitable for the purpose. Then everything seemed settled, but Mr. Tate ultimately declined the offer of the Government, and anxious that his pictures should not be housed in an unsuitable building, offered the sum of £50,000 to build a new gallery, provided that the Government would find a suitable site. He suggested a piece of land at the corner of Imperial Institute Road and Exhibition Road, a request which the Treasury seemed half-inclined to grant. Thereupon arose a veritable storm of indignation against the implied breach of faith on the part of the Government, not alone in the Science Department, but from the whole scientific world. A petition was hastily drawn up to which the signatures of few eminent men of science were wanting and the Government had to yield at discretion; for the site half-snatched from Mr. Tate, was a portion of the ground set apart for the new Science Museum, which a strong Treasury Committee had a short time before reported to be imperatively needed. The British Gallery warned off this ground, was thus adrift again." And it wandered on, trying to rest on the Embankment, on a vacant site belonging to the city. Suggestions were made for various other sites, but none seemed to suit and at last Mr. Tate has withdrawn his offer, pictures, gallery and all. Whose fault it is, I know not, but the result I know too well,—England has lost the finest collection of pictures of British Art ever offered to her.

The *Builder* has taken a useful step by the publication of a reprint of those designs exhibited in the Academy last year, which were reproduced in its columns. We have for a long time needed some record in a convenient form of the best architectural work of the year and this seems to supply the need. A very good attempt in this direction has been made during recent years by Messrs. Koch and English by the issue of a small book entitled "*Academy Architecture*," but the chief fault of this was that the reproductions were too small for any practical purpose. The *Builder's* album is, however, of folio size and the editor is thus enabled to do justice to the drawings entrusted to him. Some of the designs exhibited are very good, and some bad enough to make one wonder how they come to be where they are. The general impression of the whole is perhaps a good one. Of course it is difficult to estimate the progress of our art during the past year, because we are too much influenced by current fashion and talk to be able to pronounce an altogether unbiassed opinion. It is all very well to say that there should not be any such thing as "fashion" in architecture. Very likely there

should not, but we can hardly live in the midst of current thoughts uninfluenced one way or the other by what goes on around us. We are apt also to be perhaps over-influenced by eclecticism. That we are eclectic in our tendencies, no one denies, but is there not a universal spirit of the ages underlying the efforts of individuals? And the spirit of nineteenth-century architecture in its declining days seems to be leaning towards simplicity and dignity. We see this spirit in many forms. Mr. Brydon gives it to us in the Renaissance, Mr. Sedding and Mr. Leonard Stokes in the Gothic. We are, I think, trying to build artistically and devoting our attention to the color, form and shape of our masses, rather than to the importance of useless forms and features because they are "in style."

A Bill has been introduced into the House of Commons for the Registration of Plumbers, I have explained in a former letter what the City Companies, the representatives of the old Trade Guilds are doing for the technical education of mechanics and the Plumbers' Company has been to the fore-front in this work. For a long time they have had this matter in hand in a voluntary way but now they are endeavoring to obtain legal authority for their work, and I have little doubt that the Bill will become law and that the plumbers of the future will really be able to interpret the architect's wishes satisfactorily and to execute their important work in a workmanlike and efficient manner.

As I am sending this to you, the returns of the new London County Council are coming in, and it is the most radical council yet elected. The progressives who have an enormous majority are pledged to the municipalization of the water-supply, the gas-supply, the markets, the docks, the tramways, the hospitals, dwellings for the poor to an enormous extent and to a number of political questions that will not interest you here. It is difficult at this early stage to estimate the result of this election, but it must certainly be very great.



A meeting of architects was held in Washington Friday, March 11. The outcome of this meeting may, and I hope will be of lasting value to the country and to the architectural profession. To the country by giving more artistic and better constructed Government buildings for less money than is now paid. To the profession by giving the educated, artistic and ambitious men an opportunity to design and construct some of the Government buildings.

The effort to change the method of administering the Supervising Architect's Office was made some years ago by the introduction of the Stocklager bill, on December 4, 1884. This bill went very minutely into the details of administration of the Supervising Architect's Office, the method of selecting plans by competition, the board who should examine plans, the amount that should be paid for certain plans, as well as the prizes to be paid to competitors. [See *American Architect* December 20, 1884, for full description of bill.] This bill apparently received very little attention in Congress. A committee composed of Messrs. Bloor, Adler and Burnham came to Washington to advocate the passage of this or a similar one before the Congressional Committee having the matter in charge. They were received coldly and their explanations listened to with indifference. All know how this matter was again brought up before the Institute by a paper read in Boston by Mr. J. H. Windrim, ex-Supervising Architect. The Directors of the Institute seem to have determined not to let the matter rest. A bill prepared by the committee has been introduced by Mr. John C. Tarsney, member from Missouri. The text of this bill which has been distributed to members of the American Institute of Architects is as follows:

Fifty-Second Congress.

In the House of Representatives.
January 5, 1892.

Read twice, referred to the Committee on Public Buildings and Grounds and ordered to be printed.

Mr. Tarsney introduced the following bill:

A Bill.

Authorizing the Secretary of the Treasury to obtain plans for public buildings to be erected under the supervision of the Treasury Department.

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Treasury is hereby authorized in his discretion to obtain plans, drawings and specifications [The word and supervision was inserted here.] for the construction of public buildings for the United States, authorized by Congress to be constructed under the supervision and direction

"of the Secretary of the Treasury, by direct selection [the words 'by direct selection or,' were omitted by advice of Congressional Committee], or competition of architects under such conditions as he may prescribe, and to make payment of the expenses and for the services of said architects out of the appropriations for the respective buildings: *Provided*, That the general direction of the work shall continue under the office of the Supervising Architect of the Treasury Department, the Supervising Architect to be the representative of the Government in all matters connected with the erection and completion of such buildings, the receipt of proposals, the award of contracts therefor, and the accounts and disbursements of moneys thereunder, and perform all the duties that now pertain to his office, except the preparation of drawings and specifications for such buildings," the said "drawings and specifications, however, to be subject at all times to modifications and changes relating to plan or arrangement of building and the selection of materials therefor as the Secretary of the Treasury may direct."

The question being referred to the Committee on Public Buildings and Grounds, the architects were granted an audience before this Committee on Friday, March 11, 1892. The following architects were present in the committee-room: E. H. Kendall, New York, Alfred Stone, Providence, and Dankmar Adler, Chicago, President, Vice-President and Secretary respectively of the American Institute of Architects; C. F. McKim and A. J. Bloor, New York, W. W. Carlin, Buffalo, N. Y., T. P. Chandler, Philadelphia, Arthur Rotch, Boston, W. R. Briggs, Bridgeport, Conn., C. E. Illsley, W. S. Eames, St. Louis, Mo., G. B. Ferry, Milwaukee, Wis., W. W. Poindexter, Glenn Brown, Leon E. Dessez, J. G. Hill and Jos. H. Hornblower of Washington, D. C.

The committee-meeting was called to order about 10.30 and Mr. E. H. Kendall made an historical address showing the desirability from an artistic standpoint and the advantages that would accrue to the Government if the work were given to different men of ability, proving by examples that one man could not attend with advantage to a large number of large buildings at the same time. Mr. Dankmar Adler was called upon by the President, Mr. E. H. Kendall, to give some practical reason why such a change was desirable. The points of economy in the erection of the buildings, the care with which the building would be supervised, and the speed with which the construction would be carried on as proved in similar structures erected by private corporations under private architects, were clearly brought out by Mr. Adler. Mr. Windrim was expected to be on hand to give some of the facts as to the methods of designing and supervising buildings in process of construction in the Supervising Architect's Office, but important business detained him in Philadelphia.

The Congressional Committee at twelve o'clock adjourned, requesting the architects to meet them again at two o'clock, as they were interested and wished to get to the bottom of the matter.

At two o'clock, a full committee and the above-named architects again met in the committee-room. Mr. Adler was questioned closely in reference to the points made by him, the committee showing a thorough appreciation of the subject under discussion, one stating that the Supervising Architect was really performing clerical duties, while clerks were performing the architect's service. The Supervising Architect required so much time to read and answer correspondence, to interview and be interviewed by Congressmen, to sign different papers and letters—in other words, to attend to routine business—that no time was left for designing or examining into the construction or economical features of the different buildings under his charge. The poor result produced is no reflection upon the Supervising Architect, as no man, however great his ability, could give proper attention to the work that goes through this office.

Mr. J. G. Hill was questioned in reference to the Supervising Architect's office. He stated that the views of the visiting architects in reference to the time the Supervising Architects could give to designing and planning of the buildings under their charge were correct. He thought that Government buildings cost about twenty per cent more than private buildings of like character, and the reason for the increased cost he attributed to appropriations being made in some instances so the buildings could not be carried on expeditiously, in most cases to the necessity of allowing subordinates to design, plan and construct Government buildings, and the many changes required are caused by the same reasons.

Mr. Briggs gave a short description of the method adopted in France in the distribution of Government work by limited competition among men who were first selected by examination.

Mr. Carlin spoke on the point of limiting the competition to selected men, mentioning the bill which is now before the New York Legislature. [This bill has already passed the New York House of Representatives, and there seems no doubt but that it will pass the New York Senate.] He said that it would be well to require all who wished to compete for Government work to have a certificate such as will be issued in New York. A requirement like this would soon cause other State legislatures to pass bills regulating the practice of architecture. This would soon lift the profession out of the anomalous position it now occupies, any one, no matter what his lack of capacity or fitness, now being able to assume the title of architect.

One of the Committee asked if there was any legal restriction upon the practice of architecture, the idea being what protection

would the Government have from a horde of incompetents if the work were thrown open to competition. The answer was: the only method of protection would be by a limited or a selected competition. The requisites for admission to the American Institute of Architects were given by request.

Some of the House Committee furnished excellent arguments to the architects: the habit of duplicating plans, using a set that may be suitable in one place for building where the same conditions do not arise. A member told of one building that was erected in his neighborhood. The natural formation was a hard limestone. This was blasted out for foundation walls to a depth of thirty feet below the cellar bottom, the stone was taken away and used in foundation walls elsewhere, and these deep trenches were filled with rubble stone masonry. This happened because plans were used of a building that had been erected where made or marshy ground existed.

Another instance was given of a building where the appropriation was made some six or seven years ago in a lump sum of \$1,250,000, in which the cellar of the structure was not yet complete. If I recollect aright, this was the Detroit Post-office, which has gone through many vicissitudes since it was first designed during Mr. Bell's incumbency.

The Congressional Committee did not think it would be wise to have direct selection, as they state it, as it would be liable to end in the selection of one man to do the work, as at present. They favored a limited competition, and they also favored giving the architect who designed the buildings the supervision of the work. This had been omitted in the bill as read.

Mr. Adler gave the cost of some of the new office-buildings in Chicago per cubic foot. The "Rookery" cost about 34 cents per cubic foot, and the "Auditorium" about 35, while similar construction under Government cost about 39 or 40. The Boston Library will cost about 50 cents, while Government buildings of like type have cost from 60 to 100 per cubic foot. (The cost of Government buildings being taken from data from the Supervising Architect's office published some years ago.) Supervising Architects Potter, Hill, Bell and Windrim have put themselves on record advising legislation of this character. The Congressional Committee adjourned about 5 o'clock, having given the architects nearly five hours altogether to explain their position in the matter.

Both parties seemed to be pleased with each other, and the architects left the city feeling confident that the Committee on Public Buildings and Grounds would recommend the bill favorably to the House of Representatives.

Mr. Richard M. Hunt arrived Friday night, and gave his time on Saturday to personal interviews with Congressmen in reference to the passage of the bill. The architects were unable to obtain a hearing before the Senate Committee during this visit to Washington.

CONSTRUCTION.²—V.



ALREADY, at the beginning of the twelfth century, the pointed arch was adopted for the large cradle-vaults in a part of Burgundy, in Ile-de-France and in Champagne; that is to say, in the provinces which were the most advanced and most active, if not the richest.

The high naves of the churches of Beaune, of Saulieu, of Charité-sur-Loire, of the Cathedral of Autun, are covered by cradle-vaults formed by two intersecting, circular arcs, although, even in these structures, the archivolts of the doors and windows remain full-centre. It is a necessity of construction which imposes the divided arch upon these edifices, and not an individual taste; for (a remarkable fact) all the architectural details of these monuments reproduce certain antique forms borrowed from the Gallo-Roman edifices of the Province. Thanks to that innovation of the divided arch

¹ This clause will necessarily be changed to conform with the change made in the fourth line in reference to supervision.

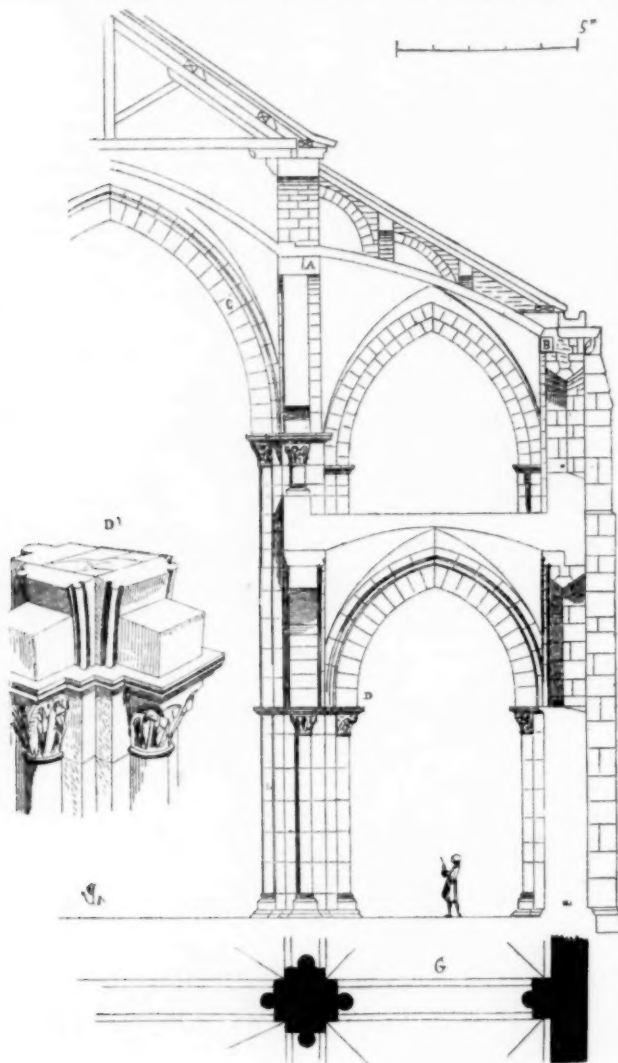
² From the "Dictionnaire raisonné de l'Architecture Française," by M. Viollet-le-Duc, Government Architect, Inspector-General of Diocesan Edifices, translated by George Martin Huss, Architect. Continued from No. 845, page 154.

applied to cradle-vaults, these churches have remained upright until our day, not, however, without having suffered disturbances grave enough to necessitate, two centuries later, the use of new means suitable to prevent their ruin.

But the edifices in which one grasps the transition from the Romanesque system of construction to that known as Gothic, is the porch of the church at Vezelay. This porch is in itself alone a monument, consisting of a nave in three divisions with aisles and vaulted gallery above.

The plan of this porch, built about 1150¹ is entirely Romanesque, and does not differ from that of the nave, built fifty years earlier; but its cross-section presents notable differences from that of the nave.

Already, toward the end of the eleventh century, the constructors of the nave of the church of Vezelay had taken a great step in replacing the high vaults, hitherto cradle-shaped, by groined vaults; but these vaults built upon an oblong plan, and produced by transverse arches and semicircular rib-arches, show us the gropings, the



uncertainty, and the inexperience of the constructors (see "*Architecture Religieuse*" Fig. 21). In the porch, all the arches are pointed, the vaults are groined without projecting diagonal arches, and constructed of plastered, rough stones; the high vaults are very skilfully buttressed by those of the galleries of the first story. This ensemble presents a perfect stability.

We give (Fig. 19) the cross-section of the porch of Vezelay: the vaults of the galleries are produced by the wall-arches *A*, of the great vaults, which are true archivolts, and by the wall-arches *B*, whose origin is much lower down; hence the slope *AB* of the key-stones of the lateral vaults, which form a continuous abutment enclosing the large vaults.

The divisions were oblong, and the wall-arches starting on the same level as the transverse arches *C*, the key-stone of these wall-arches *A* is on a lower plane than the keys of these transverse

¹ It must here be said that the Burgundian architecture was at least twenty-five years behind that of Ile-de-France; but transitional monuments in Ile-de-France are wanting. The Church of Saint-Denis, built about 1140, is already almost Gothic as to its construction, and the intermediate edifices between that and those plainly Romanesque no longer exist, or have been almost entirely modified in the thirteenth century.

arches; the great vaults, in consequence of this arrangement, are very much elevated while their projecting groins are barely perceptible.

At *D'* we have represented the detail of the abutments of the arches at the level *D* of the pier, and in *G* the ground plan, with the starting point of the arches and groins of the vaults.

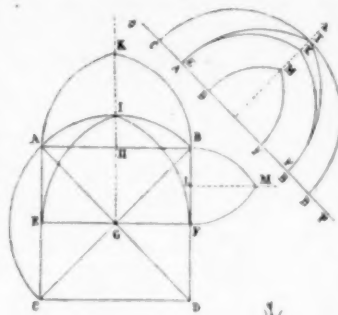


Fig. 20.

Fig. 20b.

This construction of vaults resembles in no respect the Roman construction; already the principle of independence between the different parts of building is conceded and developed.

Nevertheless, these vaults of the porch of Vezelay, except two, are not provided with visible ribs. They are held in place only by the adhesion of the mortar, and form each a homogeneous, concrete cavity like the Roman vaults. The only two vaults of this porch possessing groins could do without them; these are only a decoration, and do not really support the filling of rough stones. But there is in that an attempt which soon had important consequences.

The builders had already obtained, by means of the transverse arches and wall-arches, independent and resistant for each vault, a sort of elastic frame upon which, if any disturbance occurred, these vaults could move independently of one another. They wished to go farther: they wished the concave triangles of these vaults to be themselves independent of each other; and to do this, they composed the vaults of two quite distinct elements; the arches and the

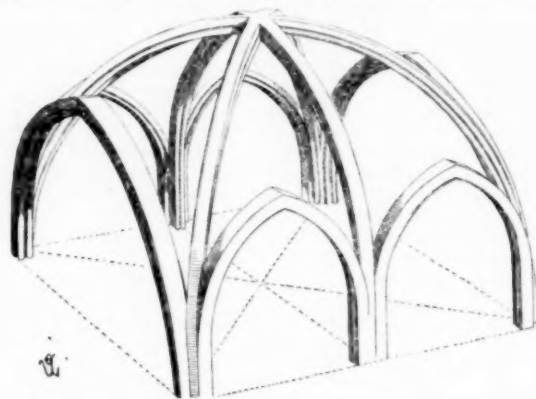


Fig. 21.

fillings; the arches considered as permanent, elastic centres, and the fillings as neutral concavities designed to close up the empty triangles left between these arches.

They began by avoiding a preliminary difficulty which had hitherto always bothered architects; they returned to the vault on a square plan, consisting of two oblong divisions, if necessity demanded it. In other words, they designed their vaults in a horizontal section, as indicated in Figure 20.

Let *ABCD*, be a square, perfect or nearly so, it matters little, containing two divisions of naves *AEBF* and *ECFD*; the diagonals *AD* and *BC* are those which produce the vault; and these two diagonals are the diameters of two perfect semicircles,

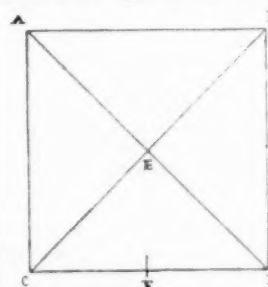


Fig. 22.

represented in the plans; these two semicircles, being of the same diameter, necessarily meet at the point *G*, which is the crowning key-stone. Taking a distance equal to the radius *GA*, and moving this radius around to the perpendicular *GI*, we have described the pointed-arc *EIF* in such a way that the point *I* falls on the point *G*; this is the transverse arch whose horizontal projection is in *EF*.

Taking a line shorter than the radius *GA*, but greater than one-half *AB*, the width of the nave, and moving it around upon the perpendicular *HK*, we have described the pointed arc *AKB*; this is the transverse arch whose horizontal projection is in *AB* or *CD*.

Finally, taking a line *LM* shorter than the line *HK* and longer than one-half of the line *BF*, we have traced the pointed arc *BMF*, which is the wall-arch, whose horizontal projection is in *BF*, *FD*, etc.

Cutting wooden centerings in accordance with these four curves laid out, upon the same line *OP* (Fig. 20b), we fix the arches

in stone on the extrados of these centerings, and we have obtained the framework of the vault represented by Figure 21.

These are the primitive vaults called ogival arches. It will be noticed that these vaults are produced by a semicircle, which in the first place furnishes the diagonals: it is the semicircle which governs the height of the pointed arches.

The pointed or ogival arches, it may be said in passing (for thus the diagonal arches are named), are, then, full-centered, which indicates clearly enough that the word *pointed* is not appropriate for the broken arch. But this is not the moment to discuss these words (see "*Ogive*"), and our remark is made here only to point out one of the numerous errors upon which people rely, to judge of an art with which they are but slightly acquainted.

The broken arch had been adopted by the last Romanesque architects, as we have seen above, to lessen the effects of the pressures. Now its function increases, and it becomes a practical means of closing vaults whose real generator is the semicircular arch.

When (Fig. 22) a groined vault is formed by two semi-cylinders at right angles, the arches $A B$, $C D$, $A C$ and $B D$ are semicircular, and their intersections $A D$ and $B C$ are elliptical, since the key E does not rise above the level of the key F , while the diameters $A D$ and $B C$ are longer than the diameters of the semicircles $A B$ and $C D$.

This brings no danger if the vault $A B, C D$ is homogeneous and concrete; if it forms a crust in one piece like the Roman vaults.

But if the builder wishes to preserve in the triangles of his vaults a certain elasticity, if he wishes to give sinews to the diagonal groins

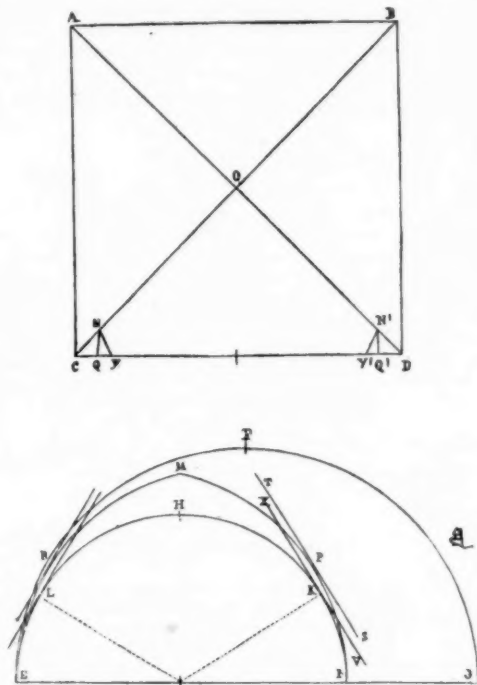


Fig. 23.

$A D$ and $B C$, if he wishes to have the triangles $A B E$, $C D E$, $A C E$ and $B D E$ rest upon these sinews as upon permanent centerings and if this vault has a great extent — then one perceives that it would be imprudent to draw the diagonal arches $A D$ and $B C$, which fulfil so important a function, upon a curve which should not be at least a semicircle.

If this design is not absolutely contrary to good construction, it presents, at least, difficulties of execution, either in finding the points through which these elliptical curves must pass, or in shaping the voussoirs. The semicircular arch avoids these difficulties, and is incomparably more solid.

The first builders of purely Gothic vaults do something very simple in appearance; instead of describing the semicircle upon the diameter $A B$ like the Romanesque builders, they describe it upon the diameter $A D$. There in reality is their only innovation, and in adopting it they suspect nothing, we believe, of the consequences of an act apparently so natural. But in the builders' art, essentially logical, and based on reasoning, the least deviation from the established methods rapidly brings necessary and rigorous consequences, which carry us far from the point of departure.

It must be said that the first Gothic builders, repelled not unreasonably by the attempts of the Romanesque builders, who generally arrived at deceptive conclusions, were not alarmed by the results of their new methods, but on the contrary sought, with rare sagacity, to profit by all the resources offered to them by these methods.

The Gothic builders had not discovered the broken arch; it existed, as we have seen above, in the constructions whose system was perfectly Romanesque.

But the Gothic architects applied the broken arch to a system of construction of which they were indeed the true and only inventors.

There were broken arches, in the twelfth century, in all Western Europe. There is no Gothic construction of that epoch except in

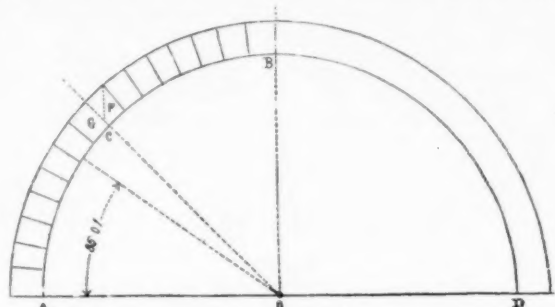


Fig. 24.

France and upon a small part of its present territory, whatever they may think who do not admit that anything was invented among us before the sixteenth century.

It is with the broken arch as with all human inventions, which are in a latent state long before receiving their true application.

Gunpowder was invented in the thirteenth century, but it was not really used until the fifteenth, because the time had then arrived when that agent of destruction found its necessary application.

It is the same with printing; at all times men had made stamps, but the idea of joining letters of wood or of metal and printing books came only when many people knew how to read, and when instruction and knowledge were spreading among all classes and were no longer the privilege of a few monks shut up in their cloisters.

Leonardo da Vinci, and perhaps others before him, had foreseen that steam would become a motive power very easy to use; still, men have made steam engines only in our time, because the moment had arrived when that agent, by its power, was alone capable of satisfying the needs of our industry and our activity.

It is, then, childish to say that since the broken arch belongs to all times, the builders of the twelfth century can lay no claim to its invention. Certainly, they had not discovered it, but they have used the resources that it presents by virtue of its properties, in building; and, we repeat, it is only in France — that is to say, in the royal domain and several neighboring provinces — that they have known how to apply it in the art of building, not as a form chosen by caprice, but as a means of extending a principle whose serious and useful consequences we are about to make known.

If, in adopting the semicircular arch for the diagonals of vaults, the builders at the end of the twelfth century had wished to apply it to transverse and wall arches, they would in the beginning have taken a step backward, since their predecessors had adopted the pointed arch, in consequence of unfortunate experiments, as having less thrust than the semicircular arch; and then they would have found themselves greatly embarrassed about closing their vaults.

In fact, the keys of transverse arches and of wall arches described upon a semicircle would be found so much below the level of the keys of the pointed arches that it would have been difficult to close up the filling with stones, and that, had they closed them, the appearance of these vaults would have been very disagreeable, and their thrust considerable, since it would have been caused by, first, the transverse semicircular arches, and then by the enormous weight that the stone filling would have added.

On the contrary, the advantage of the tierce-point arch adopted for the transverse arches, in the vaults with pointed arches, is not only that it has a very slight thrust by itself, but also that it reduces a great part of the weight of the stone filling, or rather, renders the pressure of that weight almost vertical.

In fact, let Figure 23 be the plan of a vault with pointed arches; if the arches $A D$ and $C B$ are semicircular, and if the transverse arches $A B$ and $C D$ are also semicircular, the representation in elevation of these arches will give, for the pointed arches the semicircle $E F G$, and for the transverse arches the semicircle $E H I$.

In this case the stone filling of the triangle $C O D$ will weigh upon the circular arc $K H L$; in other words, about three-fifths of the semicircle. But if the transverse arches are drawn according to the broken arc $E M I$, the stone filling of the triangle $C O D$ will weigh only the portion of that are comprehended between $P M R$, the points P and R being given by a tangent $S T$ parallel to the tangent $V X$, and the portions of the filling included between $E R$ and $I P$ will act vertically.

If the transverse arches are semicircles, the oblique weight of each triangle of filling-stones will be $O N Q Q' N'$; while if they are drawn in tierce-point, that weight will be only $O N Y Y' N'$. The experimental method sufficed to give these results, and at the end of the twelfth century the builders had no other. It is our work to demonstrate the exactitude of that method.

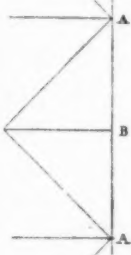


Fig. 25.

We have just said that the point *K*, where the weight of the filling begins, gives an arc *IK*, which is about one-fifth of the semicircle. Now (Fig. 24) let *AB* be a quarter of a circle, *OC* a line drawn at 45 degrees dividing this quarter of a circle into equal parts; voussoirs placed from *C* to *B*, if not supported by the pressure of other voussoirs placed from *B* to *D*, will sway, according to the laws of gravity, and consequently push against the voussoirs set from *A* to *C*.

So it is at *C* that the rupture in the arch must take place; but account must be taken of the friction of the surfaces of the voussoir beds, and of the adhesion of the mortar. This friction and adhesion are still enough to maintain the voussoir *F* in its place and unite it firmly to the lower voussoir *G*.

But the voussoir *F*, sharing in the weight of the voussoirs set from *F* to *B*, carries along with it the voussoir *G*, and sometimes one or two below it as far as the point where the sections of the voussoirs give an angle of 35 degrees, which is a little less than a fifth of the semicircle.

It is only above this point that the rupture takes place, when it must occur (see Fig. 16) and consequently that the actual weight begins.

Whether the calculation be theoretical or practical, it is certain that the builders of the twelfth century counted upon some time reducing the thrusts of the vaults enough to do without buttresses, and to maintain the vaults upon piers of moderate thickness, provided they were weighted; for they did not think at first, that it was necessary to oppose flying-buttresses to the thrust that they believed

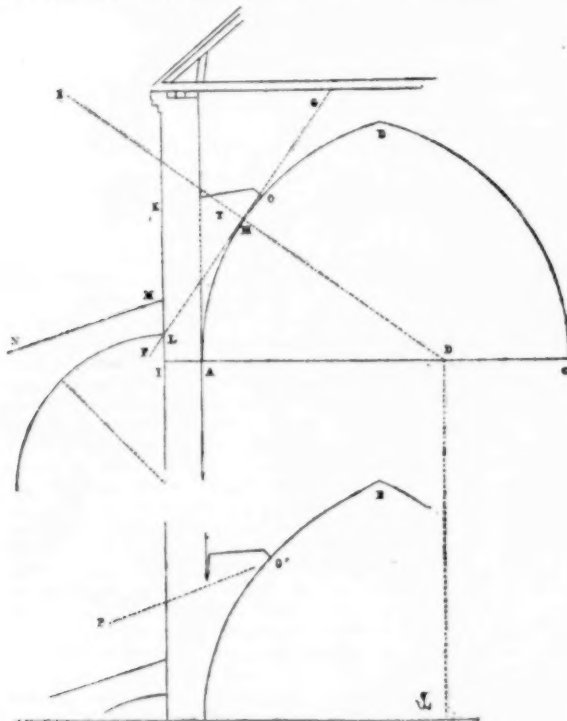


Fig. 26.

themselves to have almost annulled, whether by the obliquity of the pointed arches, or by the broken curve of the transverse arches. Still, experience showed them that they were mistaken. The resultant of the oblique thrusts of the semicircular pointed arches, added to the thrust of the transverse arches in tierce-point, was strong enough to overturn piers which were very high above the ground and were only a collection of uprights without breadth of base. So they set flying-buttresses, at first only on a level with the points of junction *A* of the three arches (Fig. 25) and dispensed with them at the height of the points *B*, receiving the detached transverse arches. But to what level carry the tops of these flying-buttresses? There lay a difficulty so much the greater, since theoretical calculation gives no certainty on this point, and long experience alone can show it. As far as we can judge by the small number of primitive flying-buttresses preserved, the following is the method followed by the architects.

Let (Fig. 26) *ABC*, be the transverse arch separating the great vaults, and from the point *D*, the centre of the arch *AB*, let a line *DE* be drawn, making an angle of 35° 0' with the horizon; let *FG* be a tangent at the point *H*, let *AI* be the thickness of the wall or of the pier; then the tangent *FG* will meet the exterior line *IK* of the pier at the point *L*.

This is the point that gives the intrados of the highest voussoirs of the flying-buttress.

That arch is then a quarter of a circle or a little less, its centre being placed upon the prolongation of the line *KI* or a little inside of that line.

The load *MN*, put upon the flying-buttresses is fixed arbitrarily

at first sight at the summit *M*, strong above the abutment *N*, which gives a slightly perceptible inclination to the line *NM* of the coping.

Soon certain effects manifested themselves in these constructions, because of the thrust of the vaults and in spite of these flying-buttresses. The reason is this; behind the haunches of the arches and vaults at *T* they filled-in with masses of rubble-work, as much to load the piers as to maintain the haunches of the arches and their filling. These masses had, in fact, the advantage of hindering the arches from breaking at the point *H*; but the whole weight of the filling, acting from *K* to *O*, and that weight being considerable, there resulted a slight displacement of the key-stone *B*, the arch not being weighted from *O* to *B*, and in consequence a change of form, as indicated (Figure 26b).

This change of form produced a break at the point *O*, the upper level of the masonry, and hence a very oblique thrust *O'P*, above the summit of the flying-buttresses. Therefore the equilibrium was broken. Accordingly, it was necessary to rebuild all the flying-buttresses in the early Gothic monuments, some years after their construction; and then they either contented themselves with raising the summit of these buttress-arches, or they doubled them by a second arch (see "Arc-Boulant").

We do not gloss over the false moves of these constructors; but, like all those who enter a new field, they could reach the goal only after groping. It is easy to-day, when we have monuments built with skill and care, like the cathedral of Amiens or that of Rheims, to criticise the attempts of the architects at the end of the twelfth century. But at that epoch, when they possessed only Romanesque monuments, small and badly enough built, when the exact sciences were scarcely known, the new task that the architects imposed upon themselves bristled with ever-recurring difficulties, which they could conquer only by a series of observations made with the greatest care.

These are the observations which trained the skilful constructors of the thirteenth and fourteenth centuries.

[To be continued.]

DESIRABLE CIRCULARS.

THE Boston Manufacturers Mutual Fire Insurance Company has issued, from time to time as occasion has required, circulars on various subjects of interest at the time, and these it has made a practice of sending on application to any persons connected with property insured in any of the Factory Mutual Insurance Companies.

This practice is quite in the nature of the ordinary methods of promoting business, but when the promoters of systematic and careful investigation into building methods go farther than this and, through us, intimate to the architects and builders of the country their willingness to extend a similar courtesy to them, we hope their generosity will be duly appreciated and that the information contained in the following circulars may do missionary work amongst those who build other than mill buildings.

- No. 23. — Dampers in Dust Flues.
- No. 27. — Non-conductors for Steam Pipes.
- No. 28. — Hazard from Outside Electric Currents.
- No. 29. — Storage of Oil.
- No. 30. — Valves to Automatic Sprinklers, and Inspection of Hydrants.
- No. 31. — Storehouse Construction and Protection.
- No. 32. — Rules for Electric-lighting and Motive Apparatus.
- No. 33. — Slow-burning Construction, and Strength of Floors.
- No. 41. — Part 1. Pumps, Pipes, Hydrants and Hose.
- No. 41. — Part 2. Automatic Sprinklers.

PLATES ILLUSTRATING METHODS OF MILL-CONSTRUCTION.

- No. 1. — Standard Mill-construction.
- No. 2. — One-story Timber Storehouse.
- No. 3. — Two-story Timber Work-shop.
- No. 4. — One-story Mill, Plan and Details of Construction.
- No. 5. — One-story Construction especially adapted to Machine-shops and Paper-mills.
- No. 6. — Electric-light Station.
- No. 7. — Standard Storehouse Construction.
- No. 8. — Basement Floors.



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

HOUSE OF MRS. MARY F. MALLON, BOWDOIN AVENUE, DORCHESTER, MASS. MR. S. J. F. THAYER, ARCHITECT, BOSTON, MASS.

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

ROMAN RUINS IN THE GARDEN AT SCHONBRUNN, AUSTRIA.

STABLE FOR GEO. BLOCK, ESQ., PORTSMOUTH TERRACE, ROCHESTER, N. Y. MESSRS. GORDON, BRADON & ORCHARD, ARCHITECTS, ROCHESTER, N. Y.

FARM-COTTAGE FOR A. D. MCBRIDE, ESQ., IRONDEQUOIT BAY, N. Y. MESSRS. GORDON, BRADON & ORCHARD, ARCHITECTS, ROCHESTER, N. Y.

HOUSE OF MR. COLLINS, BRYN MAWR, PA. MR. GEORGE T. PEARSON, ARCHITECT, PHILADELPHIA, PA.

ODD FELLOWS HALL, PHILADELPHIA, PA. MESSRS. HAZLEHURST & HUCKEL, ARCHITECTS, PHILADELPHIA, PA.

[Additional Illustrations in the International Edition.]

A DETAIL OF THE HOTEL DE CLUNY, PARIS, FRANCE.

[Copper-plate Photogravure.]

As already announced this illustration partakes of the nature of a "premium" plate, and is of such size, character and excellence of execution that we trust many of our subscribers will feel that it is worthy of a frame and a space on the wall of office or study. It may add a little interest to its intrinsic value to know that the negative was made by the *American Architect* Travelling-scholar for 1891, Mr. Albert Kahn.

THE GRAND DUCAL PALACE, SCHWERIN, PRUSSIA.

[Gelatine Print.]

THE Grand Ducal Palace, begun in the early Renaissance style, from designs by Demmler, in 1845, and completed by Stüler in 1857, is an extensive structure with irregular wings flanked with lofty towers and enclosing a pentagonal court-yard, the whole producing, as shown, a very picturesque effect. As early as the beginning of the twelfth century, a palace of the princes of Mecklenburg occupied this site. It was rebuilt in the fifteenth and sixteenth centuries, and parts of this medieval edifice have been skilfully incorporated with the modern palace.

In an opening of the tower wall of the palace in Schwerin, is the equestrian statue of Niclot (Nicholas), Prince of the Obotrites, and founder of the reigning arch-ducal house of Mecklenburg-Schwerin.



Niclot, the Obotrite. Genschow, Sculptor.

The tribe of the Obotrites were a powerful race of Slavonic origin, and having aided Charlemagne in his Saxon wars, they were given the territory now comprised in Holstein and Mecklenburg. In the tenth century they fought successfully against the Danes, and entered into war, at the instigation of the Saxon Emperor, against the Germans, destroying Hamburg in 983. They had been converted to Christianity

scantly and unwillingly, and their success in the German war was followed by an attempt to extinguish the new religion. A second heathenish insurrection broke out again in 1060, and Prince Gottschalk, who favored the Christian monks and missionaries, was murdered, as well as every open confessor of the hated faith.

Finally, in 1060, the German Prince Henry, called the Lion, moved with his warriors into the land to force the Obotrites to accept Christianity. Prince Niclot called his people to arms, and a fierce battle took place between the opposing armies on the spot where the palace and its tower now stand. Niclot lost his life and his dominions as a result of the engagement. But Henry restored a portion of the latter, or the present duchy of Mecklenburg-Schwerin, to his son Pribislar, on his adopting the Christian religion.

The statue of Niclot was erected by Archduke Friedrich Franz II in 1856. The sculptor was Genschow, a native Mecklenburger, whose artistic education was completed in Berlin, in the school of Rauch.

The conspicuous position of the statue high up in the tower is no uncommon one. Numerous monuments of princes and knights stand on consoles within the sacred walls of medieval churches in Germany; one of the most ancient and interesting examples being that of Conrad in the Romanic Cathedral of Bamberg. But unusual is the exhibition of so large-sized a horse in the arcade of a palace tower. Hence this "Obotrite Chief" seems to have struck the popular imagination at once; for in contemporary Mecklenburg, horses are named "niclots," after this effigy; and one, a Mecklen-

burg mare, stands at the head of the few world-famous racers of Central Europe, a circumstance that accounts for the prevalence of this obsolete name of Niclot in the modern hippological lists of Germany and Austria.

CORRECTION.—It is well to take advantage of this opportunity to correct a mistake made in the section of the papers on "Equestrian Monuments" dealing with the New German Empire. It was there stated (*American Architect* for February 6) that the two groups of "horse-tamers," which flank the entrance to the bridge that connects the palace grounds with the mainland, were copies of the groups by Baron Clodt at St. Petersburg. In reality these figures were modelled by the sculptor Wilgoss.

THE OSTEND GATE, BRUGES, BELGIUM.

[Gelatine Print.]

A VILLA AT CHATEAUDUN, FRANCE.

[Copper-plate Etching.]

AT DOMO D'OSSOLA.

DOMO, on the Tosa, is a town containing less than 3,000 inhabitants, and belongs to the province of Novara, in North Italy. It is not much known to strangers, unless to those who start from it for excursions in the southern valleys of the Alps. There is more Romanesque work in it, and Prout found a congenial subject in its principal street, which seems formed for a scene on the stage.

PROPOSED COUNTRY HOUSE, CHESHIRE, ENG. MR. E. HODKINSON, ARCHITECT, CHESTER, ENG.

This design was exhibited in the last Academy exhibition.

DOORWAY, FOUNDLING HOSPITAL, CORDOBA. F. W. BEDFORD, ARCHITECT.

PART OF CATHEDRAL, GRANADA. F. W. BEDFORD, ARCHITECT.

MENDOCINO STATE ASYLUM FOR THE INSANE, MENDOCINO, CAL. MESSRS. COPELAND & PEIRCE, ARCHITECTS.

[Description omitted from our last issue.]

This asylum is situated in a beautiful valley surrounded by high mountains and is near the city of Ukiah in the northern part of the State of California and is being erected for the accommodation of the insane from that portion of the State and will, when completed, contain room for over 600 patients. The entire buildings will consist of an administration building, four wards (two male and two female), kitchen building, laundry and bakery building and an engine and boiler house. Two of the wards, the kitchen building, laundry and bakery building and the engine and boiler house are at present under construction at a cost of about \$350,000. All walls and partitions throughout are of brick; the fronts are executed in red pressed brick with red lone sandstone trimmings and the roofs are of slate. The greatest care has been expended to make the plan perfect in every detail; all staircases and staircase halls being of fireproof construction and all wards being disconnected from same with fireproof doors. All of the buildings are heated with hot water, the direct indirect radiation being the system used, and special attention has been given to same as well as the ventilation and plumbing. The entire frontage of the wards and administration will be about 900 feet and the total cost to complete about \$700,000.



[The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.]

A CORRECTION.

WASHINGTON, D. C., March 23, 1892.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—The illustration of pump drill in my Washington letter published March 19, has been inadvertently printed upside down, the drill point being in the air.

Yours truly,

WASHINGTON CORRESPONDENT.

[AFTER passing the proof-readers, the pressman had occasion to remove the cut from the form and in restoring it set it back upside down.—EDS. AMERICAN ARCHITECT.]

BOOKS ON LANDSCAPE-GARDENING.

PHILADELPHIA, PA., March 24, 1892.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—Can you recommend to us some comprehensive work on landscape engineering or gardening, more particularly devoted to the development, by cutting of roads, etc., of a large suburban tract into several country seats of a few acres each than to smaller operations such as lawn gardening, though the latter would be of interest.

Yours truly,

PHILADELPHIA.

[In the *American Architect* for January 7, 1888, a comprehensive list of works on landscape gardening was published, the most useful amongst them being indicated.—EDS. AMERICAN ARCHITECT.]

NOTES & CLIPPINGS

SPURIOUS WORKS OF ART BEGAN EARLY.—That there were sham pictures of Apelles and Protogenes, spurious marbles of Phidias or Lysippus, and false gems of Pyrgoteles in old Greek times is more than probable. It is certain, indeed, that an infinite number of copies and imitations of the works of these immortals, on which, nevertheless, their names were shamelessly painted or graven, as the case might be, abounded in antiquity, and are now often enough unearthed. Every evidence goes to show, in short, that art frauds were as rife and universal in the Classic Ages of Greece and Rome as in our own. I shall not begin so far back. I forget where the charming anecdote of the irate country 'Squire and his Rubens is to be found—most likely in the *Teller* or the *Spectator*; in any case, it illustrates a state of mind and a condition of things which doubtless prevailed just as much in the days of Mæcenas as in those of Queen Anne. "Come and see my Rubens. So and so says it is not a Rubens. Damme! I'll kick anybody out of the house who says it isn't. What do you say, sir?" The credulity and obstinacy of amateurs and the craft and cunning of purveyors is doubtless quite as rife now as then. There have, however, been golden ages of art fraud, and we are, I think, living in one of them at present. The art frauds that have taken shape and substance, which remain to incumber the world as false coin, ever circulating from hand to hand, are, then, of all times and periods. The archaeology of fraud, even, has become a science; some of the overt and acknowledged frauds themselves have attained the status of precious and coveted works, more valuable in the strange gyrations of the wheel of time than the originals they simulated. Michael Angelo's marble Cupid, for instance, which he made in secret, broke and mutilated, buried in a vineyard, and dug up again himself, all for the express "taking-in" of a certain cardinal, collector of antique marbles and connoisseur of modern art, is a case in point. If this particular Cupid could now be identified, it would probably be worth more than the most beautiful genuine, antique work of its kind which Italian soil still enshrouds. At all periods there have been men of true genius who have prostituted their talents in this service, but the rank and file of art impostors have been mostly vulgar workmen rather than artists—ignorant, half-informed mechanical drudges, veritable slaves held in bondage, worked remorselessly by the astute dealers, their taskmasters. Here, as in all branches of trade, the middleman takes the gross profits; the forger is of small account. The utterer of the fraud, he who plants the vulgar sham on the unwary amateur, is the really important player in the game. — *The Nineteenth Century*.

IRON PILES.—About fifty years ago, says *Specialities*, M. Eudes Desclouehamp presented to the Linnean Society of Normandy some cannon-balls, taken from the bottom of the sea, off Cape la Hague, which were sunk with the ships under Admiral Tourville, in 1692. They did not, at first sight, appear to have undergone any change, but when examined, were found to have lost two-thirds of their weight, and could be scraped or cut with a knife, like black lead. They contained no remains of their ferruginous qualities, and had not the least effect upon the loadstone or magnetic needle. We have exhumed the foregoing statements from an old book, on account of their important bearing upon the question of the durability of submarine iron piles. If indeed it be true that the action of the sea, will, in course of about a century and a half, convert iron into plumbago, how brittle will the supports to some of our piers and similar structures become before the lapse of such a period! The following passage, which appeared some little time ago in the *Building News*, seems to have reference only to the oxidation of the iron: "Engineers who have had experience in the erection of lighthouses and bridges of iron on screw piles, say that the life of iron in sea-water is considerable, in those conditions. Solid wrought-iron piles have been known to stand with only a very slight corrosion. The experiments made by Mallet and others, to discover the amount of corrosion, prove that cast-iron immersed in clear salt water is practically indestructible, as the rate of corrosion is so slow that a whole century would not cause a greater corrosion than one-tenth of an inch. But the effect of less pure water must be taken into account, especially when wrought-iron is used, and we have noticed a considerable corrosion in wrought-iron piles in piers constructed at many of our watering-places. At any rate, the safest plan is to specify solid wrought-iron piles in submerged sea structures, both with the object of discounting the effects of corrosion, and also of rendering the piles strong enough to resist sudden blows from vessels during stormy weather."

A REMARKABLE CLOCK.—Japan possesses a remarkable timepiece. It is contained in a frame three feet wide and five feet long, representing a noontide landscape of great beauty. In the foreground, plum and cherry trees and rich plants appear in full bloom; in the rear is seen a hill, gradual in ascent, from which apparently flows a cascade, admirably imitated in crystal. From this point, says *London Iron*, a thread-like stream meanders, encircling rocks and islands in its windings, and finally losing itself in a far off stretch of woodland. In a miniature sky a golden sun turns on a silver wire, striking the hours on silver gongs as it passes. Each hour is marked on the frame by a creeping tortoise, which serves the place of a hand. A bird of exquisite plumage warbles at the close of each hour, and as the song ceases, a mouse sallies forth from a neighboring grotto, and, scampering over the hill to the garden, is soon lost to view. — *Boston Herald*.

THE WAVES AT TILLAMOOK LIGHTHOUSE.—An illustration of the height of breaking waves is afforded by the following paragraph, which we take from the *San Francisco Chronicle* of January 6: "Portland, January 5. The lighthouse tender 'Manzanita' reached Tillamook

Rock Sunday for the first time in six weeks, and brought away the keeper, George Hunt, who has been on the rock for four years, and has been transferred to the Cape Mars Light. He says that, in the storm of December 7 the waves swept clear over the house, washing away the boats, and tearing loose and carrying away the landing-platform and tramway, which were bolted to the rock. On the 29th the waves were still higher, and streams of water poured into the lantern through the ventilators in the balloon top of the dome, 157 feet above the sea level. The lighthouse was shaken to its foundation by the impact of seas against it, and the water found its way into the house. Men were on duty all night to keep the lamp burning, and but for the wire screen the shutters of the lantern would have been demolished."

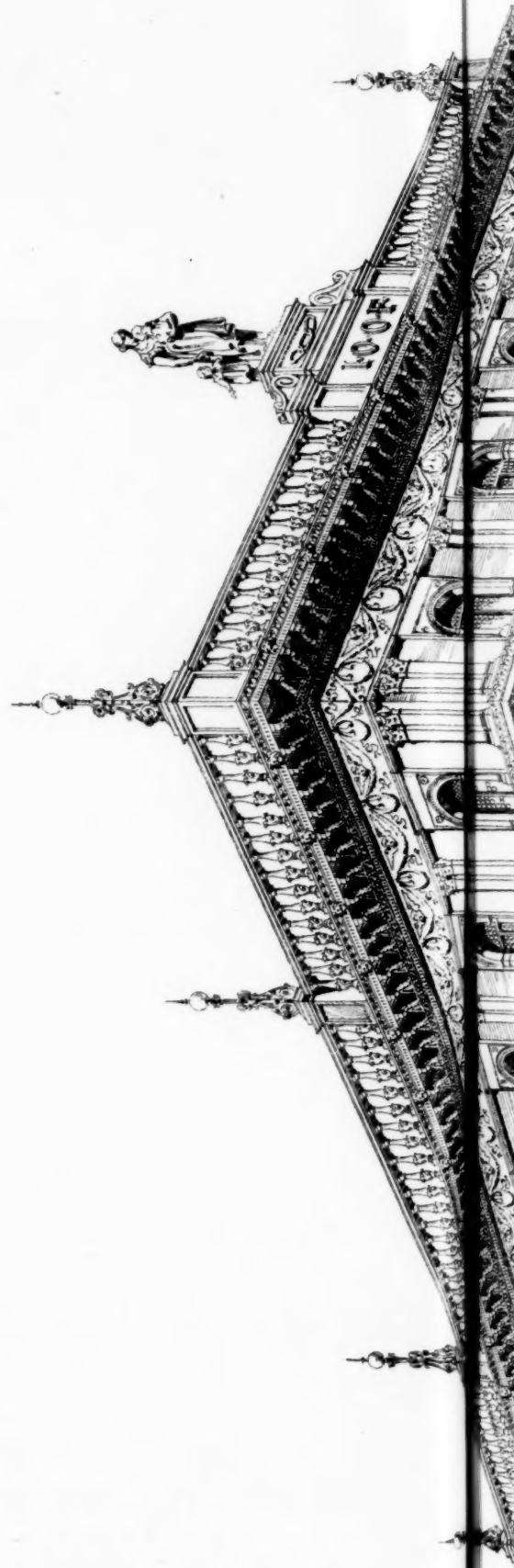
ROMAN MOSAIC DISCOVERED AT THE PIERÆUS.—A discovery has been made at the Pieræus, near the ancient theatre of Zea, of a very fine Roman mosaic. The whole forms a square of about three yards, in the centre of which is a circular medallion, two feet in diameter, on which is carved the head of Medusa nearly full face, the head being furnished with wings and wreaths with snakes. The carving of the head is especially fine, the details being admirably executed. Various colored marbles were used, the mosaic being composed of nine varieties. The statue is said to be unique. — *Boston Transcript*.

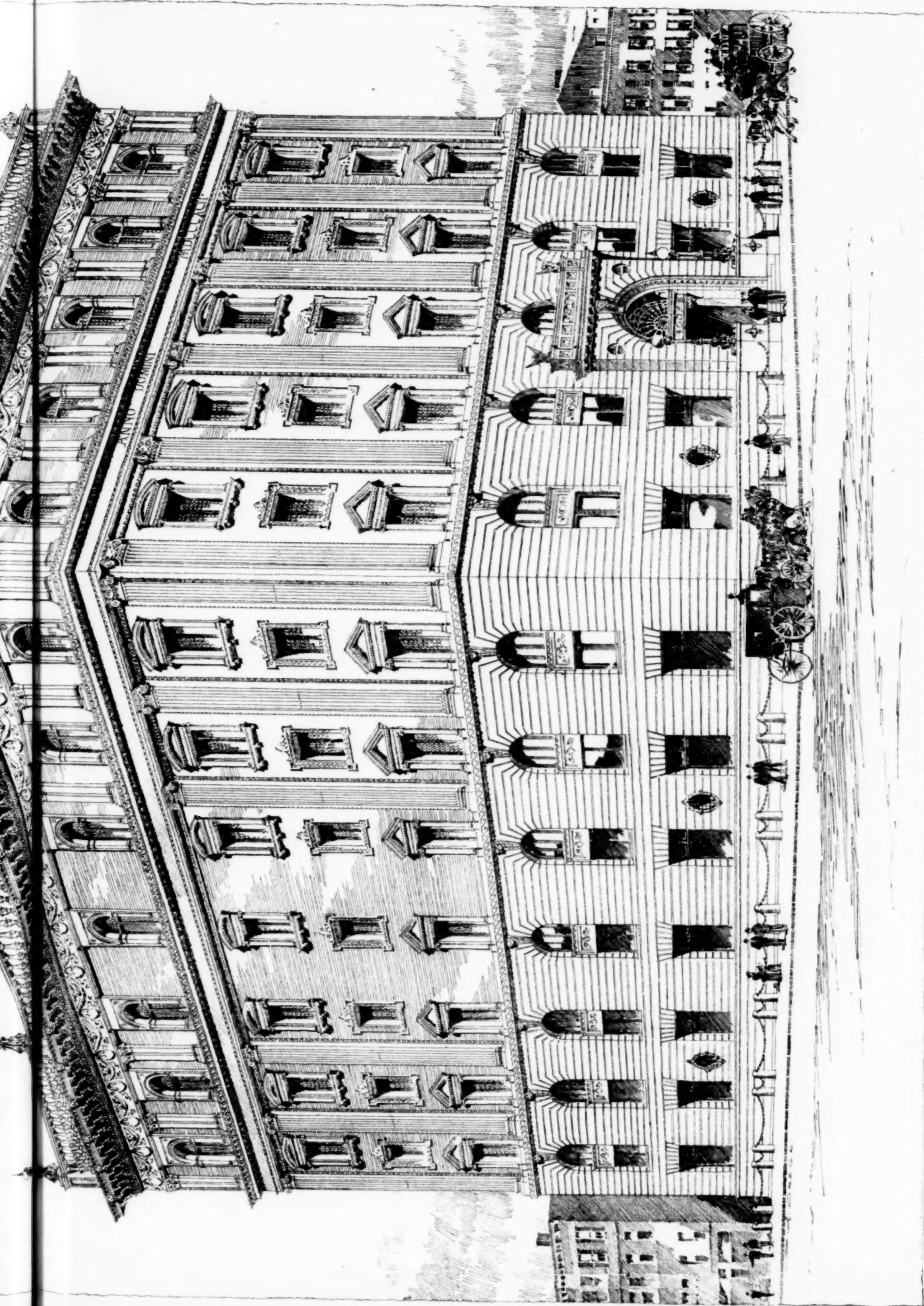
TRADE SURVEYS

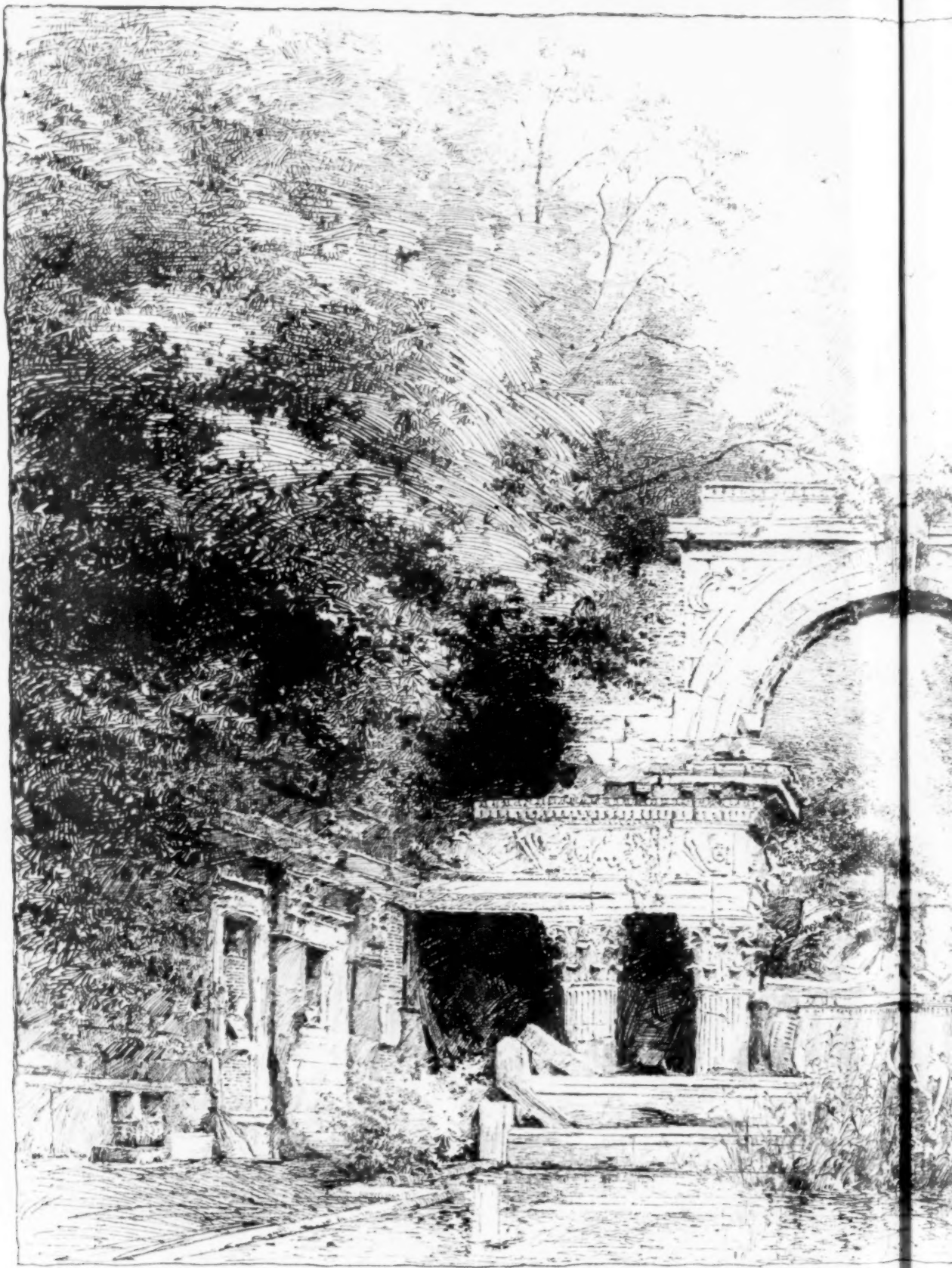
ONE of the results of the remarkable scattering of industries throughout the United States will probably be the construction of a system of inland water-ways of greater extent than is probably conceived of by very many at present. Engineers have given some attention to the possibilities of such construction, and, while their investigations are very scattering and crude, enough has been seen and said in regard to the construction of such water-ways to show that there are grand opportunities for development in that direction. For thirty years the country has run wild in the construction of railroads, without which our past progress and present development would have been impossible. That there will be a continuance of railway construction upon a grand scale cannot be doubted. The necessity for railroad building will become greater and greater with the increase of wealth and population. But there are other features of our future progress which have been overlooked, and one of the most important is the matter referred to; namely, the progress involved in a pretty thorough system of what might be termed canalization of our water-ways. No eminent engineer has yet given his indorsement to any thorough system of improvement, but quite a number have studied the subject, and, under proper encouragement, which the Government might extend, are prepared to suggest and advocate systems of improvement in that direction which will vastly increase land values and make available for immediate cultivation vast areas of land now practically valueless, or, at least, very far removed from the probability of profitable occupancy if obliged to wait upon railroad construction. Just what this line of improvement is it is hardly necessary to state, but even a cursory study of our waterways by the non-expert shows grand possibilities. Engineering societies and engineers have thrown a good deal of light of recent years upon possibilities in this direction. The construction of an inland water-way along the Atlantic coast and along the Gulf coast, and in portions of Texas, and the construction of canals in portions of the regions of country west of the Mississippi, and in the Northwest in connection with the Lakes, and from the Manitoba region to connect with the Mississippi River, are a few of the schemes which have been seriously studied by men who know what can be done. That we are upon the eve of such a general improvement in the construction of water-ways is evident. The jobbing interests at Chicago have begun to find other methods of reaching foreign countries than by the network of railroads running eastward. No less than a dozen schemes have been discussed looking to the establishment of water-ways between the Northwest and the Atlantic seaboard. What there may be in all these enterprises it is too soon to say, but the investigators are at work, and the urgency is great, and work will soon be begun in that direction. The Erie Canal has shown what can be done, but it has remained a solitary factor for a generation. That the Lakes and the Ohio and Mississippi can be connected by more than two canals is evident to engineers; that canals can be constructed from the Ohio southward toward the Gulf is also a recognized fact. Many years ago, the State of Illinois had an elaborate investigation made into the possibilities of canalization, and found that enormous advantages could be secured to agricultural, manufacturing and jobbing interests, and to the country at large by Governmental action upon a large scale in this matter. The rapid development of the country, the springing up of industries in all sections and the growth of the value of land have combined to make a departure from almost exclusive dependence upon railroads a commercial necessity. Railroad earnings continue fair, but not large. The change is in the right direction. Manufacturers are adhering to their careful policy of making only as much as sells easily. Prices continue low, and business is not at all booming. Confidence is stronger than ever in an ultimate revival, which is predicted to take place within a month. The conservative policy which has actuated the business men of the country for so many months past cannot but be productive of good results. Iron and steel makers are restricting. Coal-producers are watching market requirements. Machinery-makers are gaining daily in activity. Jobbing interests along the Atlantic coast recognize the danger of over-doing in trade, and are very careful. Collections are almost everywhere slow and difficult, despite statements to the contrary in financial journals. The export trade continues heavy. The possibilities of European disturbances have a more or less unsettling effect upon our markets. The inflow of American securities held abroad is falling off. Silver continues very low in foreign markets. The shelving of the Free Coinage Bill will be favorably regarded by the community, and will have a good effect. The accumulation of stock in manufacturing centres will not be permitted to jeopardize prices already low enough. A recuperation will take place very soon, but, unlike many former recuperative efforts, will not be followed by advancing prices, because of the extraordinary producing-capacity. The country is in a strong and safe condition and position. Foreign upheavals cannot but act beneficially from a trade standpoint. The conflicts caused by over-speculation by British capitalists in foreign countries are being gradually overcome, and a closer study of investing opportunities has followed. Enormous investments by British capitalists will continue, but fewer mistakes will be made.

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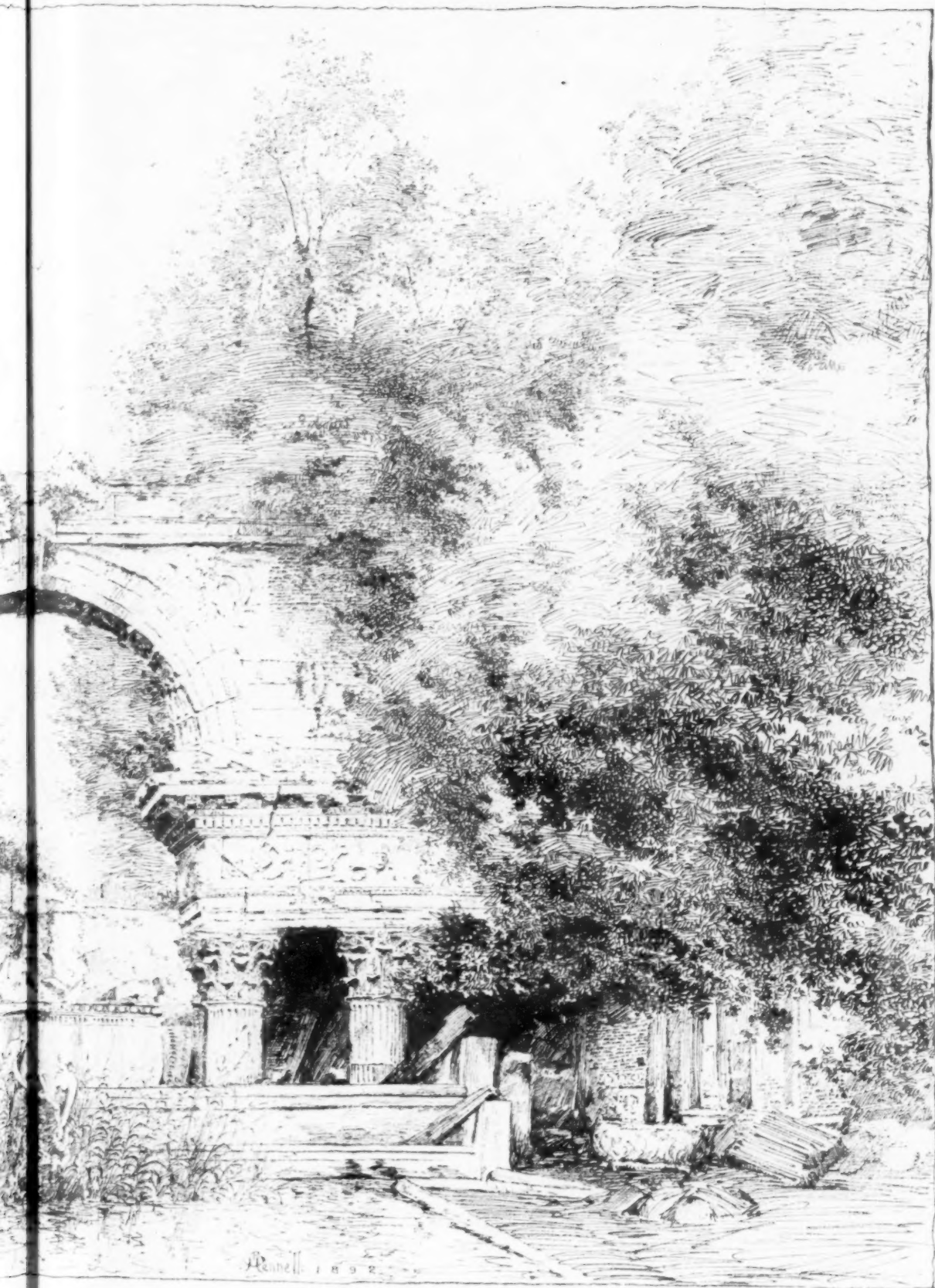
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ROMAN RUINS IN THE GARDEN



GARDEN AT SCHÖNBRUNN AUSTRIA

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GORDON, BRADON & ORCHARD ARCHITECTS ROCHESTER, N. Y.



STABLE FOR MR. LEO BLOCH. PORTSMOUTH TERRACE.

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