PRICE 15 CENTS.

MAY 10, 1890.

THE AMERICAN ARCHITECT AND BUILDING NEWS

VOL. XXVIII. * REGULAR EDITION * NO. 750.

ARCHITECTURE

ENGINEERING

DECORATION

CONSTRUCTION

TICKNOR & COMPANY

BOSTON MASS.

CONTENTS.

ILLUSTRATIONS.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XXVIII. Copyright, 1890, by TICKNOR & COMPANY, Boston, Mass. No. 750.

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

MAY 10, 1890.

CONTENTS.

WE regret extremely to learn of the death of Mr. Henry O. Avery, one of the most accomplished and energetic of the younger architects of the country, and a devoted worker for the good of the profession. Mr. Avery was originally a pupil of Professor Russell Sturgis, but went to Paris in 1874, and spent nearly seven years in the School of Fine Arts. On his return to this country, he entered, as an assistant, the office of Mr. Richard M. Hunt, and took an important part in the designing of the famous houses of Messrs. W. K. Vanderbilt and Henry G. Marquand. His subsequent practice on his own account, although it had been carried on for only a few years, had brought him distinction, but his principal claim to the remembrance of architects will come from the unselfish zeal with which he endeavored to promote the cause of art. He was perhaps the leading member of the Architectural League, an officer of the Archæological Institute, and prominent in the new Society of American Artists. His early death will be a severe loss to the community, as well as the profession, and it will be long before his place is filled.

A JOINT meeting of the Senate and House Committees on Public Buildings and Grounds was held in Washington the other day, for the first time in eight years, to consider sites for the erection of new buildings for the Interior Department, the General Post-Office, and the City Post-Office for Washington. We sincerely hope that an effort will be made to have these important structures decently worthy in design to stand among the other great public buildings of Washington. Up to this time, the artistic value of the principal architectural objects at the Capital of the nation has been pretty steadily deteriorating. The White House, the oldest of them, is a beautiful and delicately studied building; the Capitol, in its present shape, is a monument of which the nation may well be proud; and no one need be ashamed of the Patent Office and the Treasury; but of some of the later structures the less said the better. If the opportunity to add to the noble group of huge Classical buildings which distinguishes Washington is lost now it will never recur, and a sample of the "dropsical Romanesque," or the "American Ovo" style of architecture, carried out on the gigantic scale demanded for the Government Buildings, would be painfully ridiculous beside the Capitol.

A CURIOUS light is thrown on certain features of labor agitations by the accounts of the strikes at Barcelona last week. Barcelona is a turbulent place, infested with anarchists and mischief-makers, who, as elsewhere, tried hard to stir up disorder. The first-of-May strikes took place, as ordered by the International Society, and the strikers, or rather, the evil-disposed among them, took to roaming the streets, tipping over and smashing horse-cars, and doing other mischief, to the terror of the peaceable citizens, while the anarchists placarded the walls with proclamations, announcing that "the hour for the social revolution had come," and calling upon the strikers to pillage the city. The Governor, however, finding that his force of police was not large enough to preserve order, called for three regiments of troops, and requested the factory-owners and other employers of labor to continue their operations, for the benefit of those persons who were willing to work, and gave notice that death would be the penalty for any interference on the part of the strikers with the liberty of persons who chose to work, instead of joining them. One cannot help being a little envious, to think that this bold and intelligent defender of liberty should have been a Spaniard, instead of an American, but we may with advantage remember the results of his energy. The next morning, many workmen, finding that a strong hand was ready to protect them, crept back to their benches and tools, and at last accounts their example was likely to be generally followed.

SIMILAR results would, as we believe, follow in this country, to the inestimable advantage of every one except the professional agitators and thieves, if any one in authority would, during a season of strikes, pluck up the courage necessary to vindicate that universal liberty which we claim as the American birthright. Few persons realize the terrorism by which the selfish and unscrupulous leaders of the labor organizations, through the subordinates whom they recruit in the saloons, coerce into obedience the sober and intelligent workmen who, in most trades, really constitute the majority of the members. We, architects, like other American business men, are secure against "boycotting," "rattening," and the other forms of persecution which are applied to our poorer brethren; but the law which protects us is silent in the defence of men who live by the work of their hands, and no one seems to think of raising a hand to help them. On the contrary, the contemptible politicians, and the still more contemptible cheap newspapers, by which our country is cursed, fall down and worship the walking-delegates, and the demagogues who direct them, flattering and coaxing the worst tyrants who exist outside of Russia, and legislating year after year, at their bidding, to strengthen them further, and more effectually to crush the opposition which a few independent spirits would still venture to offer them. We believe, with the Governor of Barcelona, that the appropriate penalty for the attempt, on the part of men who do not choose to work, to prevent others from working who wish to do so, is death, and we should like to include in the sentence the miserable politicians who can stand by and see honest mechanics hounded from shop to shop by the walking-delegates, because they choose to work on terms to suit themselves, and to give the money they earn to their wives to take care of, instead of to the Unions, and can then bargain with the Union leaders for votes secured by fear of such persecutions, in return for the enactment of laws intended to facilitate and extend their tyranny.

THE story of the settlement of a pier in the great drawbridge at New London, to which we recently referred, proves to have been greatly exaggerated. A settlement of about four inches has taken place, and the ice-breaker is slightly cracked; but the settlement has nearly ceased, the total movement for several months past having amounted only to about one-eighth of an inch, and there are no cracks in the main pier, which indicates that the compression of the soil under the masonry has nearly reached its limit. Trains, therefore, run over the bridge at the ordinary speed, and no apprehension is entertained of further trouble.

MR. FRANK FURNESS, a well-known Philadelphia architect, has invented a system of concrete flooring which appears to have certain merits. Mr. Furness first lays his floor with wooden beams, two feet from centres, each beam having an angle-iron bolted on each side, with a washer between the angle-iron and the beam, three-eighths of an inch thick, so as to permit the concrete, subsequently put in, to envelop the iron on all sides. A strip, triangular in section, is nailed on the lower edge of each beam, with the edge down. Boards are then nailed over the underside of the joints, and concrete, made with one part Portland cement to three parts sand, and an equal quantity of broken stone, is filled-in over the boarding five inches thick. The cost is said to be only a trifle more than that of an ordinary wooden floor, but we must confess that we do not understand the calculations by which this estimate is obtained. As the floor is described, the concrete is carried by the beams, and adds nothing to their strength; consequently, the wooden joists and the angle-irons together must be considerably stronger than they would be for an ordinary floor, as they have the concrete to carry, in addition to the weight, inherent and superposed, of the floor. As the angle-irons, used as floor-beams, cost much more than wooden beams of the same transverse strength, it follows that the beams of the new floor will cost considerably more than they would for an ordinary floor — probably at least twice as much in most cases. Moreover, the new system does not promise any saving in the expense of the floor-boarding, although, as the floor-boards in either case would be simply nailed to the joists, it involves no extra expense; but the cost of the ceiling would be greater by the new method. It is true that plastering could be applied directly to the underside of the concrete, thus saving the cost of lathing; but the use of concrete involves boarding the ceiling all over, and the cost of putting up and taking down boards, with the waste involved, would far more than offset the cost of lathing. The obvious result, therefore, appears to us to be that Mr. Furness's plan affords a good fireproofing, at a material increase of cost over that of an ordinary floor. That the concrete is only for fireproofing the joists, and is not intended to carry weight, is shown by its composition, as a six-to-one concrete of Portland cement, five inches thick, not rammed or consolidated in any way except by raking evenly into place, could not be depended upon to do more than carry its weight, and that of the plaster ceiling, over a two-foot span, and we should doubt its capacity for doing that with certainty.

THE practice of fireproofing wooden floors by putting concrete between the joists, although a useful one, is by no means new. We employed it ourselves twelve or fifteen years ago, following the example of other architects of our acquaintance; but ours was a simpler method than Mr. Furness's. Instead of bolting angle-irons to the sides of the joists, we put on wooden strips, well nailed, an inch and a half or so above the bottom of the joists, which were only about sixteen inches from centres. Boards were then put up against the underside of the joists, not nailed, but held in place by supports beneath; and a concrete of lime-mortar, plaster-of-Paris and cinders was poured in to a depth of a few inches, and brought well up on the sides of the joists. After setting, the concrete slabs were held firmly in place by the fillets on the beams, and furnished a good surface for plastering on, the plaster easily spanning the width of the joists, so as to protect them from fire. The same thing was then, and probably still is, done in Paris with wooden joists two feet or more from centres; but in this case it is usual to give additional support to the concrete, which is there made of old plastering rubbish, or "platras," grouted with plaster-of-Paris, by means of slender, square, iron bars, or rather wires, which are hooked over two joists, and hang down between them, nearly to the ceiling level. With these wires, which are put in a foot or so apart, the concrete is well supported. There is no doubt that construction of this sort is becoming rapidly popular in this country, and architects will do well to exchange views and experiences on the subject, for their own benefit, as well as that of their clients. The great danger to be apprehended is that of decay of the wooden joists, which, if buried on two sides in so compact a material as Portland-cement concrete, plastered and painted underneath, and covered on top with a double floor, probably with felt between the floorings, are in a rather unfavorable position in this respect. Of course, the proper material to use is iron, but, under present circumstances, this is out of the question in most cases, and it is for us to devise porous concretes, or to secure in some other way the circulation of air around the joists which experience shows to be essential.

PROFESSOR BLAKE, of the University of Kansas, makes a valuable suggestion for testing well-water for sewage contamination. The ordinary way, where contamination from a given cesspool, vault or sewer is feared, is to pour salt water into the suspected source of contamination, and, after a time, to test the well-water for salt, by means of nitrate of silver. In fact, as salt is always present in considerable quantity in sewage and house-wastes, the presence of salt in well-water is presumptive evidence of contamination. It is not, however, positive evidence, as many innocent soils contain chlorides, and Professor Blake proposes that a lithium compound should be used instead of common salt. Lithium is a substance so rare that it would hardly be found in any natural soil, and a very small quantity can be detected by means of the bright red line which its spectrum shows in the spectroscope. According to the best authorities, one forty-millionth of a grain of lithium will give the red line clearly. Professor Blake proposes to make the test by dissolving one ounce of carbonate or chloride of lithium in a quart of water, and pouring the solution into the suspected cesspool or vault. After a week or more, the well-water is examined, by evaporating a little of it, dipping a platinum wire in the concentrated liquid, and holding the wire in a Bunsen gas-flame. If, on looking at the flame with a spectroscope, the lithium line is seen, the contamination is proved.

ONE of those astonishing letters from old mechanics, or distinguished inventors, or retired military men, or other persons, announcing the discovery by them of not merely improved, but almost miraculous methods of building, by which all the defects common to houses designed by architects are done away with, appears in the New York *Evening Post*. The letter, which is attested by a professor, describes an ingenious and delightful device invented by the writer, who appears to be a builder, consisting in carrying the under floor in balloon-framed houses to the outside boarding, and laying a few rough bricks on it, between the studs, as if this were something new. In point of fact, it is an inefficient practice, which was once commonly used among architects, but which, as it prevents back-plastering below the floor-lines, and does not prevent fire from running up the studding and spreading into the spaces between the beams, has been superseded by the far better method of cutting-in short pieces between the studs, just below the ceiling, and, after back-plastering, building up with bricks and mortar on these pieces to the level of the floor, so as absolutely to prevent fire from below from getting into the spaces between the beams. Many architects not only cut off the spaces between the beams in this way from the spaces between the outside studs, but build up with brick on top of all partition-heads to the under-side of the floor-boards, so as to divide the beam-spaces into compartments isolated from each other. Another piece of advice which the *Evening Post's* correspondent gives is to have the plastering on outside walls carried to the floor, instead of to the ground. This, so far as we know, is the invariable rule in all but the cheapest class of "jerry" buildings in the Northern States, and most architects improve upon it by requiring the plastering to be carried to the floor on all inside partitions, as well as outside studding. Of course, we do not object to having the *Evening Post*, or any other newspaper, publish letters on the subject of making our ordinary houses safer, as well as more durable and wholesome, but we might suggest that most architects give more thought and attention to these matters every week than the average builder does in the whole course of his life, and that the best way to get something better than mere repetitions of observations which have been the commonplaces of the offices for twenty years is to apply for it to the people who have studied most thoroughly what has been done, and have spent the most ingenuity in devising new safeguards; that is, to the architects, to whom, and to the mill mutual insurance companies, is due nearly every improvement that has been made in the art of building in this country.

RELIGIOUS ARCHITECTURE.[1] — V.

II. RELIGIOUS ARCHITECTURE OF ANTIQUITY. — ASSYRIA, PHŒNICIA AND PERSIA.

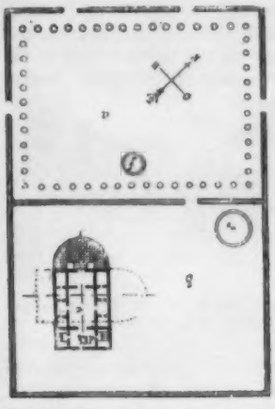


Fig. 12. Plan of the Temple of Paphos, Cyprus (before the 7th Century B. C.). After Gerhardt.

WE shall have but little to say about the temples of Phœnicia and her colonies, for the remains of them are so incomplete that it is impossible to obtain any reliable information concerning them.

Their design, which seems to belong by right to the Semitic race, had its origin in traditional religious customs quite unlike those we have encountered among the Egyptians; it comprises simply a very large uncovered room; in the centre of one of the extremities stands a tabernacle or ædicula, containing the mystic emblem of divine power.[2] This is the disposition which still prevails among the Arabs, except for the idol, which is found only in the most ancient edifice of Mussulman worship, the Ka'ba.

The great importance which the Asiatic Greeks gave to the peribolus in their temples was doubtless due to Phœnician influence. The space reserved for the temple annexes, and designed for the use of the people, was much more vast and much more richly decorated in Asia Minor than in Greece proper.

Little is known of the celebrated Temple of Paphos (Figure 12) beyond what can be learned from medals, which give outline representations of it. After a careful examination of the ruins, which are scarcely visible, Gerhardt and Cesnola have both attempted a reconstruction of the plan. The temple was 220 feet long by 164 feet broad, and the peribolus measured 689 feet by 538 feet; the outer wall was pierced by gates, traces of which have been discovered. It is supposed that court *a* was surrounded by porticos; *f* was probably a basin; in the second court, *b*, rose the temple proper, *c*, in the rear of which, at *d*, the ædicula must have stood which sheltered the sacred stone or *beryle;* the latter was usually of conical shape. It should be added that the restorations of Gerhardt and Cesnola are far from agreeing with each other.

At Golgos, where it has not yet been possible to discover any trace of the peribolus, the sanctuary is all that remains (Figure 13). According to Ceccaldi,[3] this ancient edifice may be thus pictured: "The temple was constructed of sun-dried brick, forming four walls, with the bases resting on stone foundations. In the interior, the roof, which sloped very gently in two directions, was supported on wooden pillars with stone capitals; it formed a sort of terrace, like the present Cypriot roofs. The roof itself consisted of wooden beams placed close together; above these reeds and mats were stretched, which were in turn covered by a thick layer of earth; this was well beaten down, and was impervious to dampness and heat alike. The external appearance of the Temple of Golgos must, therefore, have been very simple. In the interior, which was illuminated solely through the broad doors, a throng of mute and motionless stone personages, with features and vestments set off by paintings, surrounded the mystic cone as perpetual worshippers. Stone lamps, in the form of ædiculæ, lit up the frescos and the grimacing votive offerings suspended from the walls, in the recesses. Odd bas-reliefs were sculptured around the edifice, and the slanting light was reflected on white and polished flags." The pedestals of the statues described by Ceccaldi have, in fact, been found all along the walls, as is indicated in the plan; the statues lay on the ground. A part of the sacred stone has been discovered.

The Temples of Hagiar Kim and of the Giganteja, at Gozzo (Figures 14, 15, 16), are similar in general disposition. They comprise extensive halls opening into one another, with but little symmetry of form, and built of blocks of colossal proportions. The rooms are nearly ellipsoidal in shape. At Hagiar Kim, the chambers at the right of the plan seem more ancient, and they alone probably constituted the primitive temple; the room near the bottom must have been the chief sanctuary, judging from the richer and more nicely wrought decorations.

The four rooms on the left appear to have been constructed later; they were doubtless added to make place for secondary gods. The upper and the lower halls have small adjoining apartments, which were originally chapels.

We know from ancient authors that these mysterious retreats were the scenes of sumptuous and voluptuous celebrations, which powerfully impressed the imagination of neighboring peoples; but it must be confessed that it is difficult for us, owing to the insignificance of existing remains, to form any adequate idea of the enchanting spectacles described by these writers.

The little that can be learned of the temples of ancient Persia is due chiefly to the researches of M. Dieulafoy. The edifices of which traces are found in the plain of the Polvar are contemporary with the reign of Cyrus; this mighty monarch, after his victories over the Medes, founded at the head of the defiles of the Polvar Rud a capital from which he could at the same time watch over the kingdom of Auran, Fars and Media, and defend the entrance to his conquest.

These edifices were not the original work of the ancient or later inhabitants of the region; they were copied from the structures of Lycia and of the Greek colonies of Asia Minor.

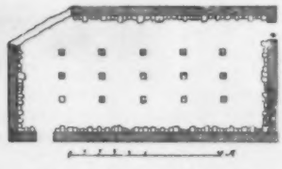


Fig. 13. Plan of the Temple of Golgos (3d Century B. C.). After Cesnola.

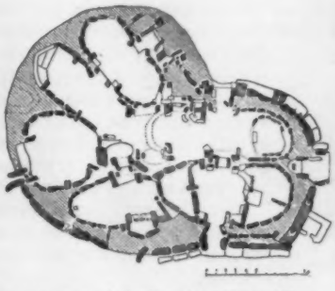


Fig. 14. Plan of the Temple of Hagiar Kim, Malta (3d Century B. C.). After Caruana.

Fig. 15. A Hall in the Temple of Hagiar Kim at Malta. After Perrot and Chipiez.

[1] From the French of P. Planat, in Planat's "*Encyclopédie de l'Architecture et de la Construction.*" Continued from page 65, No. 749.
[2] Perrot et Chipiez. "*La Phénicie.*"
[3] "*Monuments Antiques de Cypre.*"

Such imitations were very probably due to the influence of Crœsus, who became the friend and counsellor of his conqueror. Until the time of Cyrus the Persians had been accustomed to only the most modest constructions, which they built with clay mortar. As for religious architecture, none, as it were, existed; the worship of the Persians was always celebrated in the open air, with no temples nor consecrated edifices. Hardly would one note, in the royal tombs of the first Achemenides dynasty, the existence of small rooms, which seem to have been destined for some ceremonies connected with funeral services.

In the same way, the only architectural remains of the second dynasty are the royal palaces of Persepolis and the tombs of Nakschi-Roustam. At the most, we can only cite a few altars (*atech-ga*), in which no originality of design is discernible, and which seem to have been directly inspired by Greco-Lycian art.

If, for our special purposes, we are seeking only the forms peculiar to ancient Persian religious architecture, and if we have to regret that no vestiges of it can be discovered, the other Persian edifices of this first period are, nevertheless, of interest for our study; for we find in them, from remote antiquity, a most complete and satisfactory solution of the problem which so long occupied the builders of early Christian times and of the Middle Ages — a solution which strikingly influenced the development of religious architecture.

In the monument of Sarvistan (Figures 17, 18), the cupola of the large hall, made of brick, is separated by a cornice from its pendentives, which are built of small, unhewn stones. But the cupola is, in fact, borne by a squinch on the angle joined by these pendentives. The same construction (Figure 19) is found at Firouz-Abad.

Other rooms are covered with barrel-vaulting, generally of an elongated elliptical form. By a very curious method of construction, which was later employed by Byzantine architects, and which had already been in use among the Assyrians, the Persians were able to dispense with centring. This was, moreover, a necessity in a country absolutely destitute of forests and of wood for building purposes.

The intrados, says M. Marcel Dieulafoy, is divided into two zones; below the plane of the springing, bricks are laid horizontally and corbelling slightly below one another, and set successively on the face and on the edge. The joints are broad and the mortars of ordinary quality. The builder knew by experience that the springers of the vault would naturally maintain their equilibrium, and he seems to have treated them with no more care than ordinary masonry work. As for the upper part of the barrel, the bricks, instead of being laid in planes perpendicular to the heads, as in all European vaults, are disposed vertically, and in planes nearly perpendicular to the axis of the barrel (Figure 20). The joints are thin and the mortars of excellent quality.

Fig. 17. View of the Palace of Sarvistan (5th Century B. C.).

"The mode of construction adopted at that time,[1] and which has since undergone no modification, is most ingenious. The following description of it applies not only to the barrel-vault of Sarvistan, but to all cylindrical vaults built by the Persians previous to the Arab conquest.

"The workman, having traced the right section of the intrados on the inner face of one of the end walls of the room to be covered, applies a first row of bricks, laid flat and following the curve adopted. Each one of these, if its thickness has been well calculated with relation to the surface and to the cohesiveness of the mortar, adheres separately to the face of the wall. When this first ring is keyed it presents a solid support, on which a second ring can be applied. Proceeding thus, the barrel is gradually prolonged; the mason advances at the same time, working on the extrados, and doubling or tripling the number of layers before venturing over the fresh masonry (Figure 21).

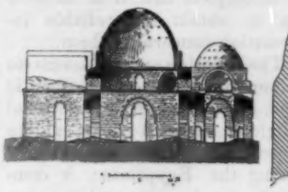


Fig. 18. Section of the Cupola of Sarvistan. After M. M. Dieulafoy.

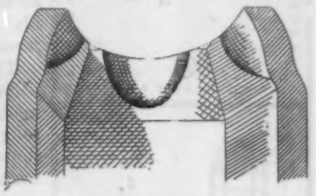


Fig. 19. Ruins of a Cupola of ancient Persia. After M. M. Dieulafoy.

"Above the springing of the arches the bricks maintained their equilibrium, whatever the curve of the intrados might be, and, as there seemed to be no call for modifying the direction of the lower courses of the barrel, they were laid horizontally, and corbelling slightly above one another, up to the point where the action of gravity tended to precipitate them into space.

"So that, from the springing of the arches to the joint of rupture, the masonry-work formed a homogeneous mass; while from the joint of rupture to the crown, the vaulting, which was turned according to the Persian rule, was constructed in thin layers, and was, in addition, formed of superimposed and isolated courses."

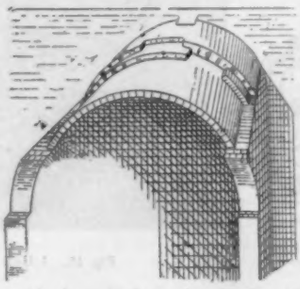


Fig. 21. Manner of Building Barrel-vaults. After M. M. Dieulafoy.

The Persians still have recourse to similar processes for building vaults without centring.

In the edifice at Firouz-Abad, which is certainly older than the above by one or two centuries, the same methods were employed, though with less symmetry and with more difficulty, owing to the use of the semi-circular arch. This form, in fact, is not as well adapted to the process as the stilted arch is, for it gives the key-stones, starting from the haunches, an obliquity which it is difficult to remedy.

Both edifices seem to belong to the second Achemenides dynasty, and are, therefore, anterior to the Parthian and Sassanides dynasties.

In the small ædicula of Ferachbad, the Persian builders struck off on a bolder path, for the cupola, which is also borne on pendentives, no longer rests on more or less open-work walls, but on free pillars. The solution of the problem here approaches more nearly to that reached by Byzantine architects.

Among somewhat more recent structures, attention should

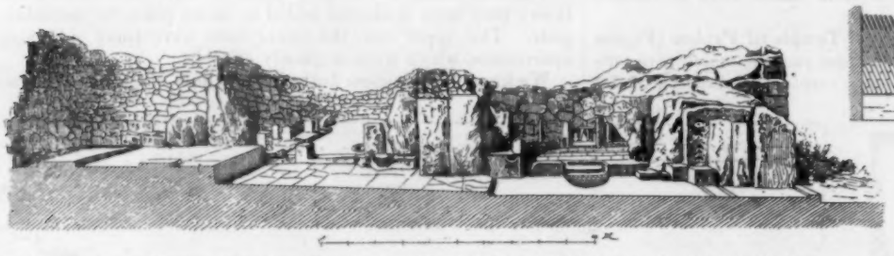


Fig. 16. Longitudinal Section of the Great Temple of the Giganteja, Gozzo (3d Century B. C.). After La Marmora.

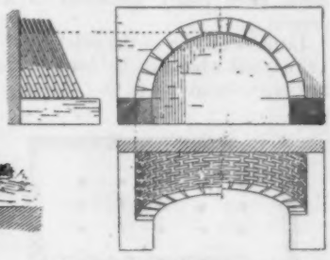


Fig. 20. Construction of an ancient Persian vault.

[1] M. Marcel Dieulafoy. "*L'Art Antique de la Perse.*"

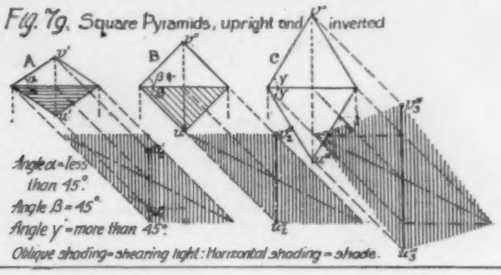
be given to the *atech-ga* of Djour, where the tower, which is encircled by a spiral inclined path or staircase, presents a striking resemblance to the ancient Assyrian temples, as well as to one of the oldest of Moslem edifices, the Mosque of Touloun; the latter has the same disposition. We may then consider the *atech-ga* of Djour as a sort of connecting link between the most remote epochs of Assyrian occupation and the modern days of Arab occupation.

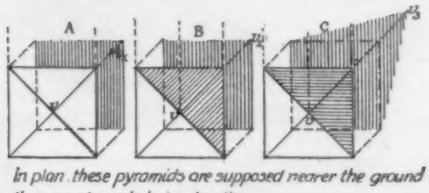
[To be continued.]

ARCHITECTURAL SHADES AND SHADOWS.[1] — IX.

CHAPTER VII — (*Continued.*)

Fig. 79. Square Pyramids, upright and inverted

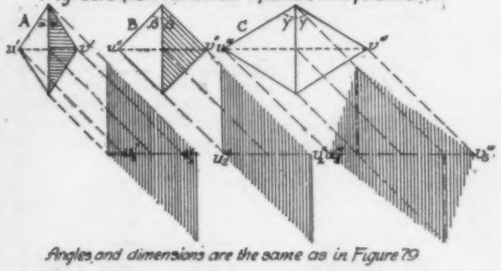




In plan, these pyramids are supposed nearer the ground than they are shown to be in elevation.

102. AMONG pyramids the tetrahedron, or triangular pyramid, may be omitted from consideration, not being a form in common architectural use. *The square pyramid* generally appears in architecture with a principal square for its base, or, less frequently, a "lozenge." To the extreme points of the shadow of this base, found by Rule (II), (IV) or (VI), is joined by two right lines the shadow of the apex, completing the shadow of the pyramid, and showing its line of shade to be composed ordinarily of two sides of the base and two slant edges, the shadow being a quadrilateral. As the angle of inclination (the angle between the base and any side of the pyramid) diminishes, the shadow of the apex approaches that of the base until it falls upon its edge. This indicates that one side of the pyramid (if on a "lozenge" for its base) or two sides (if on a principal square) are in shearing light (Figures 81, *A*; 79, *B*; and 80, *B*). A further diminution of the angle, by bringing the shadow of the vertex wholly within that of the base, shows the whole slant surface

Fig. 80. Square Horizontal Pyramids, Axes parallel to VP.



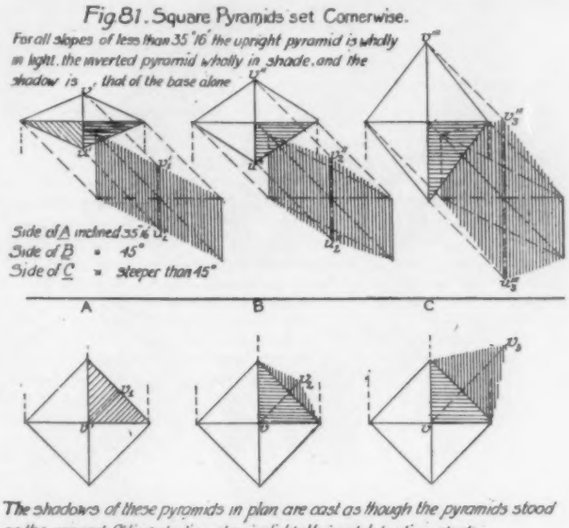
Angles and dimensions are the same as in Figure 79

of the pyramid to be in light, and only its base in shade; the shadow of the base is, therefore, the shadow of the whole pyramid (Figure 79, *A*), as is also the case when one or two sides of the pyramid are in shearing light. The angles at which the sides pass respectively into shearing light and into full light are indicated in the figures.

103. *The octagonal pyramid.* The varying phenomena of its shade and shadow are clearly indicated in the figures, the increase in the number of its sides, as compared with the square pyramid' affording a greater variety of cases of sides in shearing light. The octagonal pyramid chiefly occurs in the forms of turret-roofs and spires; that is, with a vertical axis, and the illustrations are, therefore, chiefly of vertical pyramids and their shadows on vertical and horizontal planes.

104. But the square and octagonal pyramid may alike occur in an inverted position, or with a horizontal axis parallel to *G L* or perpendicular to *V P*, as well as in various oblique positions. Dog-tooth ornaments and pyramid-flowers in Gothic and Norman decoration

Fig. 81. Square Pyramids set Cornerwise.

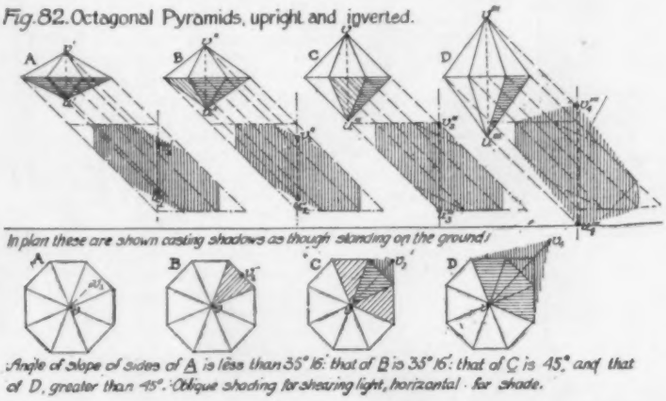


The shadows of these pyramids in plan are cast as though the pyramids stood on the ground. Oblique shading = shearing light; Horizontal shading = shade

are familiar instances of such occurrence of the square pyramid. It is not worth our while to particularize regarding them here. The special forms and relations of shade and shadow for the most important among them are indicated in Figures 79 to 82; it is only necessary to add a few words with reference to the axis and to the shaded sides.

105. The shadow of the axis is useful in locating the shadow of the apex. It passes through the centre of the shadow of the base, and, being (usually) the shadow of a principal line, is easily drawn by the rules for principal lines, and the shadow of the vertex or apex of the pyramid is located upon it. It will be seen from the figures that in the case of pyramids on principal squares *the shadow of the axis always passes through one corner of that of the base*,[2] and in the case of pyramids on "lozenges," through the middle of the long side, whether the shadow in plan or in elevation be considered. This fact makes it unnecessary to find the centre of the shadow of the base in order to draw the shadow of the axis.

Fig. 82. Octagonal Pyramids, upright and inverted.



Angle of slope of sides of A is less than 35°16′; that of B is 35°16′; that of C is 45°, and that of D, greater than 45°. Oblique shading for shearing light, horizontal for shade.

106. With regard to the shaded sides of the pyramid, the draughtsman should observe that *none of these is visible in elevation* when the pyramid has for its base a principal square, "lozenge" or octagon, and has its apex turned upward, to the left, or away from the eye; nor in plan when the apex points downward, forward or to the left.[3] In other positions, one or more dark sides come into view, according to their inclination to the base and their angular position, as is shown in Figures 79 to 83.

[1] By A. D. F. Hamlin, Assistant Professor of Architecture in the School of Mines, Columbia College. Continued from page 9, No. 745.

NOTE. — [In view of the inconvenience of having to refer to back-numbers for explanations of the notation used in these papers, the following memorandum will be found of service.]

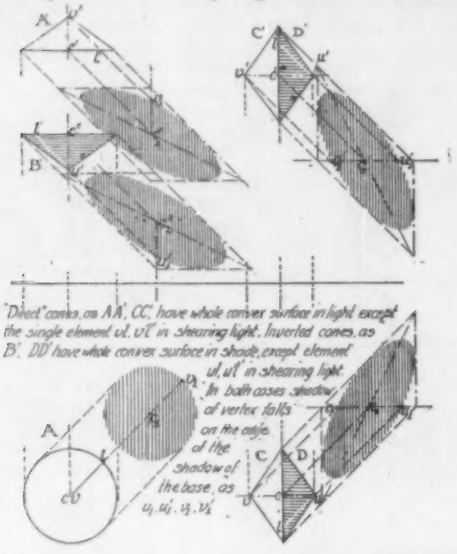
H P = horizontal plane of projection; *V P* = vertical plane of projection; *G L* = ground-line or horizon. Capital letters designate points and lines in space, small italics their horizontal projections, and the same accented or "primed," their vertical projections. Subscript figures indicate points of shadow: small figures above the line indicate points of shade. Greek letters (α, β, γ, θ, δ,) designate angles. The *diagonal* of a line or dimension is its length multiplied by $\sqrt{2}$. Shadows are indicated by vertical shading; shades by horizontal shading; shearing light by oblique shading parallel to the projections of the luminous ray.

[2] The shadow of the axis of a principal octagonal pyramid passes through a corner of the shadow of the square circumscribing the base.

[3] In those positions in which the apex is turned towards the light (*i. e.*, upwards, horizontally forward or to the left in principal pyramids), we may designate the pyramid as "upright" or "obverse." In the reverse of these positions it may be designated as "inverted."

107. *The cone*, whose shadow, like that of the pyramid, is found by means of the shadow of the base and vertex, generally compels recourse to the reverse process for finding its line of shade. The discussion of the cone will be confined to principal cones, which may occupy any one of six positions, according as the vertex points towards the light; that is, upward, horizontally forward or to the left; or away from the light; that is, downward, horizontally towards *V'P* or to the left. In the first three positions we may call the cone *upright* or *obverse*, and *inverted* in the last three.

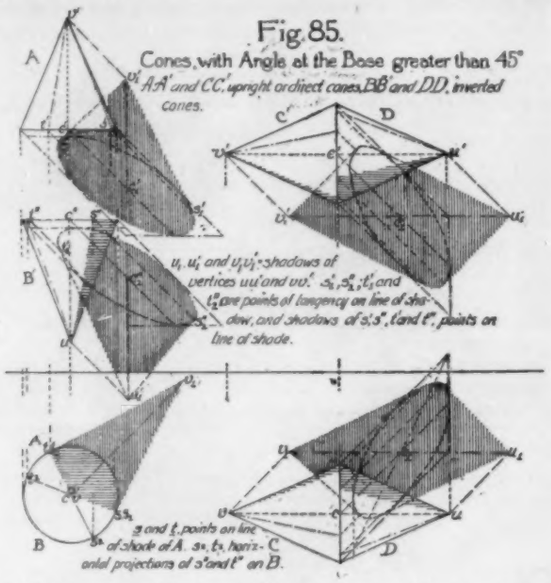
Fig. 83. Cones having Angle of 35° 16′ at the Base.



108. The line of shade of the cone consists generally of a portion of the circumference of the base and two right-line elements of the cone. Its shadow is, consequently, limited by an arc of a circle or ellipse, and two tangents to it meeting in the shadow of the vertex. The precise location upon the cone of the two right-line elements of the line of shade is found by following back the rays from the points of tangency on the shadow to the base of cone. The two points thus obtained are extremities of the rectilinear elements of shade. According as the vertex is higher or lower, its shadow falls at a greater or less distance beyond the shadow of the base. When the angle of inclination of the conical surface to the base is 35° 16′ (Figure 83), the shadow of the vertex glides along one element of the cone and falls on the edge of the shadow of the base. The whole conical surface, except that one element, is in light when the cone is upright or obverse (*A* and *C*, Figure 83), and in shade when the cone is inverted (*B* and *D*, same figure). At less than 35° 16′ the whole conical surface is in light or in shade, according as the cone is upright or inverted, while at 45° one-quarter of the conical surface of the upright cone is in shade, and three-quarters in the case of the inverted cone (Figure 84, *B* and *D*). Between 45° and 90° (at which angle the cone becomes a cylinder, with its line of shade on the corner) the front or visible element of shade on the upright cone must lie between the right-hand "corner" and the extreme right-hand element of the cone, and on the inverted cone between the right-hand "corner" and the middle of the cone. On the further side of the cone, the element of shade of the upright cone lies between the middle and the left-hand "corner," and, on the inverted cone, between the left-hand "corner" and extreme left-hand element of the cone (Figure 85). It should be observed that on the direct cone no shade is visible in elevation unless the inclination is steeper than 45°, and that half of the visible surface of the inverted cone of 45° appears in shade in elevation.

Fig. 85.

Cones, with Angle at the Base greater than 45°



109. When the axis is perpendicular to the plane of projection and incidence (as in the plan of a vertical cone, or the elevation of a cone projecting horizontally from a vertical wall), the shadow of the base is a circle, and that of the vertex a point at a distance from the centre of this circle equal to the diagonal of the altitude or axis of the cone. Two tangents drawn from this point to the circle complete the outline of shadow. When the cone stands *on* the plane of incidence, its base covers its own shadow, so that we have only to draw from the shadow of the vertex two tangents to the base of the cone (Figures 83, 84, 85).

Fig. 84. Cones having Angle of 45° at the Base.

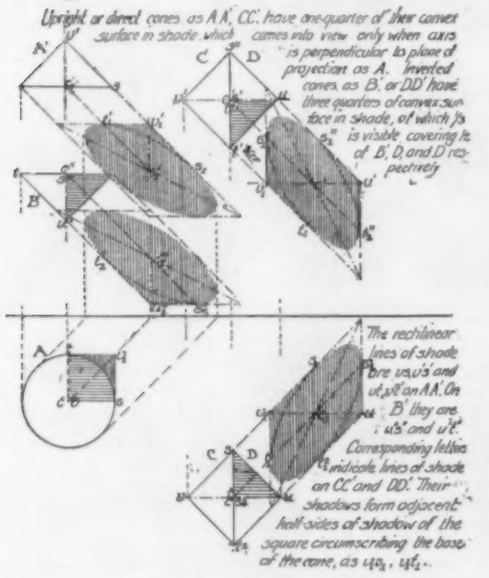
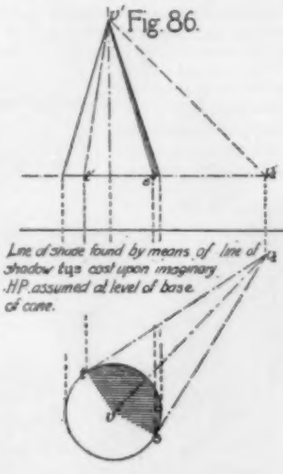


Fig. 86.



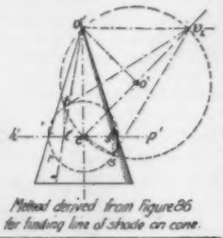
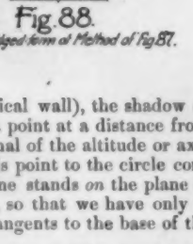


Fig. 87.

Fig. 88.



Abridged form of Method of Fig 87.

110. When it is required merely to find the line of shade on the surface of the cone, as in the elevation of a round spire or conical roof, a horizontal plane of incidence may be assumed passing through the base of the cone, or, indeed, cutting it at any desired level. The

projection of the cone upon this plane will be a circle, to which we draw two tangents from the shadow of its vertex on the same plane, so that the points of contact of the two tangents are themselves the extremities of the two right-line elements of the line of shade. These two points are then easily found on the vertical projection of the base of the cone (Figure 86). But the two projections can be combined in one by drawing the circle or plan of the cone *on the elevation*, its centre being on the axis at the level of the assumed plane of incidence, as shown in Figure 87. The construction may be still further simplified if we remember that a tangent to a circle at any point is perpendicular to the radius drawn to that point; and that a right angle can always be inscribed in a semicircle, which, in the figure just referred to, would have for its centre the middle point *o'* of the shadow of the axis. This middle point may in turn be found by means of a line at 45° from the vertex of the cone to the shadow of the axis; and, as it is not necessary to draw the whole shadow of the axis, nor the two tangents (since all we are seeking to locate is the two points of tangency), we may reduce the whole operation to that described in the following rule:

(*XIII*) — *From any point, C, assumed on the axis as a centre, describe the circle of section of the cone at that level. From the same point, and from the vertex, draw two lines at 45° meeting in a right angle on the side away from the light in the case of the obverse cone, and on the side toward the light in the case of the inverted cone. From their intersection O as a centre, strike an indefinite circular arc through C; the intersections of this arc with the circle of section already drawn, when projected back onto the base of the cone assumed to pass through C, mark the extremities of the required elements of shade* (*Figures* 87 *and* 88).

[To be continued.]

SEARCH FOR TREASURE IN ABOUKIR BAY.

AN OLD STABLE NEAR ROTHENBERG, BAVARIA.

IN recent years many attempts have been made, some of which have been successful, to recover from the sea the treasures which have lain at the bottom of the ocean for many years. One of the most interesting of these enterprises is the attempt to raise from the sandy bottom of Aboukir Bay the treasure contained in some of the French vessels of war sunk by Lord Nelson at the battle of the Nile. The facts of that great naval engagement are historical and well-known. After the sacking of Malta, Napoleon attempted to enter Alexandria, but finding it difficult to do so, his fleet came to an anchor in the now historical Bay of Aboukir, and were there surprised by Nelson, and on that memorable night in August, 1798, the battle of the Nile put an end to Napoleon's ambitious aspirations in the East.

It is well-known that on his way to the East, Napoleon carried off from Malta treasures of great value. These treasures consisted of the loot of the Church of St. John's, and the whole of the specie and moneys deposited for safety in the French bank in that island. The Knights of St. John at that period were immensely wealthy, the income of the church exceeding £6,000,000 per annum. The greater portion, if not the whole, of this income was expended by the Knights in ornamenting their church, the plate, and even the candelabra and brackets being of precious metals, and the most beautiful workmanship, one candelabra alone, of solid gold, being large enough for twenty men to stand upon. These precious articles, including massive silver gates, were carried off by Napoleon, and taken by him on board his flagship "*L'Orient*." It is stated, and we believe authentically recorded, that on his way from Malta to Alexandria, Napoleon divided this treasure into three classes; the first consisting of specie and such articles of gold as could be easily melted and transformed into money for the payment of his troops; the second consisting of gold and silver ornaments, which might, if occasion required, also be used for the same purpose; and the third consisting of precious stones and articles of artistic beauty which Napoleon contemplated retaining for his own use. Some doubt has been expressed as to whether the whole of this treasure remained on board "*L'Orient*" on that memorable night in August, when the battle was fought. This doubt may apply to articles of the first class, inasmuch as it is believed some of the specie and articles of that class was sent ashore, and used for the payment of the troops in Egypt, but as to the second and third classes, there is every reason to believe they were on board and went down with "*L'Orient*."

It will be remembered that in the course of the battle, "*L'Orient*" was set on fire and exploded. Her magazines being in the centre of the vessel, she was literally blown in two halves. These two halves went down at a few cables length from the spot where the explosion took place. It is upon one or both of these portions of "*L'Orient*" that operations are at present in progress, for recovering the treasures we have mentioned. The divers employed in the enterprise have discovered the precise spot where the explosion occurred, and they have there found a huge heap of articles, which on the splitting asunder of the vessel appear to have rolled from her decks and cabins to the bottom of the bay. They are at present operating upon this wreckage, and upon one of the portions of the great ship, with a view to penetrating her store-rooms, and bringing to the surface the treasures which it is believed are still deposited there.

These operations commenced about the middle of June last, English divers, sent out by an English company formed for the purpose, assisted by Greek divers, carefully inspected and buoyed the position of the wreckage, and at the end of July a vessel with the necessary steam-lifting power and appliances commenced the work of raising these articles to the surface. Their operations have, however, been materially retarded by the phenomenally rough weather which has prevailed in the Mediterranean for the past two months. Heavy seas break into the Bay of Aboukir, and although it does not actually prevent the divers descending, yet it causes the waters to become so clouded, it is impossible for them to see to carry on their work successfully. Notwithstanding this drawback, however, they have, we are informed, up to the present brought to the surface a large number of valuable relics, consisting of swords, muskets, pistols, cannon, and articles of use and ornament, which were on board "*L'Orient*." They have found that this vessel was copper built, the huge bolts of copper, with which she was constructed, being twisted into every conceivable variety of shape by the force of the explosion. The value of the copper alone, which is of the purest metal (very superior to the class of copper used in the construction of vessels of the present day) and of great thickness, must be very great.

It has also been stated to us that centrifugal pumps for pumping out the sand arrived at the scene of operations a week or two ago, and have been fixed, and are now at work, and it is anticipated that on the subsidence of the present phenomenally bad weather, rapid progress will be made in this interesting search.

His Highness, the Khedive, his ministers, and, in fact, all classes of the community in Egypt take great interest in watching the progress of the work, and the scene of operations has been visited by His Highness and by several of his ministers. On August 3, His Highness inspected a number of the articles recovered.

It must be very satisfactory to the company engaged in these operations to find they have been so far successful as to have thus at the outset recovered more than sufficient to recoup them all the expenses of the expedition. We learn that it is possible that the rise of the Nile may for some two or three months cause a cessation of work, but the company are confident they will ultimately succeed in bringing to the surface all that remains of the great French vessel. In addition to "*L'Orient*" they also propose operating on the "*Maza Munda*," a large French transport, which carried funds and supplies to Napoleon, and before landing them was also sunk in the bay; the "*Juno*," another of the French ships of war, being also available for overhauling.

The work is an exceedingly interesting one, and we trust it may ultimately result in finding those treasures which it is firmly believed now lie at the bottom of the bay.

The French claim to have given up to them any articles, as they term it, of historic interest which may be brought to the surface. The right of the Egyptian Government to grant the concession for the recovery of the treasures is not disputed, but the French authorities say that, whilst admitting that the concessionaire is entitled to any treasures that may be recovered, articles of historic interest ought and must be given up to them. What are articles of historic interest they do not define. What, however, it is believed the French Government do, and will claim, are papers and letters which it is anticipated will be found in a state of preservation, and which may possibly disclose matters of French history as affecting Napoleon and his movements at that day.

The Egyptian Government at Cairo, without admitting the French claim, have in compliance with their requirements, appointed His Excellency, Middlemas Bey, to watch the operations of the company, and the company has given him every facility for the performance of his duties, and we learn that His Excellency has expressed himself perfectly satisfied with all that has been done up to the present. — *Invention.*

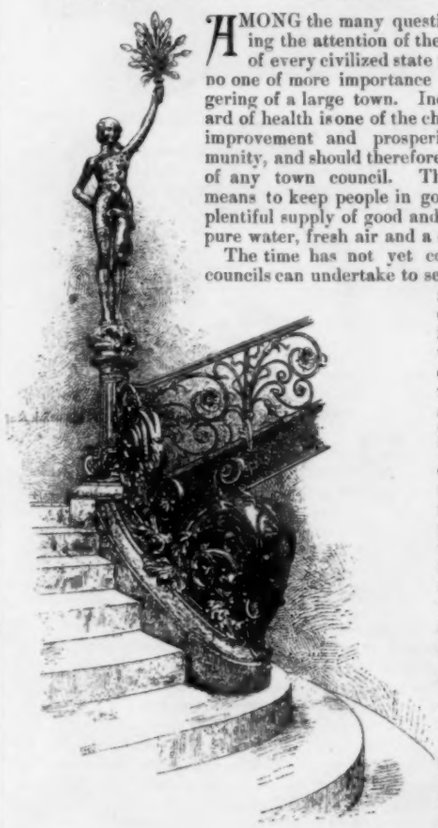
A BUST BY G. DUPRE. — The Louvre was not long ago enriched by the addition of a bust by Guillaume Dupré, who, in the seventeenth century, gained fame by his medallions. It was believed that he confined himself to work in relief, and the bust is the only known example of his skill in the round. The subject, De Vic, was a governor of Calais, and vice-admiral of France, and he is represented wearing a cuirass with a mantle thrown over the left shoulder. According to the *Courrier de l'Art*, the bust belonged to a lady who was offered 30,000 francs for it by an amateur. But, preferring that the work should be in a French gallery, she began negotiations with the government, and finally sold it for 18,000 francs. This is patriotism of a certain sort. — *Commercial Advertiser.*

MR. WILLIAM MORRIS ON GOTHIC ARCHITECTURE.

"All the Modern Improvements."—No. 8.

MR. WILLIAM MORRIS lectured on Saturday afternoon at the Artists Club, Liverpool, on the subject of "Gothic Architecture." The lecturer said that the word architecture was commonly understood to mean the art of ornamental building, and in that sense he should often have to use it in his lecture. Gothic architecture is, he observed, the most completely organic form of the art which the world has seen. The break in the thread of tradition could only occur there; all the former developments tended thither, and to ignore this fact and attempt to catch up the thread before that point was reached would be a mere piece of artificiality betokening not a new birth, but a corruption into mere whim of the ancient traditions. In order to illustrate this position, the lecturer sketched the historical sequence of events which led to Gothic architecture and its fall. East and West it overran the world wherever men built with history behind them. In the East it mingled with the traditions of the native populations, especially those of Persia of the Sassanian period, and produced the whole body of what we erroneously call Arab art (for the Arabs never had any art), from Ispahan to Grañada. In the West it settled itself in the parts of Italy that Justinian had conquered, notably Ravenna, and thence came to Venice. From Italy, or perhaps even from Byzantium itself, it was carried into Germany and pre-Norman England, touching even Ireland and Scandinavia. Rome adopted it, and sent it another route through the South of France, where it fell under the influence of provincial Roman architecture, and produced a very strong, orderly and logical sub-style, just what one imagines the ancient Romans might have evolved if they had been able to resist the conquered Greeks that took them captive. Then it spread all over France—the first development of the architecture of the most architectural people—and, in the north of that country, fell under the influence of the Scandinavian and Teutonic tribes, and produced the last of the round-arched Gothic styles we call Norman, which those energetic warriors carried into Sicily, where it blended with the Saracenic Byzantine, and produced lovely works. But we know it best in our own country, for Duke William's intrusive monks used it everywhere, and it drove out the native English style derived from Byzantium through Germany. It was the first style since the invention of the arch that did due honor to it, and instead of concealing, decorated it in a logical manner. It had shaken off the fetters of Greek superstition and aristocracy, and Roman pedantry, and though it must needs have had laws to be a style at all, it followed them of free will and unconsciously. The cant of the beauty of simplicity—viz., bareness and barrenness—did not affect it. It was not ashamed of redundancy of material, or superabundance of ornament, any more than nature is. Material was not its master, but its servant. Marble was not necessary to its beauty. Stone would do or brick or timber. Smoothness it loves, and the utmost finish that the hand can give; but, if material skill fail, the rougher work can so be wrought that it also shall please us with its inventive suggestion. During the twelfth and thirteenth centuries, as far back as the art of beautiful building is concerned, France and England were the architectural countries *par excellence*. The period in which Gothic architecture reached its zenith was marked by the Battle of Courtray, where the chivalry of France turned their backs in flight before the Flemish weavers. All over the intelligent world was spread this bright, glittering, joyous art, which had now reached its acme of elegance and beauty. Dante, Chaucer, Petrarch, the German hero ballad epics, the French romances, the English forest ballads, the Icelandic Sagas, Froissart, and the chroniclers represent its literature. Its painting embraces a host of names of Italy and Flanders chiefly, the two great realists, Giotto and Van Eyk, at their head. The few pieces of household goods left of its wreckage are marvels of beauty; its woven cloths and embroideries are worthy of its loveliest building. In the middle of the fourteenth century Europe was scourged by that mysterious terror, the Black Death, and in the years that followed it Gothic architecture began to alter its character. It began to lose its exaltation of style, and to suffer a diminution in the generous wealth of beauty which it gave us in its heyday. In England it grew more crabbed and even commonplace. In France it lost order, virility, and purity of line. At last, at the close of the fifteenth century, the great change became obvious. This change we have boastfully, and as regards the arts, called, "The New Birth." In short, the age of commercialism was being born. There are many artists at present who do not sufficiently estimate the enormity, the portentousness of this change, and how closely it is connected with the Victorian architecture of the brick box and the slate lid, which help to make us the dullards that we are. St. Peter's in Rome, St. Paul's in London, were not built to be beautiful and convenient. They were not built to be houses of the citizens in their moments of exaltation, their supreme grief or hope, but to be proper and respectable, and therefore to show the due amount of cultivation and knowledge of the only people and times that in the minds of these ignorant builders were not barbaric. From this brief historic review of the progress of the arts it results that to-day there is only one style of architecture on which it is possible to found a true living art which is free to adapt itself to the varying conditions of social life, climate, and so forth, and that style is Gothic. What we now call architecture is but an imitation of an imitation of an imitation, the result of a tradition of dull respectability or of foolish whims without root or growth in them. It is true that the world is uglier now than it was fifty years ago; but then people thought that ugliness was a desirable thing, and regarded it as a sign of civilization, which no doubt it is. Art cannot be dead so long as we feel the lack of it. Unhappy and slavish work must come to an end. In that day we shall take Gothic architecture by the hand, and know it for what it was and what it is. —*The Building News.*

THE SANITARY SERVICE OF AMSTERDAM.[1]



Staircase of Machinery Hall, Paris. From *L'Architecture.*

AMONG the many questions now engaging the attention of the scientific public of every civilized state there is certainly no one of more importance than the scavengering of a large town. Indeed, the standard of health is one of the chief factors in the improvement and prosperity of the community, and should therefore be the first care of any town council. The most certain means to keep people in good health are a plentiful supply of good and wholesome food, pure water, fresh air and a disinfected soil.

The time has not yet come when town councils can undertake to see that every citizen has an abundant supply of food, but they can watch over the quality and see that no adulterated food be offered for sale. The inhabitants of Amsterdam may, as a rule, rejoice in the possession of pure water. In how far, then, is attention given to the purity of the air and the disinfecting of the soil.

To obtain fresh air and a disinfected soil, a town must possess a good system of drainage, that is, one which is quick, regular, and perfect in its escape, and all animal matter of which 95 per cent of the refuse of a town consists and which in a rotting state throws off those dangerous gases which infect the soil, must be perfectly disinfected. Yet this refuse is only refuse in a town when heaped up in cess-pools, gullies, and drains. On the other hand, it becomes a blessing when taken to the right place, namely, the fields. This, in fact, is the only proper means to entirely disinfect a town.

According to scientific inquiry, the excreta of every person, irrespective of age, averages 286 kilograms a year, seven-eighths of which is in a fluid state and about one-eighth solid, excellently suited for manuring purposes, and worth from 2 to 2.40 florins. The collective value of the human excreta of the population of Amsterdam represents, therefore, in theory, a sum of not less than 800,000 florins.

[1] Translation, by Consul Eckstein, of an article published in Amsterdam, on the City Sanitary Service.

Now, Amsterdam possesses, at present, two systems by which part of its drainage is done. The first is the flush system, by means of which all impurities, both solid and fluid, with the exception of ashes, kitchen refuse, and street sweepings, run waste through brick drains into the canals. The other system, on the contrary, separates the refuse in such a way that only the rain and slop water flows through the drain, whilst the excreta is collected in a solid, unmixed form and sold to the agriculturist at a high price. This latter system is subdivided into the Liernur system and the exchange-tub system.

There is still another way of collecting fæces, which is unworthy the name of system. We refer to the cess-pools. These are still found in many houses. Hereafter we shall explain how the fæces are got out of these cess-pools. At present all excreta, except that which runs through the drains into the canals, the effects of which one becomes strongly sensible of by taking a walk along the Rose and Eglantine canals, all the ashes, kitchen refuse, street sweepings, etc., are conveyed to the extensive grounds lying in the Polder of Sloten on the Kostverloven Wetering, and commonly known as the Belt. They reach these grounds either through the net system of Liernur or by means of boats and dust carts.

The inventor of the system, Captain Liernur, set to work on the idea that the flushing by water, leaving out of account its effects on health, caused a loss of millions and millions to the farmer, and he concluded that compressed air might be employed. This has the advantage of being everywhere present, and it diminishes nothing from the volume or weight of the matter. Let us briefly describe this system, as worked in Amsterdam, with some unimportant alterations: The excreta fall along the privy-pan into a funnel, which is so arranged that the matter drops directly into a turned-up S-bend fastened to a stand-pipe; in the funnel is a grate to prevent any large solid matter from entering the pipe. This funnel is moreover connected by a pipe with the outer air so that offensive gases are carried off. Near the funnel there is a lid over the S-bend, which can be screwed off for inspection and the removal of any obstacle in case of stoppage.

The different stories of a house are all connected with the same stand-pipe, which is extended above the roof-level to obtain the necessary air-pressure. At the bottom there is again a siphon, to which a distention valve is fixed, to carry off the gases which accumulate in the soil-pipe; this valve turns the gases into another pipe, which also extends above the roof. As a rule, this second pipe is coupled onto the first in the attic. The siphon is also furnished with a lid, which can be taken off to remove any obstruction. The stand-pipe runs out into the middle of the street, where it can empty itself into a small reservoir, which can be shut off by a valve. The object of this is, in case of obstruction in any stand-pipe, to be able to shut off all the other stand-pipes and turn the full volume of air on this one, which is alone connected with the vacuum.

From the small reservoir runs a side escape, which empties all the privies at once into the main, this being connected with the street reservoirs by means of turncocks. Every block of buildings, therefore, must have a side escape into the main.

Several escapes empty themselves into the street reservoir, generally about six or eight; these reservoirs being mostly situated at cross streets. From the pumping-station at the Kostverloven Wetering there run two chief mains, the one serving for the pneumatic working and the other for the conveyance of the soil through all the parts of the town where the Liernur system is completed. The street reservoirs are connected by taps with these chief mains.

At the central pumping-station a steam air-pumping engine of 60 horse-power exhausts the large reservoir. The chief mains being connected herewith by the opening and shutting of taps, the air volume therein gradually diminishes, and this again reacts on the street reservoirs. Thus the air is exhausted from reservoir to reservoir. If, now, the tap of the escape-pipe from the buildings to the street reservoir be opened, then the vacuum extends itself once more to the excreta in the S-bend. From above there is a volume of air pressing downwards, which in its course carries everything with it and empties the same into the street reservoir. When this is full, the taps of the chief air-main are turned off and the tap of the chief conveyance-main opened, which has also been exhausted. Above the reservoir is a valve, and this being opened the outer air presses on the soil and drives it into the chief conveyance-main, and as the engine continues to exhaust the air the soil speeds along to the large reservoir at the pumping-station. The speed would become something enormous if the mains were quite horizontal; but, as they sometimes rise and fall, this serves to moderate the speed. At the pumping-station the soil is received in two lower reservoirs. An arrangement brought into action by the pumping-engine alternately opens and shuts the taps, so that automatically, as soon as one reservoir is filled its taps are closed and the taps of the next one opened for the reception of the matter. In the same automatic way the matter is brought up into the two upper reservoirs, whence it flows off to the different quarters where it is required.

The gases which are drawn off from the chief main are burnt in fires under the boilers. At the end of 1888 the number of blocks of buildings connected with Liernur's system was 2,847, and these blocks were inhabited by 50,240 persons. The quantity of soil amounted to 44,840,150 litres.[1] To the Belt Liernur-fæces are also brought from the temporary arrangement by boats. This is the so-called tub system with drop pipes. The fixing of the stand-pipe and the tunnels attached is just the same as in the other system, only the soil in this case runs into small reservoirs capable of containing from 200 to 300 litres, situated in front of the house, whence it is pumped by an air-pump into tanks and conveyed by boat to the Belt. Last year 35,121,500 litres were collected in this way. The exchange-tub system is distinguished by its simplicity. It is in working in 334 blocks of buildings, and requires 1,505 sets of tubs, which are daily carried from the houses in well-closed carts and conveyed to the Belt, where, in a special building, they are emptied, cleansed, and disinfected. The average number of tubs exchanged every day is 810, and the quantity of soil collected in this way amounted last year to 1,500,000 litres. The original intention was to turn the matter collected by the Liernur system and the exchange-tub system into "poudrette," and a "triple-effect" was set up for this purpose. To carry out this, however, it is necessary to allow the matter to thicken into a paste, and, as this did not succeed, the plan had to be given up. At present, tests are being made to turn the fæces into sulphuretted ammoniac, which so far have been very successful. If the Liernur-fæces cannot be worked up artificially, they are taken to the compost sheds (to be described hereafter), the reservoir of fæces, or to the boats for conveyance to the country.

Now, what do we find at the central Belt? (1) Liernur-fæces collected by the air-pumps; (2) Liernur-fæces brought in by boat; (3) fæces from the exchange-tubs. But this is not all. The cess-pool carts which patrol the back quarters of the town, and into which the fæces are poured in a most unsightly manner from all sorts of vessels, brought in 7,277,000 litres in the year 1888. And now comes the residuum of the night work. In 1888 there were emptied 871 privies with the Latrine cleansing machine, and in 83 cases it was necessary to carry the soil in buckets by hand, which produced 10,651,000 litres. Such a machine empties a privy without smell. A thick hose is so placed in the cess-pool as to have its termination below the matter. This hose is then fastened to an iron cylinder or a large, air-tight barrel capable of containing 1,500 litres. By means of an air-pump the cylinder is exhausted and the matter flows pneumatically into the barrel. A gutta-percha ball shuts off the connection as soon as the barrel is full. The gases are drawn off from the pipe and burnt in a fire attached to the pump, so that there is no smell. One night we convinced ourselves of the excellent qualities of this machine, which, being worked by hand, causes no noise. Some means must be found to dispose of this immense mass of fæces consisting of nearly 100,000,000 litres, or 100,000 cubic metres. As we have said before, part of it is turned into sulphuretted ammoniac, and another part is taken off by boats, consequently we need not be concerned on this head.

In the meantime the dust carts in their daily rounds collect an immense mass of ashes and refuse at every house and in every street. Large quantities of refuse and street sweepings and floating matter from the canals are brought in by boat — in 1888, *inter alia*, 4,535 carrions. The abattoir sends also its offal. All this material is sorted at the Belt, and objects of any value set aside, such as rags, paper, iron, glass, etc., and then the rest is taken to the compost sheds, where it is flooded with the Liernur-fæces, and so the compost manure is made.

The street sweepings and flotsam of the canals, which are not used in the compost sheds, after being assorted and dried, are sold in trade and bring a good price. What still remains of the fæces is put into a large brick reservoir 65 metres long by 25 metres broad and 4 metres deep, whence it is sold for manuring of fields and sandy soil. The market-gardeners are the largest buyers, this article being specially useful in the cultivation of cauliflower. In 1888 the total receipts for manures of all kinds was $55,840.

The premises of the central Belt are entirely surrounded by water, which greatly facilitates the loading and unloading of boats, whilst the grounds are also rendered easily accessible to the dust carts. A branch line connecting these premises with the Dutch Railroad is still a pious wish.

If one pays a visit to the Belt in the morning, one sees a continual streaming in and out of carts and boats, which deposit their various loads here. The quantity of ashes and refuse brought-in in 1888 amounted to 25,860 cart-loads, 2,813 barrow-loads, and 9,470 boat-loads, making a total of 117,363 cubic metres.

There is scarcely an institution of any importance which does not possess its cabinet of curiosities, and the Belt has also its cabinet. South of the pumping-station proper, on the other side of the canal which surrounds the premises, there is, besides the town disinfecting rooms, a large oblong shed for storing objects found among the ashes and refuse. Here we may learn that the most unsightly-looking objects and bits of paper have their comparative value.

From the nature of the refuse collected at every door the variety of things to be found herein is considerable. Here, in the first place what we commonly denominate refuse is classified, linen and cotton rags taking the foremost rank. These are first put through the mill, which cleanses them from all dust, then washed and dried and packed in bales. The paper manufacturers know their value. But even rags are sorted once more. We find the linen, the cotton, the muslin and woollen departments.

Above all, the carpet department attracts attention. The Smyrnas, Doorniks, Brussels, and Deventer carpets are all neatly arranged, and their value is not inconsiderable. Nay, even amongst the rags their distinction is kept up. The proud Smyrna would never be associated with a piece of stair-carpet or cocoa matting.

[1] 1 litre = 2.113 pints.

Broken glass has here also an important place. And, strange as it may seem for a city like this, where last winter hundreds of people were daily supplied with a loaf of bread gratis, there is a large tank full of pieces of bread ranging from the finest sorts down to the black bread. This can, however, be turned into fodder for the cattle. Shoes are by no means wanting; there are bales and bales of old shoes and boots in the warehouse which will find a buyer. In fact, we have been told that the beautiful leather articles of Vienna and the cuir de Russe are manufactured from old boots, which are ground to powder and pressed. Many of the beautiful-looking albums we see are made in this way.

There are bales of old and new tin articles, hundreds of tins and metal objects, such as tea-pots, coffee-cans, spoons, forks, etc., heaps of cotton-down, horse-hair, and such like; all lie assorted just as neatly as we find objects in a fashionable shop in the Kalverstraat. Twice a year these things are put up at auction. These premises are during the whole day an everchanging scene of life and movement. The carts drive in and out, the boats come and go, and the five and twenty tjalks are loading or awaiting their turn.

As a matter of course, the cartage and working of so many thousand cubic metres of material, and the sweeping of the streets, squares and canals, require a large number of work people. In addition to the inspectors, about three hundred workmen are employed. For collecting the ashes and refuse there are 12 commanders, 52 foremen, 52 assistants, 35 barge-men, 2 masters for the tug-boats, 2 engine drivers, and 65 horses. Further, 10 men are engaged in collecting the flotsam from the canals. For sweeping the streets there are 6 commanders, 12 drivers for the sweeping-machines, 70 workmen, 6 drivers for the water-carts, and 20 horses. To water the streets in the height of summer 30 workmen and 6 horses are required. Seventy-nine workmen are necessary to look after the drains. At the Belt itself there are 2 bosses, 2 commanders, 107 workmen, 1 engine-driver, 1 cooper, etc.

The plant and 115 horses required for the sweeping-machines, exchange-tubs, Latrine carts, refuse carts, etc., are stationed on the Bilderdijkkade, generally known as the central stables.

This depot is also well worthy of a visit. The premises are surrounded by palisades, flanked by the dwellings of the two bosses, and the whole plant, such as sweeping-machines, exchange-tub carts, arranged under awnings which are made fast to the walls of the stables. This is probably done for economy's sake, but it does not appear to me sufficent protection against wind and weather.

On the left are the sheds, a smithy, a cartwright's shop, the painter's, the cooper's, and the saddler's shops, and the warehouse of all sorts of articles necessary for repairs or the replacing of the materials in use. The wages paid to the workmen in these shops amounts to $3,734.

The stables, however, are the most interesting of all. They are built in three long rows, and between them the space intervening is fitted up for cart sheds. Each stable has room for forty horses, allowing 1.7 metres of standing room for each horse. There is none too much room as these horses are chosen for their size and draught powers. Among them are some really fine-looking animals, giants we may call them in their domain.

For these stables there are two bosses, assisted by an upper groom and six stablemen.

The largest and strongest horses are employed for the sweeping-machines, and it is an interesting sight to see the machines drawn by these gigantic horses at 12 o'clock at night file out through the gates to commence their work in the different quarters of the town.

As a rule, there are twelve horses, twelve drivers, twelve machines, sixty-six sweepers, and from twelve to fifteen barrows engaged in this service every night. In dry weather the sweeping-machines are preceded by the water-carts. The sweepings are wheeled in barrows to the side of the canals, shot into boats, and conveyed, early in the morning, to the Belt. In this way all the streets get a thorough cleansing once a week, and the principal streets and squares three times a week.

The drawing of the sweeping-machines is very heavy work; it requires the strongest horses, and these are very soon unfit for this service. The stables are excellently well kept, and are specially remarkable for their cleanliness and airiness. On these premises there is also a shoeing smithy, a horse pond, and a coach-house and carriages for the service, beside a hospital stable for the horses. At present the latter is, fortunately, unoccupied, and it struck us as being small, for there is only room for three horses.

On these premises there is standing-room for two hundred and fifty carts, and, with the fodder and other requisites, the expenses are not small. In the estimates 40 cents a day are set down for the maintenance of each horse. For 1890 the sum of 21,648 florins has been put into the estimates for the purchase of new horses, fodder, shoeing, saddlery, etc., and for the maintenance of the rolling stock 4,260 florins. The average price paid for a horse is 204 florins. In 1888 there were required 238,710 kilograms of hay, 318,280 kilograms of oats, 173,805 kilograms of straw, or for each horse per day, 6 kilograms of hay, 8 kilograms of oats, and 4.4 kilograms of straw; and the total expenses for forage and bedding came to just over 41 cents per horse per day.[1]

The work of cleaning the streets is heaviest after a fall of snow. Then snow-plows are used. To clear away the snow from the bridges salts of potash are used with good effect. At such times men, horses, and material are all put to the strain, and often some hundreds of men are called in to assist temporarily. In warm weather the streets have to be watered by the hose from the fire plugs or by the water-carts. At all times the kennels and drains must be looked after, the cess-pools, large and small, deepened, and the urinals kept clean, and all the refuse sent on to the Belt. This item in the expenses is set down at 20,000 florins. There are in Amsterdam 3,567 large cess-pools and 7,495 smaller ones; the number of urinals is 237. These are cleansed once every day, flushed and painted over with a mixture of carbolic acid and black varnish. The town is divided into six divisions, which are again subdivided into sections, so that each dust cart and each boat has its appointed work to do. For each division there is a responsible superintendent.

Though it appears we are still far from perfect, yet we are on the right track to gradually carry out the most urgent demands of sanitation. People who knew Amsterdan ten or fifteen years ago readily confess that rapid progress has been made; and if this service demands an estimate of 218,480 florins for 1890, who will say this amount is too much to pay for pure air and a disinfected soil?

The Liernur system is certainly the system of the future, and this question will no longer present any difficulties when Amsterdam gets its net completed. Then the difficulty will arise, how to get rid of the immense mass of fæces which will be accumulated. Perhaps then the Heath Company will become a large buyer, and the refuse of Amsterdam will be conveyed to the heaths of Guelderland and North Brabant; there it will not be refuse, but gold.

[1] The florin = 40.2 cents American, so that the 41 cents here referred to doubtless mean Dutch cents, 2½ of which equal 1 American cent.

ARCHITECTURAL EDUCATION IN ITALY.

THE question of architectural studies in Italy is one which dates a long time back, and which in these days has been brought forward again. It is curious that in Italy we have no schools of architecture; that is to say, we have no architects recognized as such by the State. We have engineer architects with diplomas and a superficial instruction in the architectonic art, and we have architects without diplomas who have not had, officially at least, any instruction in the practice of building. I will explain whence comes this strange condition of architectural studies in Italy. In Italy there are two institutes to which are admitted those who desire to study architecture, the polytechnic schools and the academies of fine arts. Evidently architects ought not to be merely artists, but also men practiced in the knowledge of construction, as well as instructed in history and the archæology of their art, especially where there is a glorious past to preserve, and study of the antiquity and the restoration of monuments are pushed to extremes. So that we have to solve the question in Italy by making our architects engineer architects; that is to say, architect constructors (as if architects not constructors could logically exist), and the necessity is recognized of giving a scientific and artistic education at the same time to the young men who desire to practice architecture, sharing their education between the polytechnic schools and the academies of fine arts. It must be known first that the people of the polytechnic schools come from two institutes very different in their aims, both of them being secondary institutes of general culture: from the "Lycées," schools almost entirely literary, and from the technical institutes, schools almost wholly scientific. In the Lycées the pupils follow courses in literature, Greek and Latin, philosophy, history, chemistry, physics and elementary mathematics, or continue a course of drawing which these pupils have already followed in the Gymnase, where the instruction in drawing is quite ludicrous. In the technical institute the pupils follow courses of mathematics, chemistry, history, and a course in ornamental and mechanical drawing, but with an aim quite outside of any artistic purpose (I speak of the

physico-mathematical section). In this way then the pupils of these secondary institutes follow their theoretical courses at the university for two years, or better, their five years at the polytechnic, where the instruction is divided into two preparatory and special courses in this way.

Behold, then, these young people, especially those from the Lycées, who have never drawn anything unless hastily in their two years' preparation in the architecture course of the polytechnic; behold them in the school of architecture almost without artistic preparation, and in three years they will be architects in virtue of a diploma which the State will award them. I have picked out the school of architecture of the polytechnic, but in truth I ought to speak of the academies of fine arts. If the pupils of the architectural section of the Italian polytechnics must follow the artistic courses of the institutes of fine arts, it must be known that the courses of architecture for the polytechnic students have, that is, a duration of three years, and acknowledge the study of architectural styles considered in their historical development, the study of composition and modelling in clay the ornaments of architecture, the interior decoration of buildings, the drawing of perspectives, and exercises in water-color, as well as the study of architectural æsthetics. During the course the pupils must exercise themselves in the measurement of monuments.

This programme, as you see, is sufficiently large and practical, but in the case of the polytechnic pupils who follow architecture, they do not find themselves in the way of deriving much benefit, because of their lack of preparation. In the school of architecture to which is attached the study of ornaments, of the figure, of modelling, the new polytechnic students do not find themselves at their ease. In revenge *ils sont des deplaces*. Although the scientific courses which these polytechnic students must follow in the same way as the industrial and civil engineers are less serious, yet it is not less the truth that these pupils have not time enough to acquire a reasonable amount of instruction in the arts. Three years would perhaps be enough for pupils directed from the very beginning of their studies to artistic subjects, but for young people who have merely a general culture, three years are absolutely insufficient to equip one for the profession of architecture. Add to this the fact that these three years of instruction in our polytechnic schools are never followed by pupils with regularity and diligence, and you will have a perfect image of the condition of the pupils in architecture in the Italian polytechnic schools. The polytechnic students that I find in the schools of architecture, without rational preparation, after enrolling themselves in the artistic courses usually feel that they have no need to consider other obligations. Their names are absent in the schools of ornament and modelling; yet civil architects, as they are called in their diploma, are well-trained men in science applied to construction, but not at all so in the architectonic art and decoration. You will ask how is it that they do not oblige these polytechnic students to present themselves regularly at the courses of the academy and the examinations. We can oblige the polytechnic students to follow the artistic courses, but experience has shown that these pupils are often rather mediocre architects. For them art comes to the aid of science; it is not science which aids art, as, according to my understanding of an architect, should be the case. However, in the Italian polytechnics the section of architecture is that which gives the least useful results. The Italian polytechnics are scientific schools, for industrial engineers and builders of bridges and ditches. For example, at Milan there is a noted polytechnic school. The polytechnists call the school of architecture the "hospital," as much as to say, that it is a school of the broken down and hopeless.

Since 1865, the year when the section of architecture was attached to the Polytechnic at Milan, from 1865 to 1888, the architects who have there received their diploma are only thirty-two in number — thirty-two architects in the course of twenty-three years. This is ridiculous, and of these thirty-two architects how many are there who have any artistic capacity? I don't say a very remarkable capacity. I assure you that the right hand will be more than sufficient to count them. Neither the polytechnics nor the schools of application at Turin, Rome, Bologna or at Naples, give better results than those which I have pointed out as attaching to the school at Milan.

And then, you will ask, Italy being without architects, who is it that builds the houses and erects public monuments? I said a little while back, those who desire to practice architecture in Italy graduate from two institutions and schools of application, the polytechnics or institutes of fine arts. Now let us see what these architects are, or the so-called architects, who graduate from the institutes of fine arts. It is necessary to understand these gentry from the beginning of their education, for it is especially to these academic students that I desire to draw your attention. The pupils who attend the artistic courses at the institutes of fine arts can enroll themselves at the academy schools at the age of twelve years. These young academicians commence their artistic career with a very elementary education, quite fitted, for the matter of that, to their age. They are entered into a preparatory course, which lasts a year, for the elementary studies of geometry and geometrical and ornamental drawing. The preparatory course finished, these youths begin the so called common course, which lasts three years, and which aims at a general education in descriptive geometry, studies of shades and shadows, perspective, the elements of architecture and ornamentation, the figure, the elements of anatomy, the history of art and Italian history. At the end of this instruction each pupil must select his special section to which he desires to be admitted. If it is the section of architecture, the pupil must arrange to follow the course for four years, quite after the fashion of the polytechnic architectural students, except as to the fourth year, which is obligatory on the academical students, but not for the polytechnic students. The instruction of the academic student and of the polytechnic being in common, the programme of instruction is the same for one as for the other; the difference is that the polytechnic pupils, having attended the instruction in science applied to construction receive the diploma of civil architects, while the academic students, without any scientific preparation, and with an instruction almost exclusively artistic, have at the end of their course an humble license, a license of a professor of architectural drawing. Of what use this is I cannot imagine.

I have shown you, then, that we have in Italy polytechnic architects, who to be real architects have insufficiently studied architecture, and professors of architectural drawing, or as they are called, academic architects, who have no necessary cultivation in technical matters to be able to follow the profession of architect with ability. So that in spite of the diplomas awarded by the State, Italy has no architects, that is to say, it has not in its schools a sufficient cultivation to produce them. Yet in practice polytechnists and academicians practice architecture after their manner, and to tell the truth I ought to tell you at once that in Italy we have in these last years some remarkable constructions. We owe almost all these constructions to architects educated in the academies, to these humble professors of architectural drawing, or to those who, not even being professors, have attended the artistic courses of the academies *temporibus illis*. Finally all, or almost all, Italian architects who have any reputation with us are academicians, who, even so far as numbers go, are much fewer in number than the polytechnic architects, and are not recognized by the State except as professors of drawing. The situation is sufficiently odd. It is for this reason that the question of giving a more rational organization of the study of architecture in Italy has been agitated many times, and congresses of architects and engineers have been frequently agitated in the press, and to-day once more brought upon the carpet by our rulers, who are solicitious of securing the support of several deputies to Parliament. The architect academicians, although some amongst them aim to teach themselves on those points where their deficiency is marked, in fact fail in technical knowledge; but on the other hand, they have a very remarkable artistic education. For this reason, it is said, let us endeavor to complete this instruction, and, the architect being an artist, science comes to aid him, and art does not come to the aid of science, as they have attempted to bring about in polytechnic courses. In fact with the aim of succeeding once in reorganizing the instruction of architects, in 1885 a decree of the Minister of Public Instruction, M. Coppino, established three "complete" schools of architecture by way of experiment, three schools after the kind of that at Paris for diploma architects, in the institutes of fine arts at Florence, at Rome and at Naples. The programmes of these schools divided the courses into two parts, the inferior and superior course, and the latter was for technical license. Mark this. This license is inferior to that of the technical institutes. The inferior course of three years consisted of a general and elementary instruction in history and the arts, in mathematics, physics, chemistry, descriptive geometry, as well as elements of architecture and ornamental drawing, the figure, and the history of the fine arts. The superior course of four years, which some desired to make five, consisted in a special condition in physics, chemistry applied to building, stereotomy, study of architectural styles, as well as of architectural composition and decoration, the history of architecture and the law of building.

Now you believe perhaps that at the end of their course the pupil academicians are awarded a diploma of architecture; but nothing of the sort. These pupils, after a final examination, "shall receive a diploma of approbation." These are the words of the decree, "Diploma of approbation," but, if you please, approbation of what? No one has ever been able to guess. Why did they not say, "Pupils who have passed the final examination with success shall receive an architect's diploma?" Messieurs, the architects, good or bad, leave the polytechnics, and we have not the courage to say frankly that the proper place for educating an architect is an academy of fine arts, and not a polytechnic school. Nevertheless, on this essential point two opinions exist in Italy. The partisans of the polytechnic schools contend that architectonic culture can be given in scientific schools, or rather insist that these schools can give such instruction, and the partisans of the academies of fine arts maintain the contrary opinion. Without desiring to draw you into this debate I remark in this connection that strictly neither one or the other of the two schools, with their respective courses of instruction, fill the bill in such a way as to give a complete architectural education. For example, architectural students scarcely receive any literary and classic instruction in polytechnic schools or in the academies, and what interest might this last education have for those among our architects who desire to devote themselves to the restoration of our ancient monuments, I do not need to tell you, as I have no more need to repeat to you that the restoration of ancient monuments and the whole cultivation of the antique is carried with us to extremes. A reservation may be made for the polytechnic students who have followed the courses of the Lycée, but this

kind of polytechnic student is always represented in our schools of application by a very small number. Nevertheless, I do not wish to enter the field of exaggeration, or I might imitate Vitruvius, who made an architect something superhuman because of possessing encyclopædic knowledge. Now to come back to what I was saying, that is to say, that no ministry has had the courage to frankly affirm that the proper place for giving instruction in architecture is the Academy of Fine Arts. I ought to mention, however, that M. Coppino, by the establishment of complete schools of architecture, affirms by implication that his idea ran in the same direction as that which I have pointed out; but that bizarre diploma of approbation deprived this meritorious initiative of all seriousness. Perhaps it is the result of a mixture of parliamentary opinions. Whatever it may be, these complete schools of architecture will, conceived as they are, if not in a definite manner, solve the question of architectural study in Italy. It is a pity the present Minister of Public Instruction, M. Boselli, has not accepted the idea of his predecessor.

Evidently M. Coppino would have architects academicians, with the scientific education joined to an artistic education, and not polytechnic architects, and give in the polytechnic school only courses for industrial engineers and engineers for roads and bridges. M. Boselli, in his project presented recently to the Royal Senate, would like to reserve to the polytechnics the faculty of awarding a diploma of architecture. In the same way he would like to give the faculty of qualifying for the profession of architect (mark that there is no talk here of the diploma of architect) to the academies of fine arts at Rome, Florence and Naples, provided that the pupil academicians should receive their scientific instruction at the schools of application. So that one would have here again polytechnic architects and academic architects, and yet not a clear solution of a question which cannot be put off by incertitude and equivocation. But there is in it all something to be pleased with in the fact of these diplomated architects. As you see then, while in France the question of having one single official school of architecture, in the School of Fine Arts at Paris, has given rise to a lively agitation, and a group of societies has suggested the creation of a diploma to be given by the members of the societies themselves, while in France the notion of diplomas granted by societies has been conceived, in Italy, if the project of M. Boselli shall receive definite sanction, we shall have many series of official architects, but perhaps we shall not have any architects; or any definite solution of the question which relates to architectural studies in the kingdom; and as I have just shown the reorganization of these studies is in Italy demanded for many reasons. All its academic students, after having passed eight years (I refer to the new rules — eight years of study at an academy of fine arts), find themselves with an unfinished education and a license which officially is almost nothing. All these pupils are declassed, and almost always declassed through injustice. It is, therefore, with propriety that the academical students of the Institute of Fine Arts at Florence, at the end of the year 1888, addressed to the Minister of Instruction a petition showing him the false and unjust position which the State placed them in. They wrote "The young academical students inscribed in the courses of architecture in the academies of fine arts of the kingdom either are obliged to work like simple draughtsmen, or under the legal name of many professionals must prepare their architectural designs for a remuneration which is almost ridiculous and without the satisfaction of having their own names known."

The solution of the question of the architectural studies in favor of the ideas which these young academicians represent — these professors of drawing — cannot be longer delayed, and everything which aims at making architects artists will be received with us without any sympathy, I assure you.

At Milan, since 1872, we have had a school called the School of Master Masons, a unique institution of the kind in Italy. It was organized in such a way as to give a technical education to those who must direct masons in the stone-yard. Still, in this school in the way of science applied to construction, they do not go beyond what is taught in the School of Fine Arts at Paris, in the section from which come all the diplomated architects of France.

Now I am in a position to assure you, since I have among my pupils a goodly number of those who follow the courses at the School of Master Masons, that many of the pupil academicians follow the courses of the school of which I speak, and these young men are those who watch over and have the direction of several Milanese buildings, and sometimes themselves prepare the designs for them. Now I ask where shall we go to discover the solution of architectural studies in Italy, for this Milanese school could itself become the key of all our discussions and our desires. The fact is that we Italians desire to be the most academical people in the world, and so far as we are concerned, simplicity hardly exists. We love rhetoric before all, and we waste our breath and time in many useless things, which prove that we are not practical people. Without this in the solution which interests us we would not have sought up to the present time the impossible.

Ought the architect to be a man of science? No. He ought to be a man more artist than savant, just as the engineer should be a man more scientific than artistic. Let us try to distinguish the rôle of each, and the question is settled. The rest you know. Art is long and life is short, and while the world is as it now is society must resign itself to having architects and engineers; that is to say, artists and men of science.

A. Melani.

The Illustrations

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

HOUSE OF FREDERICK BRADLEY, ESQ., BEACON ST., BROOKLINE, MASS. MR. GEORGE F. LORING, ARCHITECT, BOSTON, MASS.

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

COMPETITIVE DESIGN FOR THE ERIE COUNTY BANK, BUFFALO, N. Y. MR. C. D. SWAN, ARCHITECT, BUFFALO, N. Y.

[Issued only with the International and Imperial Editions.]

COMPETITIVE DESIGN FOR THE ERIE COUNTY BANK, BUFFALO, N. Y. MR. W. L. FUCHS, ARCHITECT, BUFFALO, N. Y.

[Issued only with the International and Imperial Editions.]

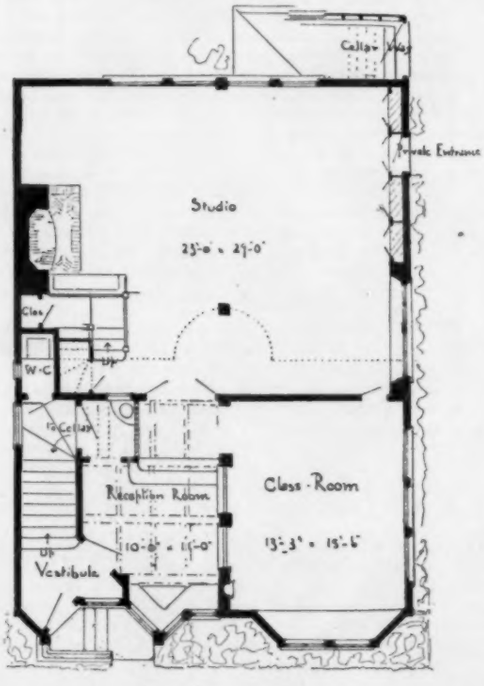
COMPETITIVE DESIGN FOR THE ERIE COUNTY BANK, BUFFALO, N. Y. MR. C. R. PERCIVAL, ARCHITECT, BUFFALO, N. Y.

[Issued only with the International and Imperial Editions.]

SECURITY BUILDING, ST. LOUIS, MO. MESSRS. PEABODY, STEARNS AND FURBER, ARCHITECTS, ST. LOUIS, MO.

THE FLEUR-DE-LYS, PROVIDENCE, R. I. MESSRS. STONE, CARPENTER & WILLSON, ARCHITECTS, PROVIDENCE, R. I.

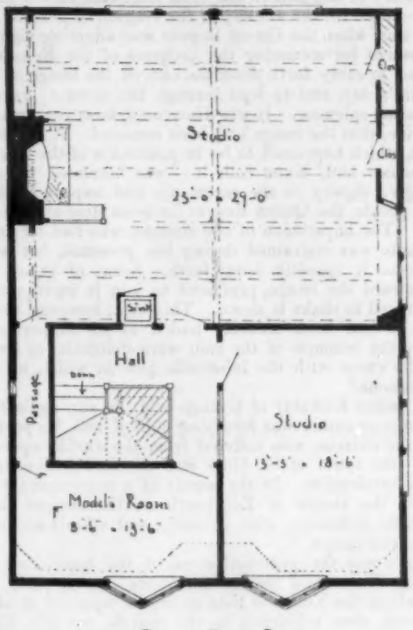
THE Fleur-de-Lys was built in 1885 for Mr. Sydney R. Burleigh, and is occupied as studios by himself and several other artists. The front is framed up of heavy chestnut timbers filled-in flush with rough-cast plaster on wire lathing on boarding nailed to fillets on the sides of the chestnut framing. The carving of the timber-heads at the second story was done by Mr. Burleigh and the other artists associated with him in the building, as was also the modelling and coloring of the figures and other ornamental work in the plastering, most of this latter being put on with mortar mixed with color in



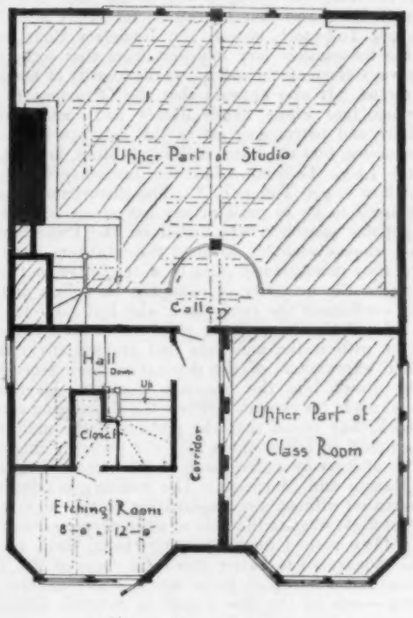
First Story Plan

the mortar-bed. Inside, the floors and roof are of factory-construction: planed-spruce plank on heavy spruce timbers, exposed beneath and coated with asphaltum, giving them a dark brown hue, with a peculiarly rich, velvety effect at the knots and hard places. The main studios are high-studded, with good north light, and have large brick fireplaces. These studios, and the rest of the building, galleries, doors, settles, etc., are finished in cypress, stained variously; and the lower studio in the first story is lined to a height of six feet and six inches with discarded window-shutters from various old

Providence houses. The plaster-work inside has also been incised, modelled and stained to some extent by Mr. Burleigh, who has got some very rich and striking effects in the staining of the plaster.



SECOND STORY PLAN



HALF-STORY PLAN

HOUSE OF GEORGE D. BARNARD, ESQ., ST. LOUIS, MO., AND STAIRCASE IN SAME. MESSRS. TULLY & CLARK, ARCHITECTS, ST. LOUIS, MO.

ROCHESTER ARCHITECTURAL SKETCH-CLUB COMPETITIVE DESIGNS FOR AN ARCHITECT'S OFFICE.

[Additional Illustrations in the International Edition]

WROUGHT-IRON BALUSTRADE. EXECUTED BY M. LEON BAUDRIT, PARIS, FRANCE.

[Copper-plate Etching.]

ALTAR IN THE CHRIST CHURCH, HALL, GERMANY. DESIGNED BY REV. JOHANN MARIA RITTER.

[Gelatine Print.]

HOUSE ON THE CORNER OF TEINFALT ST. AND THE FREYUNG, VIENNA, AUSTRIA. HERR CARL NEUMANN, ARCHITECT.

[Gelatine Print.]

THE OLD CHURCH TOWER, DUNDEE, SCOTLAND.[1]

"PERHAPS one of the most singular features of Scottish architecture presents itself in the almost universal poverty of the church towers erected after the thirteenth century; for we must except those of an earlier period, if either Elgin or Arbroath are to be taken as the general type. Nor, indeed, can we call the lantern towers of Edinburgh, Haddington, or Aberdeen, plain, except by comparison with the lofty and highly enriched spires of the old English parish churches.

"At a first glance of the more recent ancient Scotch church towers, it would appear that the castle keep had been their aim, and that their object was rather the centre of a fortress than the peaceful spire pointing heavenward; but an examination of their attached buildings shows their peaceful mission, abundance of elaborate detail being within reach of the hand. It is, generally speaking, a striking difference between the churches of the north and south of Britain, that those of England generally increase in decoration upward, and those of Scotland as decidedly the contrary.

"Dundee Tower is now the largest specimen in Scotland, the most elaborately ornamented, and certainly the most picturesque. Yet, with all its ornament, how completely the massiveness of its masonry holds the grim keep tower in view, and it has claims to that title, having been fortified upon the occasion of the storming of Dundee by the Parliamentary troops under General Monck, in 1651.

"From a very early period, the important position of Dundee rendered it a constant object for contention. Twice did the town fall into the hands of Edward I; twice was it retaken from the English by Wallace and Bruce, and it was twice nearly reduced to ashes by the forces of Richard II and Edward VI. Of the ecclesiastical buildings of Dundee, the church tower alone remains as the silent witness of most of these stirring scenes; the attached church has long since virtually, and even fruitfully disappeared; for now, in place of one adjunct to the tower, there are no less than four religious edifices, under the same series of roofs, the entire mass being known as the 'Dundee Churches.' Never in modern times has old steeple been honored with such a numerous progeny, and well it bears them, raising its gigantic form to a height of nearly 160 feet.

"David, Earl of Huntingdon, built a church here before the year 1200, to commemorate his escape from a tempest. This building appears to have been destroyed by Edward I, and according to tradition was rebuilt to be again destroyed by Edward VI (1547–1553). It is impossible that this can be true, for no trace of such recent handiwork exists in the tower, and we should rather refer the destruction and rebuilding to the time of Richard (1377–1399). It is to the style of this period that the whole mass refers itself.

"In the tracery filling the circular-headed window on the western side of the tower, we recognize the system of window-panelling carried out more extensively in the cathedral tower of Iona; and we draw attention to this feature, because the effect produced is as original as it is beautiful, and because it is capable of being varied as a field of design without limit.

"Another feature of Dundee Tower we recommend strongly to the notice of the architect. It is the unbroken form of the external line of the octagonal staircase from base to summit, and the frequent repetition of its loop windows surmounting each other. This continuation of perpendicular line gives an air of loftiness to the mass, and completely neutralizes the lowering effect of the ornamental horizontal lines prevailing upon the different stages.

"And finally we recommend the imposing mass delineated in our plate to the notice of the men of Dundee, wishing at the same time that they would restore the west window, and thus give us the opportunity of correcting our own perpetuation of its present plastered deformity."

THE LANTERN OF ST. GILES'S CATHEDRAL, EDINBURGH, SCOTLAND.[1]

"FEW visitors of Edinburgh can fail to be acquainted with the main features of Old St. Giles's. A few years ago, when the city was less amply endowed with edifices of a spiral character than it is at present, the airy lantern of this church, situated at so great an elevation, was the main feature in the long, rugged outline of buildings covering the ridge of the narrow eminence from the Castle to the Canongate; its light and graceful details formed a fine contrast with the massive features of the Castle, and even yet it asserts a marked superiority in dignity and elegance over the modern steeples by which it is surrounded. This species of lantern, formed by cross-ribs as in groined arching, seems to be peculiar to the north of Britain. It does not occur further south than Newcastle, while in Scotland we find it still remaining in King's College, Aberdeen, and the Tron steeple in Glasgow; until lately it existed at Linlithgow, and formerly terminated the tower of Haddington. Of all the

[1] It should always be kept in mind that these illustrations from the "*Baronial and Ecclesiastical Antiquities of Scotland*," [1845] by R. W. Billings, are republished very largely for the sake of giving instruction in one manner of the rendering of architectural drawings.

Scottish instances, St. Giles's is at once the richest and the lightest. The others had merely been formed by two crossed arches springing from the corbels of the tower. That of St. Giles's has an octagonal character, from two arches springing from the centres of the wall-plates. Along the intermediate spaces there is a parapet pierced with quatrefoils, having a flowered moulding at the projection, and cusps on the upper edge. The outer edges of the arches are adorned with crocketed pinnacles, and, supported by the general keystone, there springs from the centre of a cluster of small pinnacles, rising tier over tier, a graceful spire. The whole plan exhibits those capricious irregularities so frequently to be found in the finest specimens of Gothic work.

"The general plan of the Church is a cross, the lantern-tower springing from the meeting of the arms. Continuous with the extremity of the nave is an additional transept with a flat roof. The main transept has aisles, and the southern branch has projecting edifices on either side, which give it in itself the form of a cross. From the accompanying plate of the chancel, it will be seen that the pillars nearest to the centre are plain octagons, the arches corresponding in simplicity, while those at the east end are clustered with decorated capitals supporting moulded arches. It will be observed that the roof is groined, the ribs of the groining resting on the imposts of pilasters supported on corbels springing above the capitals of the pillars. The great east window and the clerestory windows are reconstructed from the ancient remains, a circumstance from which the mullions and mouldings are necessarily somewhat thinner than they originally were.

"*Historical Sketch.*—That some portions of this edifice are of considerable antiquity, a few features of its present architecture, and particularly the semicircular arched doorway now preserved in the transept, sufficiently testify; but in its earlier form it seems to have been a small and obscure parish church, for in the records of other ecclesiastical buildings it is seldom referred to. In an old ecclesiastical taxation of the Archdeaconry of Lothian, we find 'Ecclesia Sancti Egidii de Edinburhu' rated at 26 merks, while that of Restalrig, a small chapel near Leith, elsewhere mentioned, is reckoned at 25.[1] The earliest among the few notices of the edifice in the ecclesiastical records mentions that on the Sunday before the Feast of St. Thomas, in the year 1297, Donaca, daughter of John, son of Herveus, resigned certain lands to the convent of Holyrood, in full consistory held in the church of St. Giles.[2]

"It is somewhat curious to find that the church which became the principal ecclesiastical institution in the metropolis, and for a brief period a cathedral, was a dependency on the now obliterated monastery of Scone. Scone was one of the foundations of that ancient and mysterious religious community, the Culdees, whose constitution and rules, as well as their pastoral pedigree, have created so much curious discussion among ecclesiastical antiquaries and polemical disputants. When the Romish clergy gradually superseded the scattered institutions of the Culdees, Alexander I established in Scone a house of Canons Regular of St. Augustine, brought from the Church of St. Oswald, in Yorkshire. In early times, this now obscure place might well compete in importance with Edinburgh. In a charter of Malcolm IV, it is spoken of as the chief seat of government. It was occasionally the place where Parliaments were held. Alexander II and his son were here crowned, and both Baliol and Bruce began the royal careers so strangely contrasted in history by a coronation at Scone.[3] These incidents of the ancient importance of the spot prepare us to find that the patronage of St. Giles was conferred on the monastery of Scone by Robert III, and that in the year 1395 the Bishop and Chapter of St. Andrews, in consideration of the losses occasioned by recent misfortunes to the monastery of Scone, united the Church of St. Giles with the monastery, appointing that when James Lyon, then vicar, should cease by death or otherwise to hold the benefice, the canons of the monastery should enter on possession of the church, keep it in repair, and supply it with ecclesiastical services. The union was confirmed by a Papal Bull, which enlarges on the great expenses borne by the monastery from its being so close to the seat of government, and thus frequently entertaining assemblages of the nobles, met for the transaction of urgent business.[4]

"It appears from a contract noticed by Maitland, that a portion of the church was arched-in in 1380, and he has preserved the terms of a contract made between the Provost and community of Edinburgh on the one hand, and two masons, in the year 1387, for the construction of five separate chapels along the south side of the edifice.[5] The same historian records the foundation of several altars and chaplainries during the fifteenth century, which were probably the means of applying these chapels to ecclesiastical uses—of occupying the empty tenements. In the year 1462, considerable additions or repairs appear to have been in progress, for the Town Council then passed a rule that all persons selling corn before it was entered should forfeit one chalder to the church-work. In the year 1466, St. Giles's was erected into a Collegiate Church, the foundation consisting of 'a Provost, curate, sixteen prebendaries, sacristan, beadle, minister of the choir, and four choristers.'[6] Various sums of money, lands, tithes, etc., were appropriated for the support of the establishment. The chaplainries and altarages appear to have been very numerous; Maitland gives the names of about forty.

"The history of this church has been somewhat turbulent for that of a temple raised for the worship of the religion of peace. In 1558, during the time when the Queen Regent was adopting vigorous and daring measures for stemming the progress of the Reformation, it was resolved to carry forth from the church the image of St. Giles on that saint's day, and to lead through the town a procession of more than usual splendor. It was discovered, however, on approaching the shrine, that the image had been removed. A smaller statue of the saint, which happened to be in possession of the Grey Friars—a 'marmouset idol,' Knox calls it—was borrowed for the occasion. To give dignity to the ceremony, and impose a wholesome awe on the people, the Queen Regent for some time attended on the procession. The impatience of the citizens, who had formed a considerable mob, was restrained during her presence, but when she left the scene it speedily burst forth. Some of them, pressing gradually toward the image, professed to join in its support, while they endeavored to shake it down. This task, however, they found difficult, as it had been securely nailed to its supporters. The struggle and the triumph of the mob were delightful to Knox, who described the event with the inimitable glee in which he indulged on such occasions.[7]

"In 1571, when Kirkaldy of Grange held the city against the Regent Morton—or rather was fortifying himself and his party at the expense of the citizens, who suffered from the warlike operations of both sides—the tower of St. Giles was mounted with cannon, and served as a fortification. In the words of a contemporary, 'Thair wes placit in the steiple of Edinburgh on the samyne day thrie pieces of brasin ordinance, with victuallis and utheris necessaris for defending of the samyn.'[8]

"St. Giles's was the principal scene of the tumultuous dispute between King James and the leaders of the church party in 1596. The place where the King was then sitting is supposed to have been the Toll-booth, close adjoining to the church, but Mr. Chambers observes, that 'The contemporary accounts of the tumult, all tend to show that the King was sitting at first in the place latterly known as the Tolbooth Kirk, and that he retired for safety into the upper room of the new Toll-booth, latterly the Justiciary Court room; an account of the transaction very different from that hitherto given, which has always assigned the old jail as the locality of King James's terror and rescue. It also appears that the Octavians (a body of eight statesmen, into whose hands James had committed all his financial affairs and patronage) sat in the Tolbooth Kirk. It may be worthy of notice, that the latter building is often, in works of that age, called the Laigh Tolbooth, while the Justiciary Court room is styled the high or upper Tolbooth.'[9] The disturbance from which James felt himself to be in peril, arouse out of an address by Balcanqual, a popular preacher, who called on the Protestant barons and his other chance auditors, to meet the ministers in the 'Little Kirk,' where they tumultuously came to a resolution to 'Intercede' with the King, on the necessity of changing his policy, and dismissing from his confidence the councillors who had advised it. The progress of a deputation towards the place where the King was to be found, brought with it the mob who had created the tumult, and when the bold expressions of the deputation were seconded by a crush of the crowd into the presence chamber, the King grew frightened and made his retreat. When the deputation returned to the Little Kirk, they found that the portion of the multitude who had not attempted to follow them into the presence chamber were listening to an address by a clergyman of the name of Cranstoun, on the text of Haman and Mordecai. The auditors, hearing that the King had retreated without any explanation to the deputation, concluded that his flight was attributable to some deeper cause than personal fear. They rushed forth, shouting 'bring forth the wicked Haman,' and endeavored to batter down the doors of the Tolbooth. It was a disturbance in which there was not any definite and decided purpose—one of the few indeed in Scottish history where there was a sort of frenzied excitement, and scarcely a distinct aim. It was dangerous, however, and James was glad to escape to Holyrood.[10]

"For forty years after this event the edifice of the church seems to have been undisturbed by tumults, until the memorable attempt in 1637 to force the newly prepared service book on the Scottish Presbyterians. The first act of hostility in the great civil war of the seventeenth century may thus be said to have commenced within the walls of this church. This event occurred on 23d July, 1637. After the reader had read the prayers, Dean Hanna ascended the pulpit to proceed with the new liturgy. The storm then commenced, and the first missile—a stool—was discharged by the celebrated Jenny Geddes at the Dean. A small folding stool, preserved in the Antiquaries' Museum of Edinburgh, is said to have been the missile used on the occasion.

"To recur briefly to other matters connected with the history of this church. It was made the cathedral of the new diocese of Edinburgh in 1634. The patent of Forbes, the first Bishop, was dated on 26th January of that year. The last Bishop was Alexander

[1] Reg. Prior St. Andrew, p. 29.
[2] Reg. St. Crucis, p. 81.
[3] "*Liber Ecclesiæ de Scone.*" Introduction.
[4] Ib., p. 149, 150.
[5] Maitland's Hist., p. 270.
[6] Maitland's Hist., p. 270. Keith's Catalogue, 468.
[7] Knox's Hist. Wodrow Edit., i, 260.
[8] "*Diurnal of Occurrents*" (Bannatyne Club), p. 226.
[9] "*Minor Antiquities of Edinburgh*," p. 175.
[10] See Tytler's Hist., vol. viii, p. 245, et seq. and the other historians of the period.

Rose, who was translated from Moray in 1687, and in the following year the Revolution deprived him of his position and emoluments. 'He lived still,' observed one of his contemporaries, 'in the city of Edinburgh, and had the chance to outlive all his brethren of his order, and all the bishops likewise in England, who had been possessed of sees before the Revolution; so that he had much respect paid him, not only by the clergy of his own communion, but all the laity also of both nations.'[1]

"At the Reformation the edifice was divided into compartments, each forming a separate place of worship. One of these, forming part of the north transept, and known by the singular name of Haddo's Hole, because Sir George Gordon of Haddo was there imprisoned for some time before his execution in 1644, was not opened as a place of worship until the year 1699. Before the late alterations brought the fabric into a symmetrical form, the various chapels mentioned above were grouped in a longitudinal mass along the south side, and various small edifices called the Crames, used chiefly as shops, were attached to their walls, as similar buildings still are to the exterior of the large churches in Belgium."

"THE MIRROR." MR. HAMO THORNYCROFT, R. A., SCULPTOR.

THE DRAWING-ROOM, REDHOLM, ENG. MR. JOHN BELCHER, ARCHITECT.

COMPETITIVE DESIGN FOR SHEFFIELD MUNICIPAL BUILDINGS, SHEFFIELD, ENG. MR. JAMES F. BELL, ARCHITECT.

THIS was considered a good design, and ran very close to those selected. The plan is a compact and well-arranged one. According to Mr. Waterhouse, most of the competitors had spoiled their plans by breaking up the front to Cheney Row in such a manner as to make it almost impossible to treat the elevation successfully; in fact, they more or less opened directly into the court-yards. Mr. Bell has avoided this mistake, and his design shows four symmetrical and well-balanced fronts that could be very successfully treated in either Classic, Gothic or Renaissance.

The author thought it necessary to place the mayor's suite of apartments in the most important and convenient position, and has, consequently, placed them along the whole of the principal front (Pinstone Street), which insures a magnificent suite over 170 feet in length. The anteroom is placed opposite the grand staircase, and leads into the reception-room, which in turn leads into the fine banqueting-room; the latter opens out and becomes enlarged at the Surrey Street end, and is well lighted by two fine bays. The reception and banqueting rooms are capable of being thrown into one fine apartment of 30 feet by 70 feet, which is sufficiently large for any festive occasion. In like manner, the Mayor's parlor and retiring room can be thrown together with an equally successful result, thus securing two magnificent apartments of about 30 feet by 70 feet each; while, on the other hand, they may be used separately, the rooms being well proportioned in either case.

From the banqueting-room a private corridor leads to the mayor's private sitting or retiring room, which is provided with a lavatory and water-closet. Adjoining and next to the banqueting-room is the butler's serving-room, with a lift to kitchens above.

It will be noted, on referring to the plans, that the author has managed to keep the various rooms of the Mayor and Council absolutely in the western portion, while the public offices are placed in the east, with the town clerk's office as near as possible to the Mayor's private room. Consequently, the author has been able to cut off the public communication with the Mayor and Council's apartments by placing private doors in the corridors, which would be kept locked, thus effectually excluding the public from this portion of the building, while at the same time the Council Chamber is so placed that both the Council and the public have access to it, the former without going into public corridors, and the latter without intruding on the privacy of the Mayor and Council. The author attaches much importance to this valuable point. The various committee-rooms are also kept private, but, whenever thought necessary, the whole suite can be thrown open to the public when the Mayor and the Council are not sitting.

The author in choosing a style for the elevations was influenced by a personal visit to the site, which showed him that though perfectly feasible to work out a good Classic or Renaissance design, the sharp runaway angles together with the surroundings pointed to Gothic as being more suitable and requiring less mechanical regularity than the foregoing style. In choosing this free form of thirteenth-century Gothic, the author thought to get more play and freedom for all his elevations.

COMPETITIVE DESIGN FOR SHEFFIELD MUNICIPAL BUILDINGS, SHEFFIELD, ENGLAND. MESSRS. FARROW AND NISBETT, ARCHITECTS.

THIS design was submitted in the recent open competition, and is of a freely treated Renaissance character. The position of the tower and other features was, to a certain extent, regulated by the disposition of the streets from which the building would be seen. The porte cochère has been designed with an open loggia over it on the first floor, as an attempt to solve the difficulty of treating this feature. The character of the drawing required by the conditions of the competition does not convey the effects of the varying planes of the elevation, a point to which the designers gave considerable attention.

[1] Keith's Catalogue, p. 64.

THE OLD COCOA HOUSE, CHESTER, ENGLAND.

THIS illustration is taken from a water-color drawing by Mr. A. H. Belcher, architect, which was exhibited at the Royal Academy last year. The building has been superseded, but it is well to have a record of so interesting an example of the style which is most associated with Chester.

STUDY FROM LIFE.

THIS illustration is from a pencil-drawing by M. Urbain Bourgeois, one of the best known of the Paris painters.

HENRY OGDEN AVERY.

THE death of Henry O. Avery removes one of the few organizers and superior workers for the good of the profession at large. One of those who had high ideals of professional intercourse and work, whose time was always at the disposal of the Architectural League and other societies with which he was identified. His acquaintance with all the allied arts made his service valuable, he had great efficiency and ability in organizing and aiding all enterprises that tended to bring architects together and to inculcate an *esprit de corps*. At a time when so many think only of the almighty dollar, he sacrificed his own interest in service, and *service* is the hardest thing to get and the most valuable when so unselfish as was his. It is sad to think that his work for the League was indirectly the cause of his death, for it cannot be doubted that working so heartily at exhibition time hastened the disease. W.

COMMUNICATIONS

[*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.*]

BEAMS.

NEW YORK, April 26, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Your answer to "W. L. P.'s" inquiry, as to whether the notching of compound beams is correct as shown in "*Safe Building*," or as shown in "*Building Superintendence*," does not cover the case.

In spite of Profs. Rankine and Clark, and others, I must maintain that my method of making the notches in compound beams is the correct one, and you will find by referring to my book that I have distinctly called attention to the fact that my method is different from the way drawn by many eminent experts.

If the two parts *A* and *B* of the beam could be considered as acting *independently* of each other, Profs. Rankine and Clark would be right, for in that case the fibres when resisting strain would act as shown in Figure I: *i. e.*, the upper fibres of both *A* and *B* would

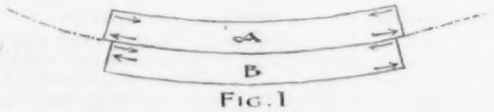


FIG. I

be in compression, or tending toward the centre; while the lower fibres of both *A* and *B* would be in tension, or pulling away from the centre, and the notching as given by Profs. Rankine and Clark (see Figure II) would be correct.

But the *very object* of making the compound beam is *to force both halves to act together as one beam*, and we so calculate the united

FIG. II

beam, in which case, unless the entire theory of transverse strains is to be upset for this especial type of beam, the upper fibres of the united beam will be in compression and the lower fibres in tension; in other words, theoretically all the fibres of the entire upper half *A* of the beam will be in compression, as shown in Figure III, and all

the fibres of the entire lower half *B* will be in tension, as shown in the same figure; accordingly, we must draw the notches as shown in my book, and as reproduced here in Figure IV, the arrows

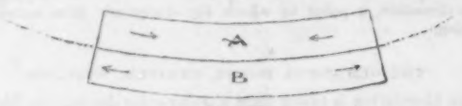


Fig III

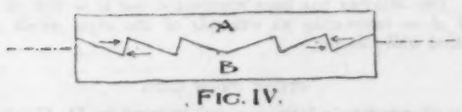


Fig. IV.

being added to show the direction in which the fibres tend to move when the beam is strained. Yours very truly,

Louis DeCoppet Berg.

[This is a very interesting matter, as well as an important one. Evidently, in order that the two beams, when put together, shall act like a solid beam of a depth equal to the net depth of the two united, the whole of the upper one should be in compression, and the whole of the lower one in tension, as Mr. Berg shows in Figure III. The question is, whether two beams, one placed above the other, and bolted together in the manner usual with built beams, act together as one beam, bringing, as Mr. Berg says, "the upper fibres of the united beam into compression, and the lower ones into tension"; or whether they act independently of each other, as in Figure I, the tendency to independent action being only partially checked by the bolts. If they act independently, in this way, Mr. Berg says that "the notching given by Profs. Rankine and Clark (see Figure II) would be correct," as it assists the bolts in preventing the independent action of the two parts. If they do not tend to act independently, but their fibres work as in a solid beam of the same net depth; all those above the middle line being in compression, and those below in tension, then Mr. Berg is undoubtedly right in his conclusions. We prefer not to take sides in the discussion, particularly as every one can settle the question of fact for himself, and get a useful lesson in doing so. Let any one procure two sticks, cut accurately to the same length, place one over the other, support them at the ends, and hang a weight from the middle; and then notice whether the ends present the appearance of Figure I or Figure III. Having observed this carefully, let him nail or bolt the pieces together, with about the proportion of bolts that would be used in a built beam, and test again. He can then make up his mind which way it would be best to face the notches. — Eds. American Architect.]

THE PROPOSED NEW YORK STATE LAW FOR LICENSING ARCHITECTS.

Rochester, N. Y., May 5, 1890.

To the Editors of the American Architect:—

Dear Sirs, — The bill now before the Legislature of the State of New York with reference to the licensing of architects, and which is published in your current issue, has been amended so as to provide for the nomination of the members of the State Board of Architects by the State Board of Regents of the University, and the phraseology of Section 5 is altered so as to read: "But nothing herein contained shall be construed to prohibit any person in this State from acting as *designer* of his own building, or as *designer* for any person employing him with full knowledge on the part of such employer that the person so employed is not a licensed architect, etc."; the word "designer" being substituted for the word "architect," very much to the improvement of the clause. It is hoped and expected that the bill will pass and be approved by the Governor. I enclose copy of the amended bill. Very truly yours,

James G. Cutler.

HOUSE-FRAMING.

Boston, Mass., May 6, 1890.

To the Editors of the American Architect:—

Dear Sirs, — In my article on house-framing, which appeared in your last number, there were some interrogation-marks which must have been puzzling to the reader. They were inserted for convenience in correcting my MSS., and I carelessly forgot to erase them before sending it in. Yours truly,

Wm. Atkinson.

NOTES AND CLIPPINGS

The Exploration of Palestine. — The quarterly statement of the Palestine exploration fund, which has just been issued, although it does not record any extraordinary discovery, yet describes much interesting work that is in progress. Two cisterns have been found near the Damascus gate, the smaller of which would contain about three thousand skins of water. "It is entirely hewn in the rock, and before it was made into a cistern was rock-cut Jewish tombs. In the rock ceiling is a square, 13 feet by 13 feet, very nicely worked, with a kind of cornice round it exactly as in the tombs of the kings." By the excavations made on the eastern brow of Zion, it has been found that there were in ancient times caves and dwellings excavated in the rock, which in later times were converted into cisterns. Herr Schick describes a church which has been discovered in the village of Silwan, which has been hewn in the rock, and which contains a Greek inscription in which the name of the prophet Isaiah is mentioned. Herr Schick thinks it is probable that Isaiah's tomb may be under this chapel, and hopes by further digging to find an entrance to the cave which is under the rocky court and is at present full of earth, and to discover rock-cut tombs. He thinks that the rock-cut chambers of the church were Jewish tombs before the Christian era, and that afterwards they were converted into chapels by the Christians. — *Jewish Chronicle.*

Photographing the Bottom of a Well. — An experiment was made in photographing the bottom of an oil well last week at Warren. The instrument was let down a distance of 1,700 feet. The moment it touched the bottom a bright flash lit up the cavity, and a perfect picture of the hole was impressed on the negative It revealed, as the effect of the explosive shock, a cavity of fourteen feet broad and seven feet below sand. Rock, sand, pebbles and minute objects were distinctly revealed upon the plate. This device is likely to prove of the greatest benefit to science. — *Iowa State Register.*

TRADE SURVEYS

The practical settlement of the eight-hour agitation throughout the United States, so far as the carpenters are concerned, opens the way for a multitude of new enterprises which have been held back for some time because of the uncertainty. It is the intention of the Federation of Labor to inaugurate strikes in other branches of trade, but probably not at a very early day. The United Mine Workers will next be invited by the Federation to make an effort for shorter hours. The selection of this craft shows that the managers of the movement are selecting points of attack where success is most probable. The miners are practically piece-workers, entering and leaving the mines, in numerous instances, as they please. There is a surplus of mining labor and of mining capacity. Scores of new mines have been opened during the past year, and old mines have been largely developed. The effect of all this is that the coal-producers have facilities for supplying much more coal than is wanted. It is very appropriate, therefore, for the mine-workers to agree upon a restriction of the hours of labor when there is no necessity for ten hours' work per day. Success may be regarded as a foregone conclusion in this case. Two successes will stimulate the Federated workmen to a third and other future efforts. Public sentiment has been strongly with the movement, the belief being that any change which promises to be advantageous to the workers at large, cannot be disadvantageous to general interests. Humanitarian sentiment is stronger than ever, and is growing in all circles. Even employers recognize that a movement which is universal cannot be really hurtful to them in the long run, after the necessary adjustments have been made. The logic of many writers, who say that we cannot get along with eight hours toil, where ten has been the rule, shows that they take a very short-sighted view of the subject. The real point to be studied is the consuming-capacity of the people; whatever increases that, increases either the demand for labor, or for the greater productive power of machinery. A general enhancement of wages, instead of working detriment, is calculated to result in benefit, because of the increased purchasing power which it confers upon the workers. During the past two or three weeks a number of meetings have been held by railroad managements, and so far as their reports have been made public, the figures afford much encouragement to stockholders, and to those who are contemplating railroad extensions. Within the past week inquiries have been received for large lots of railway construction material. The car-builders have booked heavy orders during the past 30 days ranging from lots of 500 up to 10,000 cars each. Nearly all of the railroad companies are in need of equipments, and the car-builders and locomotive-builders, car wheel and axle makers, and manufacturers of all kinds of railway equipments and supplies are booking numerous orders.

There is a feeling prevalent in manufacturing and trade circles generally that this activity will continue pretty well into midsummer. During the p t few months, great progress has been made in the consolidation of railway properties through purchase, lease, combination, etc. Figures are not available to show the degree of concentration affected, but influences are now manifesting themselves which were indicated in this column several months ago; viz., a genuine consolidation of railway interests will in a short time be brought about. This tendency will continue, and, through it, control will be secured over now competitive railway interests which no legislation and no amount of treaty-making will ever accomplish. Ownership will be concentrated. There are a score or two of roads only waiting to be bought out, the stockholders and managers being tired of the fruitless contest. It is a case of the survival of the fittest, and a great many roads are destined to lose their identity, and be swallowed up by the stronger systems, under abler management. The industries which have not already shown increasing activity will do so shortly. In the first place, the great body of buyers of supplies, material, etc., have been proceeding in a cautious way for months past, but are now ready to change their policy. They remember that for years past higher prices have frequently prevailed during midsummer, and the possibility of an advance is now apparent to many, although there is in reality little cause for such apprehension. Prices in all probability will remain about where they are, although there are thousands of buyers who are beginning to think otherwise, and are making inquiries and offers for the supplies they need for the summer. In the iron trade, nothing of importance has been developed, except that numerous inquiries have been received by rail-makers for rails, by locomotive-builders for locomotives, and by iron and steel manufacturers for ship-building material. Building material has been active all along, and a stirring demand for lumber is now setting in, especially for Southern hard woods. Spruce and hemlock have recently advanced, and there are rumors that yellow pine will shortly share in the improvement; but there seems to be no good reason for this apprehension. The anthracite coal trade has slightly improved, and production is now a little over 100,000 tons per day. The bituminous coal mines along the Allegheny Mountains are producing 250,000 tons per week, and are now 800,000 tons ahead of last year's output to this date. In Western Pennsylvania, coal-mining operations are pursued with great vigor. Throughout the Ohio and Indiana block-coal fields the same activity is spoken of. In natural-gas districts, nothing of special importance has been developed, although a few wells have recently been added to the list of good gassers.

S. J. Parkhill & Co., Printers, Boston.

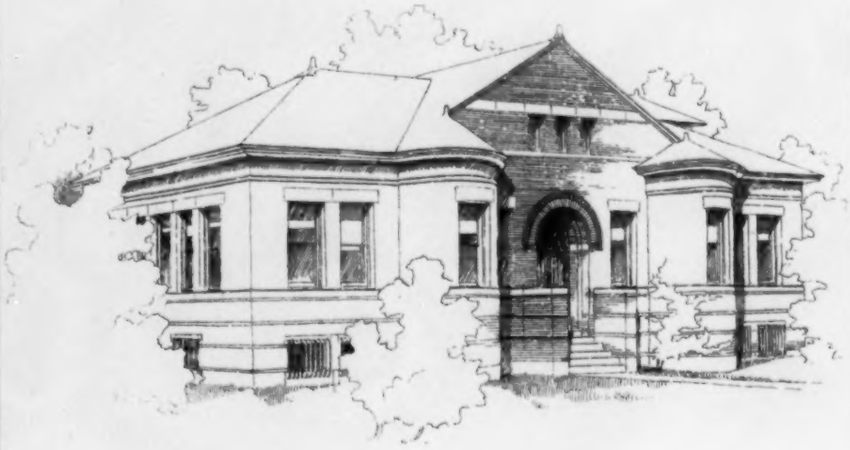
INTERIOR VIEWS OF THE FLEUR-DE-LYS.

HELIOTYPE PRINTING CO. BOSTON.

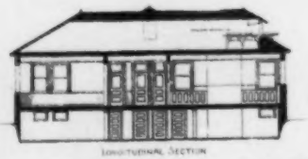
RESIDENCE OF GEO. D. BARNARD, ST. LOUIS, MO.
TULLY & CLARK, ARCH'TS., ST. LOUIS, MO.

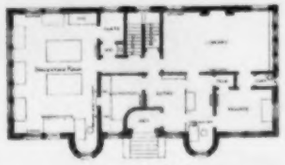
STAIRCASE.

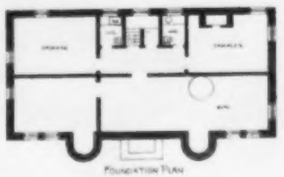
Heliotype Printing Co. Boston.



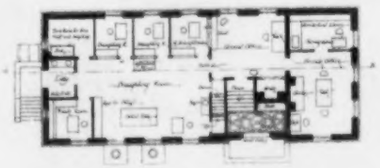
FIRST PRIZE, E. S. GORDON.

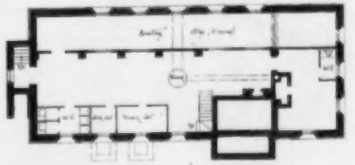




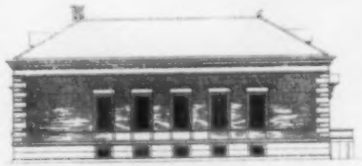


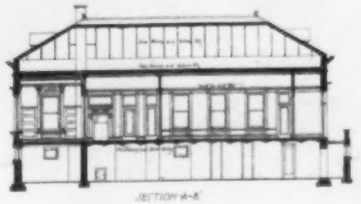
SECOND PRIZE, CLAUDE F. BRAGDON.





·ROCHESTER · SKETCH · CLUB · ANNUAL · COMPETITION ·
·A · FIRE-PROOF · ARCHITECT'S · OFFICE · by "Florentine"





Heliotype Printing Co. Boston

Sign of the "Fleur-de-lis"

Studios of F. K. Burleigh & C. W. Stetson. Stone, Carpenter & Willson, Archts.

Providence, R. I.

Heliotype Printing Co. Boston.

SECURITY BUILDING ST. LOUIS.

PEABODY STEARNS & FURBER, ARCHITECTS.

HELIOTYPE PRINTING CO.