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CONTENTS.

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THE Heliotype Printing Company, to whose good-will towards this publication our subscribers are in no small degree indebted for favors which they cannot detect, has been able partially to resume its interrupted business with unexpected promptness and the first work it has undertaken has been the replacing of the plates omitted from our issue for November 28. These illustrations will be found included with the plates of this issue, but dated and numbered as of two weeks ago so that our subscribers can easily sort them out and assign them to their proper place.

THE most impressive evidence of the late disaster is not the charred walls and floors but the vacant bins and shelves where used to be stored the stock of "back issues" and bound volumes. These have all disappeared and we can no longer fill orders. All issues of the *American Architect* of date earlier than this year are definitely and finally out of print. A portion of this year's stock, however, has been saved, and we advise our readers to examine their files for this year and try to replace missing numbers at once.

ALTHOUGH there is no longer any back stock to draw from, most of our negatives have been left uninjured, and consequently, we can at any time reprint plates that have been published since 1880. If at any time an architect desires, for framing, an enlarged "solar print" or "bromide enlargement" of any domestic subject published as a gelatine print, we can supply him with such print at moderate cost.

THE Secretary of the American Institute of Architects reminds members of the duties mentioned in the resolution adopted by the recent Convention, under which all persons connected with the Institute, including, we presume, all architects, are to consider themselves charged with the office of explaining to the members of Congress for their several districts or States, the propriety and importance of having the Government buildings designed and supervised by various architects, in the same way as private structures. It is acknowledged that Government buildings cost more per cubic foot, than private buildings of the same sort, and it is by no means the case, as is often asserted, that the Government work is better and more solidly done than private work. On the contrary, it is notorious that political influence has secured the use of a good deal of material in buildings for the Government which is worse than doubtful, and will, sooner or later, cause immense losses to the public treasury; while any architect can see at a glance faults in workmanship in some of the post-offices and custom-houses constructed within the past twenty-five years, even excluding the tottering ruin at Chicago, which would not be tolerated in a structure for a private owner. In one word, the public pays more than any private proprietor for the plans of its buildings, and gets them worse designed; it pays more for having them superintended, and is obliged to accept work which would never be passed by a private architect; it pays more to its contractors, for the same result than any private architect would allow his client to pay, and gets, instead of the first-class workmanship and materials which it supposes it had contracted for, defective stone, the refuse of the quarries, cement which private architects have rejected and, in general, work of a character which can hardly be described, but which is never seen in private buildings of similar pretension. The officers of the Government have endured this so long, mainly because the whole business of planning and executing buildings is so technical that they could not appreciate the facts. There is probably no attempt now to use the Supervising Architect's office as a political machine, and Congressmen of all parties might be relied upon to join in an effort to promote the interests of the people in their building affairs, if they were shown how great are the evils of the present system, and a feasible plan were proposed to them for reforming it, or substituting a better one. The task of doing both these things should properly fall on the architects of the country, who understand the matter best; and they may be perfectly fearless in explaining their ideas to the people who have it in their power to put them in force. It will not require much argument to convince a Representative that it would be for the credit of the nation to get for its public buildings the best designs of architects who have little to learn from any in the world, especially if buildings executed in pursuance of those designs would be much cheaper, and infinitely better built, than the products of the Government "plan-factory"; but most members of Congress know little of the means of getting the sort of design referred to, and fear, with reason, that they would make a hopeless bungle of any attempt to accomplish such a result by their own unaided powers. It is for meeting this difficulty that the preparation of a bill by a committee of the Institute is so desirable. A proposition by a non-professional member of Congress to open Government architectural work to competition would infallibly be met by the assertion that this had been tried, and the better class of architects would have nothing to do with the competitions, while those who did compete, and were successful, brought scandal on the Government by their misunderstandings and complaints. There would be a good deal of truth in this, and it is evident that the best and only possible way of forestalling such objections, is to have whatever measure is to be laid before Congress embody a plan of competition endorsed by the representatives of the Institute as containing the provisions necessary to secure the participation of the best architects. Our own opinion is that the members of the Government, as well as the public, and the profession, would be better satisfied to have competition for public work restricted to architects of known standing; and that an excellent preliminary step would be to establish a body of "Government Architects," consisting of architects selected by recommendation and examination, much as members of the Institute now are. The appointment, which should be open to all who should pass the proper tests before a professional commission, sitting on behalf of the Government, would be a purely honorary one, but it should carry with it the exclusive right of competing for Government work. Such a system as this, which is not very different from that pursued with so much success in France and Germany, while it secured the public interest by guaranteeing the character and skill of every architect who could by any possibility win a competition, would have the additional advantage of giving an official recognition and endorsement of professional merit which would be valuable to those who had earned it, and would help greatly in promoting the dignity and development of the architectural art, while it would cost the Government nothing.

A NEW danger appears to threaten the consumers of natural gas. A few days ago, the automatic regulator at the main distributing-station in Detroit got out of order, and shut off the supply from the street pipes. Although the accident occurred at two o'clock in the morning, lights were burning in many houses, and gas-fires in many more, and, of course, the light was extinguished when the supply stopped, and when it was restored, the unlighted gas poured out of the burners into the rooms. A large part of the meters are furnished with safety-valves, which close on a failure of the supply, and remain closed until reset by the inspectors, but the gas escaped in many houses, while the occupants were asleep. The manager of the gas-works showed admirable energy in the emergency. The fire department was called up, ready for instant service, while all the men that could be spared were sent in different directions through the city, to warn householders, and look for signs of danger; and notice was sent to the police officials, who set the patrol-men at work waking the citizens, which they did so successfully that they are said to have aroused half the town. Thanks to these precautions, only two serious accidents took place, both of them from explosions, caused by striking matches in places filled with an accumulation of gas.

THE New York Committee on the revision of the building-laws is holding frequent sessions, and it seems likely that a model ordinance will, through its efforts, be passed this year. At a recent meeting, Mr. John McGlensey, the Chairman of the Employing Plasterers' Association, urged the adoption of a provision in the new law, under which wire-lath should be extensively used in the construction of dwelling-houses, particularly on the underside of stairs, and on hall partitions. He believed, moreover, that plastering should, in all cases, be carried to the floor, and not stopped at the grounds for the bases, as is now the practice in cheap houses. Mr. McGlensey is a plasterer of very great experience, and his suggestions excited so much interest that he was requested by the Committee to present them again in writing. Although the proposed new law, in its present draft, says nothing about the use of wire-lath for the purposes to which Mr. McGlensey thinks it should be applied, most architects have long been impressed with its value as a fireproofing material of modest pretension, but great efficiency, and will be glad to have the support of a builder of such skill and intelligence in their opinion. In our own house, the underside of the stairs was plastered on wire-lath twelve years ago, and we imagine that this is not an unusual practice; so that architects will be quite ready to second Mr. McGlensey's wish that the law should make compulsory what they can only advise. As to plastering partitions and furrings below the ground, to the floor, we need not say that all architects specify this method in everything but the lightest structures for summer use, and usually these also, if the owner is willing to go to the expense. To say nothing of the immensely increased resistance to the spread of fire which plastering in this way affords, the carrying of the mortar to the floor keeps the rooms much warmer, by preventing the circulation of air between the rooms, and checks to a considerable degree the ravages of rats and mice, who do not like to gnaw plastering, and cannot get into their favorite habitation, the space between partition studs, without doing so.

A NEW set of building regulations is proposed for Glasgow, Scotland, which is, in some respects, the most radical yet described. In regard to thickness of walls, the regulations are no more strict than ours, but it is provided that no warehouse shall contain more than three hundred thousand cubic feet of space, not divided by walls. This space is large enough — too large, we think, but as it amounts to the prohibition of the huge retail stores, covering an acre or so of ground, and open to the roof, which are so popular, it will probably meet with great opposition. A much more radical provision is, however, one which limits the height of all buildings to the width of the street on which they face. This regulation is given under the head of sanitation, so that its purpose is probably to prevent the streets from being deprived of sun and air. Factories and warehouses must have provision nearly similar to that required by our building-laws for the escape of operatives in case of fire, but an improvement is made on ours, by ordering that fire-escapes shall consist of fire-proof stairs, which must be placed at least five feet clear from the wall of the building, and be reached by fire-proof platforms in each story, with doors, opening outward, and kept unlocked during working-hours. Some of the minor regulations are evidently copied from those of our cities. For example, all iron columns are required to be of wrought-iron, or, if of cast-iron, must be surrounded with plaster or cement. Openings in party-walls must have double iron doors, in iron frames, bolted through the walls; and all elevators or hoists of more than six square feet in area must be enclosed by incombustible walls, carried three feet above the roof; while all elevator and hoistway doors must be of iron. Public buildings must have one foot in width of exit for every seventy persons who can be accommodated in the building. The roofs of all new buildings are to be constructed of incombustible material, and it is directed that wooden mantelpieces must not project beyond the face of the fireplace more than one inch for every two inches of vertical distance between the shelf and the fireplace opening. A novel, and rather startling provision, which is, however, the most useful and necessary of them all, is that at the end of seven years after the passage of the Act establishing the regulations, all buildings then existing, which do not conform to the regulations, shall be altered forthwith to conform to them, under a penalty for delay or refusal. Every architect and insurance-man knows that, in all our cities, the existence of the whole town is constantly menaced by the miserable wooden fire-traps, which have been preserved from the village days of the place, and which no one has authority to suppress. Few persons, outside the fire-engineers and the members of these two professions, we suppose, would believe that at least half the area of the most closely-built part of Boston, for example, is occupied by wooden buildings; yet the insurance-maps show that groups of the most costly banks and office-buildings in the city, covering land which would be cheap at from fifty to a hundred dollars a square foot, often enclose old timber structures of the most dangerous description. New York is not so bad, but an examination of the region just behind the Broadway stores, from Canal Street to Fourteenth, would not give much pleasure to the underwriters. So long as this state of affairs is allowed to continue, there is not much use in spending money on fireproof construction. All our great fires have shown that a conflagration, beginning in a nest of these masses of combustible material, and fanned by a strong wind, soon gains power enough to destroy iron, stone and brick, in the form of buildings, with ease; and the only safety is to suppress the structures in which such conflagrations can originate. Whether Parliament will approve the Glasgow plan is doubtful, as the English are slow to interfere with vested interests, but it is much to be hoped that this part of the scheme may be carried through, and may serve as an example for future cases.

THE new cruisers, in which the people of the country are greatly interested, are said to be very imperfectly ventilated, and the men's quarters, particularly, are excessively close and unwholesome, in comparison with the clean, airy, light accommodations provided in the old-fashioned ships-of-war. The consequence is that the sailors, who can manage to exist with only tolerable comfort while the vessel is in port, desert in large numbers as soon as it is ordered on a long cruise, and it has been questionable whether some of them would not have to go to sea without a proper crew. Moreover, as the Navy Regulations expressly require that the crew shall be provided with proper accommodations, there appears to be some doubt whether men could be punished as deserters for trying to escape from improper ones. The editor of the *Scientific American* proposes that the designer of the vessels should be compelled to take a long voyage in them, as a lesson for his future guidance. It is, however, understood that the cruisers are built from English plans, which were furnished, as an act of courtesy to the United States, by the British Admiralty. The plans had already served for building some of the best ships in the Queen's navy, and it is probable that no important changes were made in them; and, that the ventilation of the originals resembled that of the copies, is indicated by the fact, reported in the daily papers, that when the British fleet was recently ordered from Halifax to winter quarters at Bermuda, the sailors deserted in great numbers, so that crews could be obtained only with difficulty. Probably the trouble will soon be remedied, as Americans do not long endure deficiencies of this sort.

ITALIAN ARCHITECTURE.[1]—V.

THE RENAISSANCE (FIFTEENTH AND SIXTEENTH CENTURIES).

THE passage from one architectural style to another is always accomplished through a transitional style, that is, through a series of forms partaking of the character of both the passing style and that which is struggling for supremacy. In Italy, we find just these transitional forms in the architecture of the fifteenth century, where it is evident that the revival of the types of Classic antiquity is not as complete as some have been pleased to assume. The great delicacy and elegance of the proportions, the maintenance of certain forms, such as the gemel-window, clearly mark a style which, though looking toward the future, has not yet forgotten the Middle Ages. It would be absurd, then, to class the styles of the fifteenth and sixteenth centuries under a single designation. In the fifteenth century the traces of the transition are well marked in Italy. In the sixteenth, the slavish imitation of the Classic examples of Rome goes on in entire disregard of mediæval traditions; Roman forms are especially exalted by the school of Palladio, as we shall see.

Tuscany was the mother of Italian Renaissance, and by Tuscany I mean especially Florence. The love of Classic forms spread thence in all directions, and was particularly accentuated in Venice, Milan and Rome. In the other great towns of Italy, the flowering-out of this art lacks the character of continuity and the original aspect which we find especially prominent in these four cities.

We will, therefore, turn our attention to the Renaissance architecture of Tuscany, and particularly of Florence. The Tuscan architectural movement of the fifteenth century may be summed up in the work of three artists, namely, Filippo di Ser Brunellesco Lapi (not Lippi), commonly, though incorrectly, styled Filippo Brunelleschi (1379–1446); Leon Battista Alberti (1404–1472), born of Florentine parents at Venice, where the family had taken refuge from the persecutions of their own city; and Michelozzo Michelozzi, a Florentine sculptor and architect (1391–1472). Of the three, Brunellesco and Alberti were unquestionably the greatest inspirers of the Renaissance. The former, endowed with mighty genius, seeking always after grandeur in his work, aspired to the honor of reviving Classic architecture, and he succeeded in his aim. As has already been said, highly Classic forms are found at Florence, dating from 1367, in the galleries and side-aisles of the Duomo. But the flowering-out of any architectonic type whatsoever cannot occur except under special conditions of surroundings. However, Brunellesco, on his return to Florence after his first journey to Rome in 1405 (this date is uncertain, though it is the one generally accepted), displayed all the Classic tendencies for which he is noted. Notwithstanding everything, then, the introduction of the architecture in which we are just now interested must be ascribed to Brunellesco.

We often find our architect at Rome, but his name must be associated especially with Florence and his Florentine works. Among these I cite, first, the dome of Santa Maria del Fiore (Figure 1), the construction of which, as appears from recent researches (see Nardini-Despotti, "*Filippo di Ser Brunellesco e la Cupola de Duomo di Firenze*"), is not so fully due to Brunellesco as has always been supposed; the idea of raising the cupola without scaffolding has ever been considered as peculiarly his; but modern criticism has shown that other architects shared it with him, as, for example, Nanni d'Antonio di Banco and Donatello — the great precursor of Michel Angelo.

Fig. 1. View of the Duomo of Florence.

We cannot, however, stop for details. Among the edifices reared by Brunellesco may be noted the magnificent Pazzi chapel (Figure 2) in the cloister of Santa Croce, constructed after 1420; the churches of San Lorenzo and Santo-Spirito, the latter begun, not in 1470, as has hitherto been thought, but during the architect's life, and finished after his death; also the magnificent portico of the Spedale degli Innocenti, begun in 1421 and completed in 1445. As for San Lorenzo, it should be remarked that it was already in process of construction when Giovanni di Bicci dei Medici employed Brunellesco to furnish a design for the sacristy, which is a really superb work; Brunellesco likewise made plans and gave advice for the unfinished portions of the church; it was completed after his death, but under the direction of the architect, Antonio

[1] From the French of Alfredo Melani, in Planat's *Encyclopédie de l'Architecture et de la Construction.* Continued from No. 832, page 144.

Menetti, who set aside Brunellesco's counsel both in regard to the interior and exterior. Until lately, the construction of the exquisite abbey of Fiesole has been attributed to Brunellesco; it seems now to have been proved that he had no part in it.

Brunellesco's name is also associated with two of the most beautiful Florentine palaces, the Pitti and the Quaratesi. The Pitti, which is the most imposing palace in Florence, was begun by him in 1440 by order of Luca Pitti; but the Pitti of to-day is not that of Brunellesco. M. Conti, in a recently published pamphlet ("*Il Palazzo Pitti e la sua Primitiva Construzione*," Firenze, 1887), has shown that Filippo's plans had seven windows in each of the upper stories, and three doors and four windows on the ground-floor[1] (Figure 3).

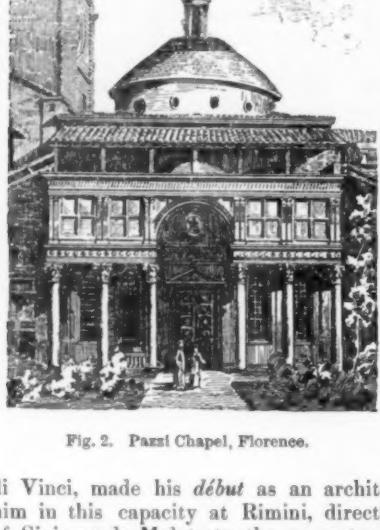


Fig. 2. Pazzi Chapel, Florence.

It is not known where Leon Battista Alberti, the forerunner of Leonardo di Vinci, made his *début* as an architect. We first hear of him in this capacity at Rimini, directing, under the orders of Sigismondo Malatesta, the reconstruction of the Church of Saint Francis, executed between 1447 and 1450, with the exception of the façade, which, according to documentary evidence, was still unfinished in 1454. Later we find him at Mantua, engaged on the small but elegant Church of San Sebastiano, begun in 1459; that is, twelve years earlier than the Church of Sant' Andrea. The latter, which, like the former, was erected by Luca Fancelli (1430–1494?), was after designs made by Alberti in 1470, two years before work was begun on the construction; but it was in large part altered by the later addition of the cupola. For the sake of exactness, it should be stated that, before furnishing the plans of Sant' Andrea, Alberti had already executed a few works and made a few designs for Rome (the former for hoisting the great ship of Trajan from Lake Nemorante, the latter for rebuilding Saint Peter's, the Vatican, etc.). In some of these he had as a collaborator Bernardo Fambarelli, commonly known under the name of Rosselino (1409 † 1464); he had also completed (about 1470), the façade of Santa Maria Novella at Florence, which had been commenced by Turino Baldesi. This last work was entrusted to Alberti by Giovanni di Paul Rucellai, to whom is also due the famous Rucellai Palace, constructed mainly, it is probable, between 1451 and 1455 (Figure 4). The palace has been attributed to Rosselino because of its likeness to the façade of the Piccolomini Palace at Pienza, built after the plans of Rosselino and Francesco di Giorgio Martino (1459 † 1502), and so closely resembling the Rucellai façade that it seems like a copy of it.

Fig. 4. Rucellai Palace, Florence.

Fig. 3. Pitti Palace, Florence.

The influence exerted by Alberti was not confined to the practice of his art. He was also one of the most exact of scholars: by his treatise on architecture ("*De re ædificatoria*") and other writings, he promulgated the principles of the revived style. It is for this reason that the name of Alberti is inseparably joined to that of Brunellesco.

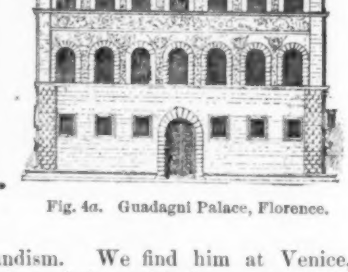


Fig. 4a. Guadagni Palace, Florence.

The mission of Michelozzo was chiefly one of propagandism. We find him at Venice, at Milan; we find him having relations with the court of Naples, where — and very probably also at Venice — he was especially active in disseminating the teachings of the Tuscan Renaissance, of which he was one of the staunchest representatives. He was the architect of the marvellous palace of the Medici, built about 1450 by Cosimo, who chose this plan in preference to another proposed by Brunellesco; the latter, according to Vasari, being "too sumptuous and magnificent" (Figure 5). This structure bears the virile Tuscan stamp in its rustic work. The *opus rusticum*, making its way across the traditions of the Middle Ages (Palazzo Vecchio and Bargello), exhibits the ancient Etruscan strength, vigor and solidity in the Pitti,

[1] See also an engraving picturing Florence at the end of the fifteenth century, preserved in the cabinet of Berlin (only copy), and published by M. Müntz in the "*Histoire de l'Art pendant la Renaissance*," Vol. I, *Italie*, between pages 50 and 51.

Medici, Strozzi, Uguccioni, Gondi, and other palaces. Instead of being confined to the ground-floor, as in the Medici Palace — better known now as the Riccardi — it is found everywhere to a greater or less extent, and not only in Renaissance constructions, but also in those of the following period and even in those of modern times. Bossage constitutes the characteristic feature of Florentine architecture, especially outside of religious architecture: San Lorenzo, Santo Spirito, the Pazzi Chapel, Sant' Andrea at Mantua and Saint Francis at Rimini. In the latter case, the character of powerful solidity gives place to a certain timidity which is full of charm, and which is in fact never wholly wanting; even in the palace of Michelozzo, this timid note is perceptible in the court which was begun in 1452.

Bernardo Rossellino was mentioned above; Renaissance art owes much to this artist. In the Piccolomini Palace at Pienza, already cited, he appears as an imitator of Alberti; at Rome, he was employed by Nicholas V, as is proved by recently published documents. This artistic merit appears in the Piccolomini Palace of Sienna, one of the most beautiful structures in the city; it is built in the Florentine style, of which it is one of the finest examples. In connection with Alberti and his collaborators (at Rome Rossellino executed Alberti's designs), it must not be forgotten that among those who directed

Fig. 5. Riccardi Palace, Florence.

the execution of his plans was the Florentine architect and sculptor Luca Fancelli, who also carried out several designs by Brunellesco, and who was in the service of the court of Mantua between 1450 and 1494. Lastly, under Brunellesco and Alberti a great throng of builders likewise were instrumental in introducing the new manner into Milan, Rome and Naples.

There are a vast number of examples of this style scattered through Tuscany. Reference has been made to the celebrated Strozzi Palace at Florence, but the fact was not mentioned that it is the masterpiece of Benedetto de Maiano, a Florentine sculptor and architect (1442 † 1497), and of Simone del Pollaiolo, called the *Cronaca* (1457 † 1508), who was the author of the splendid entablature. Nothing has been said of the Guadagni Palace (Figure 4*a*), which seems to have been by Pollaiolo also. It is partly in rustic work, partly *à graffito* and recalls the Tuscan and particularly the Florentine type of palaces, with an open gallery in the upper story. I have passed over all the constructions of Giuliano di Sangallo, a Florentine architect (1445 † 1516); as well as those of his brother Antonio (1455 † 1534) and of Antonio di Sangallo, the younger (1485 † 1546), his nephew, whom we find at Rome where he worked much. The family name of the last was Cordiani, of the others, Giamberti. Nothing has been said of the productions of the Florentine architect and wood-engraver Baccio d'Agnolo (1462 † 1543), one of Raphael's masters; and the name of the Siennese, Francesco di Giorgio Martino, one of the most remarkable geniuses of the fifteenth century has had only a passing mention. The reader is referred to special articles for details that cannot be introduced here. I regret, however, not having had space to speak of a few constructions outside of

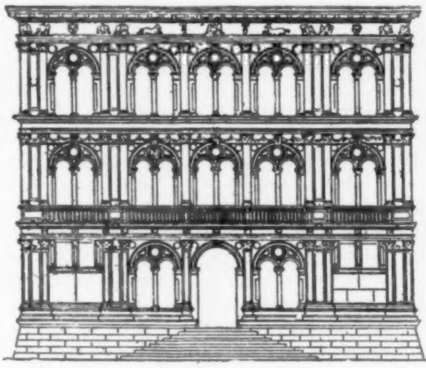


Fig. 6. Vendramin Palace, Venice.

Florence; as for instance, the beautiful Madonna delle Carceri at Prato, a Virgilian eclogue, the work of Giuliano di Sangallo, and the sumptuous church of Santa Maria dell' Umiltà at Pistoja, begun after the designs of Ventura Vitoni da Pistoja († 1509?) in 1497, and completed by Giorgio Vasari (1511 † 1574), after 1571.

Almost nothing has been said of Sienna, where the most beautiful edifices of the second half of the fifteenth century, like the Piccolomini delle Papesse, now the national bank, the Spannocchi Palace, the Church of Saint Catherine *in Fontebranda*, that of Nôtre Dame delle Nevi and the Loggia del Papa, erected by Pius II, are attributed, though without any foundation, to Francesco di Giorgio Martino. As for the loggia, although Vecchietta furnished the model for it, it is nevertheless clearly the work of Antonio Federighi, a Siennese sculptor (1460).

Let us turn now to Venice and Venetia. The Renaissance type of architecture which flourished in this smiling region of the peninsula is termed Lombardic, because it is in great part the work of a family of artists of Lombard origin, that is, from Carona on Lake Lugano, which then belonged to the duchy of Milan. The family name is said to have been Solari. Although the original home of the Lombardi may henceforth be considered as settled, it is by no means certain that they belonged to the Solari family, a whole colony of Lombard artists, to whom much research has been devoted. However this may be, it is a fact that they carried architecture and sculpture to a high degree of perfection in Venice; in the development of these arts, ethnographic conditions and the traditions of the country were taken advantage of in such manner as to produce most characteristic results. The Lombardic style is therefore easily distinguishable from that of Brunellesco, termed the Florentine, and from that of Bramante. It should be added, nevertheless, that Bramante did not confine himself, as is generally thought, to one manner. The Bramante of the baptistery of San Satiro at Milan is not the Bramante of the court of San Ambrogio; as at Rome, the architect of the palace of the Cancellaria and of the Giraud is not the architect of San Pietro in Montorio.

Fig. 7. Church of San Zaccaria, Venice.

But to return to Venice; in the architecture of the fifteenth century, it has been thought, and with reason, that Tuscan influence can be detected, though always subordinated to the necessities of adaptation, which in architecture most imperatively hold sway over the imagination; an effort has been made to connect this influence with the presence in the city of Michelozzo Michelozzi, the Florentine sculptor and architect spoken of above, who was at Venice with Cosimo de Medici, banished from Florence. Vasari remarks (Op. vol. II, p. 434) that Michelozzi, during his stay in Venice, had the opportunity to construct private and public edifices there, and that, by order of Cosimo, he erected the library of the monastery of San Giorgio Maggiore. These statements made by Vasari, have not been disputed. If we admit their truth we may easily fancy that several of the Venetian edifices belonging to the middle of the fifteenth century, whose architects are still unknown, may have been by Michelozzo.

The supposition takes on a serious aspect when we consider that some of the Lombardic forms bear a resemblance to earlier Florentine forms. For example, the gemel-windows of the Vendramin Palace and the Scuola of San Rocco at Venice appear to have been inspired by those of the Riccardi and Strozzi palaces at Florence. If this be true, Michelozzo preceded the Lombardi at Venice in the production of Renaissance

Fig. 8. Façade of the Hospital of St. John and St. Paul, Venice.

types, and like his friend and co-worker Donatello, he appears to have introduced Tuscan art into Venetia. These are, however, conjectures.

Reference has already been made to the Vendramin palace, which was erected in 1481 (Figure 6). It is attributed to Santo Lombardo (1504 † 1560) but it cannot have been by him, as it was constructed before his birth. Yet it is without doubt the work of some member of the Lombardo family. Which one, is the question. When we remember that Pietro and Martino were the architects of the most beautiful Venetian structures of that time, it seems very probable that this palace may also have been designed by one of them. It ranks among the most sumptuous edifices in Venice: Sansovino placed it "among the four most imposing palaces of the city." There is a certain similarity of style between it and the Corner-Spinelli palace, so much, in fact, that both may be ascribed to the same architect, Pietro Lombardo († 1515). It is customary to consider Pietro as the head of the Lombardo family, but strictly speaking this honor belongs to Ser Martino da Charona, father of Pietro *tajapiera* (stone-cutter). Sculptors were thus termed at Venice in those simple times. Pietro was an artist of great merit. Among his productions in Venetia, the Cathedral of Cividale, in Friuli, is noteworthy; at Venice he built the church of Santa Maria dei Miracoli, between 1481 and 1489. The celebrated tower "dell' Orologio," has sometimes, though incorrectly, been attributed to him. His less important works, such as the Zeno monument at St. Mark's, the altar of the Zeno chapel and the monument of Pietro Mocenigo, in the church of SS. Giovanni e Paolo, we will pass over. As to Martino Lombardo, we must be content to refer the Scuola di San Marco to him (it is the only edifice which can with certainty be ascribed to him). In it, he had as co-workers Tullio, the greatest sculptor of the family, and Moro, who is supposed to have been a son of Martino; in this Moro some have recognized a certain Mauro di Bergamo, who rebuilt the church of Santa Maria Formosa in 1492, the son also of a Martino, but one in no way related to the Lombardo family.

It has been thought that the charming church of San Zaccaria, founded about 1456 and completed in 1515 (Figure 7) was by Martino. In my opinion, only the façade is from his hand. He was the architect of the Scuola di San Marco or the Hospital of St. John and St. Paul, illustrated by Figure 8. Moro's work amounts to but little here. On the other hand that of Tullio (who died a little before 1559) son of Pietro, is worthy of high praise. He was not only a sculptor of great merit but likewise won distinction as an architect, as for example, in the church of the Holy Saviour at Venice and in various structures at Treviso. To Santo Lombardo, incorrectly accredited with the construction of the Vendramin palace, the Trevisani palace is now attributed; this is not, however, wholly certain. Other artists of the Lombardo family flourished at Venice, but they cannot be noticed here.

[To be continued.]

ARCHITECT, OWNER & BUILDER BEFORE THE LAW.[1]—XII.

A FRENCH INSTANCE.[2]

ONE of the most curious instances of an architect's exceeding his authority is to be found in the French books. One Savoye was architect of the church of Saugnière. He was authorized by the contract "to order works omitted or overlooked in the specification, and to provide for contingencies which might arise during the execution of the works"; and the contractor, Duchez, was bound by his contract to obey Savoye's orders. Savoye, without consulting the officials of the town at whose expense the church was to be built, practically substituted a new plan for that which had been officially approved. He increased all the dimensions of the building after the contract was made, thereby adding 12,675 francs to the cost, and ordered changes in details of construction and decoration to the value of 5,000 francs.

The town refused to pay the bills for these extras, and the case came before the highest court, which held that if the enlargement of the building did not better adapt it to the requirements of public worship in the district of Saugnière, so that the commune received some benefit from the change, Savoye must pay the cost himself. In regard to the other extra charge, of 5,000 francs, the court found that a portion was for "changes in detail fully justified by the necessities of good workmanship," but that 2,000 francs of the extra expense had been incurred through "the exaggerated importance attached by the architect to the interior decoration, and the details of the tower, the entrance door and the windows." Of the cost of the increased size, the experts found that the commune should bear a part, as being to a small extent benefited; but Savoye was condemned to pay a total of 10,500 francs.

DANGER TO ARCHITECTS IN ORDERING ARTISTIC EXTRAS.

The lesson afforded by this case in regard to the danger of trying to improve the artistic effect of their clients' buildings without their knowledge will not be lost upon architects; but there are other ways in which it is easy for an architect, in his anxiety to promote his employer's interest, to overstep his legal

[1] Continued from No. 832, page 145.
[2] Commune de Colombier-Saugnière vs. Duchez et Savoye, Dalloz, 1883, 3-92.

authority, to his own detriment. Nothing is more common, for example, than for architects to order mantelpieces, or tiles, or gas-fixtures, or similar objects, for their clients, knowing that they are needed, and supposing that the owner will be glad to avail himself of their greater knowledge of the market and more educated taste.

In the majority of cases the result bears out this supposition, and both architect and client feel that the former has rendered a favor in performing, either gratuitously or for a small fee, as included in the general commission on the cost of

MANTELS, TILES, ETC.

the building, a service for which a much larger commission is properly payable; but it sometimes happens that a client chooses to repudiate the transaction, and the architect may make the unwelcome discovery that he has made himself personally liable to the dealer for the amount of the purchase-money. It is, of course, to be understood that the client cannot repudiate the purchase and at the same time enjoy the benefit of it, and, if he keeps the mantels or gas-fixtures which the architect ordered for him, he ratifies the architect's action, and must pay for them; but he can, if he chooses, refuse to keep them, and the architect will then have them thrown on his hands, while, if the articles so purchased were built into the structure, so that they could not be removed without great injury to the building, a court might hold that the owner was entitled to keep them, paying only what the jury might determine that they were actually worth to him, and the architect would be liable to the dealer for the balance of the price.

SPECIAL AUTHORITY NECESSARY FOR PURCHASING ARTISTIC GOODS.

To avoid such mishaps, the architect should be sure to obtain special authority before making any purchases on behalf of his client. In cases of constructive exigency he would probably be sustained in ordering materials and work, as, for instance, if an iron column, after being set in place, should be broken by an accidental blow, as sometimes happens, the architect not only may, but should, order the shoring necessary to keep the superstructure from falling, and the owner will be bound to pay for it, but he has, unless the contract, or some special authority, gives it to him, no right to purchase goods for his employer which are not required for some such purpose.

In Wisconsin, one Kline, a builder, contracted with McDonnell [1] to furnish all materials and do the mason-work of a house, under the direction of an architect, who was to render the usual professional services, with the addition that McDonnell, the owner, put into his hands the money to pay for the mason-work under the contract, arranging that, as it became due, he should pay it out on Kline's order. Kline ordered some lime of one Williams. Williams presented his bill to the architect, who said that he would pay it out of "the next estimate." Before the next payment became due to Kline under the contract, he stopped work, and never completed his contract. Williams assigned his claim to Dodge, who sued McDonnell for the price of the lime, claiming that it was ordered by the architect for him, or rather, that the architect, having promised to pay for it, bound McDonnell.

DEPOSIT OF MONEY BY OWNER IN ARCHITECT'S HANDS DOES NOT MAKE HIM OWNER'S GENERAL AGENT.

The Supreme Court said that the inference that a man who employed an architect to render the usual services of architects, and engaged a contractor to furnish the materials and do the work, and placed the money due the contractor in the architect's hands, to be paid on the contractor's order, made the architect his general agent, and authorized him to bind him by new and independent contracts with other parties, was entirely unwarranted. It was natural for the architect, supposing that Kline would go on with the contract, to tell Williams that his bill would be paid out of the next instalment, but this did not bind McDonnell. The debt was evidently Kline's, and the plaintiff had no ground of action against McDonnell.

HOW FAR CAN AN ARCHITECT GO IN INSPECTING CONCEALED WORK?

How far an architect can go in carrying out his principal duty, that of endeavoring to see that the contractors comply with their agreements, is, unfortunately, not determined. There is no question that here the architect is agent for the owner, but the owner's rights are as undefined as his own.

Where a contractor has done work which is visibly not in accordance with the plans or the specification, there is no doubt that he can be required by the owner, or by the architect, under the usual contract, to pull it down, and do it over again; but a difficulty arises in cases where work is concealed immediately after it is put in. In such cases, the architect may have grave suspicions that the concealed work is not what it should be, but, under the ordinary contract, neither he nor the owner can compel the contractor, at his own expense, to tear down work already done in accordance with the contract, in order to see whether it does not conceal other work in violation of the contract. Under the ordinary provisions for ordering extra work, the architect and owner may require the contractor to remove the good work for the purpose of making the investigation, and if the work concealed behind it proves to be bad, the contractor will be bound to pay all the cost of pulling down and replacing the good work by which the bad was concealed, as well as that of making good the defective work; but if the architect's suspicions should prove not to be justified, it seems to be the law that he will have to pay the cost of making the investigation. This might be a serious matter for an architect conscientiously bent on satisfying himself that every part of a building was strictly in accordance with the contract, and it is desirable that a clause should be inserted in building contracts, providing for the inspection, at the contractor's expense, on the demand of the architect, of work which cannot be properly examined during the architect's ordinary visits of supervision.

THICKNESS OF METAL IN COLUMNS.

For example, there is no way of determining the thickness of the shell of cast-iron columns, except by drilling several holes in each column. The thickness of shell of one column of a series, as ascertained by drilling, affords no evidence regarding the other columns of the same series; and the thickness often varies in the same column from that of a sheet of paper to nearly two inches; so that the only way of making reasonably sure of the adequacy of the supports on which the safety of the whole building and its inmates may depend, is to drill every column in at least three places. This is made compulsory by law in many cities, and it ought always to be done, at the contractor's expense; and there are several other points where similar investigations should be provided for in the contract, to be held at the contractor's expense.

ARCHITECT HAS NO AUTHORITY TO CHANGE CONTRACT.

In any event, the architect must remember that his authority is strictly limited by the plain terms of the contract, and that he has no right to excuse the contractor from any of its provisions, or to change them in any way. A contractor in Kansas City, named Burke,[2] agreed to build a sewer, according to certain plans, profiles and specifications, and according to the directions of the city-engineer; and it was provided that any workman who refused to follow the directions of the engineer should be discharged. Felix, an assistant-engineer, was detailed to supervise the work, and, according to the evidence, ordered some 600 feet of trench to be dug, and a corresponding amount of pipe laid, at a less depth than the plans and specifications required. Felix was then superseded by Baker, who discovered the variation from the plan. The contractor was then ordered to take up the pipes laid under Felix's direction, dig the trench to the grade shown on the plans, and relay the pipes. He did so, and claimed payment for doing so, as extra work. The city refused to pay, and the case came to the Court of Appeals, which held that the engineer's duty was

CONTRACTOR CANNOT BE EXCUSED BY SUPERINTENDENT FROM FULFILLING HIS AGREEMENT.

to see that the contract was complied with, not violated, and he had no authority to give directions varying from the plans and specifications; and, Burke having done only just what he agreed to do under the contract, the city was not liable for any extra payment on the facts presented.

A leading case [3] involving the same point is that of Bonesteel *vs.* Mayor of New York, etc. The Street Commissioner of New York advertised for proposals for grading a portion of 70th Street, from Tenth Avenue to the North River, the rock to be excavated one foot below the curb, and deposited in the river, in

[1] Dodge *vs.* McDonnell, 14 Wis. 253.

[2] Burke *vs.* Kansas City, 34 Mo. App. 570. Starkweather *vs.* Goodman, 48 Conn 101. Stuart *vs.* Cambridge, 125 Mass. 102. Cooper *vs.* Langdon, 9 M. & W. 60.

[3] Bonesteel *vs.* Mayor of New York, 22 N. Y. 162.

extension of the street. McDonald was the lowest bidder. The bids were laid before the Common Council, and an award of the contract to McDonald confirmed. Two months later, the Street Commissioner, in behalf of the city, and in pursuance of the authority conferred by the confirmation of the award made by him to McDonald, entered into a written contract with McDonald to do the work, but in this contract varied from the specifications on which the original estimate was made, by providing that the rock should be excavated to a

ROCK EXCAVATION.

depth of two feet below the curb, but that the excavated rock should belong to the contractor, he furnishing an equal quantity of earth, and depositing it in the street where required. The written contract, as well as the ordinance of the Common Council authorizing the grading of the street, provided that the work should be done "under such directions as should be given by the Street Commissioner and one of the city surveyors."

Before any work was done, McDonald assigned his contract to Bonesteel. The city surveyor in charge directed Bonesteel to excavate the rock only to a depth of one foot below the curb, and he complied with this direction, but instead of putting the excavated material in the river, as was provided in the original specifications, he put only a small part there, and kept and sold the rest. On the completion of the work, he demanded payment of the contract price, which was refused, on the ground that the contract had not been performed. The case was brought before the Supreme Court, which held that "the provision of the ordinance that the work should be "done under such directions as should be given by those "officers" (the Street Commissioner and City Surveyor) "conferred no authority on them, or either of them, to change "or modify in any essential particular the provisions of the "contract made and entered into for the performance of the "work."

Although Bonesteel had complied with the original contract in regard to depth of excavation, he had violated it in selling the stone, and, the contract being entire, he could recover nothing.

A very similar case[1] was decided and commented upon by an equity court in New Jersey. Here a contract was made for paving in the city of Newark, to be done under the direction of the Street Commissioner, and to the satisfaction of the Committee on Streets and Highways. All work and materials were to be subject to the inspection and approval of the Street Commissioner. The work was done, and the inspectors appointed by the Street Commissioner, the Street Commissioner himself and the Committee on Streets all approved the materials and the work, on the ground that, although not literally or substantially in accordance with the contract, the paving was done as well as such work was usually done, and was, on

"A GOOD JOB, ON THE WHOLE."

the whole, a good job. Some of the abutting owners, whose property would be assessed to pay for the paving, headed by a Mr. Bond, applied to the proper court to prevent the city from paying the contractor, and a temporary injunction was issued. The Common Council then passed an order, which was approved by the Mayor, directing that the contract-price should be paid in full as soon as the injunction should be removed. On the trial of the case, the court said that, although the Street Commissioner, with the other officials named in the contract, were the proper persons to inspect and approve the work under the contract, and their decision as to whether the paving was done in a workmanlike manner, or whether the materials were good, might, perhaps, be binding, they had no power to dispense with the contract, or anything that it expressly required. "An architect," said the decision, "to whom, "by the contract, everything was to be referred, could not hold "that a brick house was a compliance with a contract to build "one of marble, or that a wall twelve inches thick complied with "a contract to make one of sixteen inches. He could determine whether the marble front, the brownstone steps or the "sixteen-inch wall were put up in a workmanlike manner, but "could dispense with no substantial matter expressly required "by the contract. Such approval would not entitle the contractor to recover at law."

In the case in question, the street having been accepted, and for some years in use, the court said that it would not be equitable to compel the contractor to put his work in the condition required by the agreement, and a master must be appointed to ascertain how much more it would have cost the contractor, at the time when the work was done, to have complied strictly with the contract, and that this sum should be deducted from the contract price before paying him.

[To be continued.]

[1] Bond *vs.* Newark, 4 C. E. Gr. 376 (19 Equity Rep., N. J.).

ARCHITECTURAL SHADES AND SHADOWS.[2]—XIV.

CHAPTER X. — (*Continued.*)

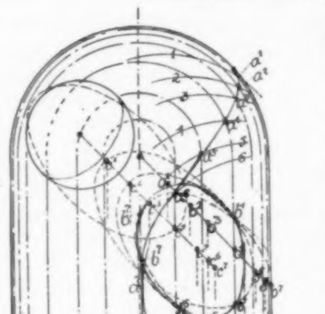


Fig. 136

174. IN Plate VI, the whole process is shown in detail as applied to both the inner and outer halves of the surface of the annulus. For convenience, these are considered separately and drawn as though they were two distinct surfaces, with their plans combined into one figure. The new ground-line is drawn below the plan and at the right, and the auxiliary projection (for convenience) below, instead of above this line. Three of the slices of the convex surface (those made by secant-planes E, F and G) are drawn complete; of each of the other four (A, B, C and D) only one-half is drawn, for reasons presently appearing. The plane H barely touches the "equator" at the point h_1, h_1', which is obviously one of the points of shade, and marks the centre of the auxiliary projection of the torus. The line of shade is determined by the points where the rays drawn at the proper angle touch the slice-contours. It passes from a'_r through h'_1 and as far as e'_r, beyond which we have no contours drawn. But here a certain property of the line of shade on surfaces of revolution whose profiles are symmetrical with respect to the equator (light being taken at the conventional angle), enables us to complete the line of shade by making the upper right-hand half from h'_1 to a'_r exactly the reverse of the other already ascertained half from a'_r to h'_1. For in all such solids the axial plane of rays[3] divides the line of shade into two symmetrical halves, and of each of these, one-half is above the "equator" and the other below it, and these last must be exactly like, but reversed in curvature, because the surface of the solid itself is exactly alike above and below its equator, but with reversed curvature. Thus the line of shade is made up of four quarters of equal curvature, so disposed that upon the auxiliary vertical plane the projections of the two lower quarters coincide in the single curve $a'_r\ b'_r\ .\ .\ .\ h'_1$ and those of the two upper quarters, must therefore similarly coincide in a curve precisely the reverse of that; namely, the curve $h'_1\ g'_r\ .\ .\ .\ a'_r$. That is, the whole line of shade is in this projection, seen *edgewise*, each of the points in this projection representing *two* points in the plan, symmetrically placed with regard to the axial secant-plane $A\ A$, and two points also in the elevation, as the letters on the Plate clearly show. The whole line of shade is thus seen to be, not a plane figure, but a figure drawn upon a (geometrically speaking) cylindrical surface made up of horizontal elements at right angles with the secant-planes and auxiliary plane of projection and whose trace upon the auxiliary plane is the auxiliary projection itself of the line of shade.

175. The line of shade on the inner surface of the annulus is found to be much more complicated by reason of the fact that most of the slices have two limbs on opposite sides of the central hollow; and by reason of the further fact that the resulting line of shade casts its shadow partly upon the inner surface of the annulus itself. The line of shade on this surface is, of course, the same as the theoretical

[2] By A. D. F. Hamlin, Adjunct Professor of Architecture in the School of Mines, Columbia College. Continued from page 151, No. 832.

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.]

HP = horizontal plane of projection; VP = vertical plane of projection; GL = 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.

[3] That is, the vertical secant-plane passing through the vertical axis of the solid.

line of shade upon the exterior concave surface of a scotia having the same dimensions and elements. As a matter of fact, however, this line of shade on a scotia of this curvature would be so entirely swallowed up by the shadow of its upper lip, that this identity of the two lines of shade is of no practical use to the draughtsman.

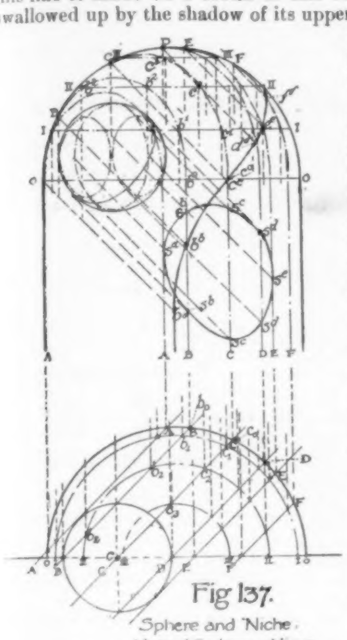


Fig 137.
Sphere and Niche.
Vertical Sections oblique.

176. It would be aside from our purpose to investigate in detail the forms and properties of the slice-contours and line of shade of the torus, further than to call attention to the fact that the sections of its convex surface made by the secant-planes are not, as they at first sight promise to be, ellipses. They are of ellipsoidal form for all slices that do not cut into the inner surface of the annulus, changing into a sort of hour-glass outline as this inner surface is more and more deeply cut by the secant-planes, then dividing into two parts, each of oval section on opposite sides of the central opening, until finally the axial secant-plane intersects the annulus in two perfect circles. These forms and changes are only seen in part in Plate VI, because of the separation into two separate figures, of the inner and the outer convex surface of the annulus gives as their general outer halves of the convex surface of the annulus.

177. The investigation by analytical geometry of the sections of demonstration of this proposition, as we have already exceeded the equation $x_2 + y^2 - 2\sqrt{r^2y^2} = 1 + r^2 - D^2$, in which r = radius of profile-curve, D = distance of slice from centre of torus, and the distance of centre of profile from centre of torus is taken as unity. It is not necessary to give here the intended bounds of this discussion of the annulus.

178. There is still another application of the method of slicing, which is of service when the line of shade is cast upon an oblique plane or a concave surface. In Figure 136 a sphere casts its shadow into a niche, and this shadow, and that of the front edge of the niche itself, are found by casting their shadows successively upon a series of vertical secant-planes parallel to $V'P$. Wherever each of these shadows crosses the contour of its own secant-plane of incidence — that is, the line of its intersection with the surface of the niche — we have a point of shadow common to both the plane and the niche; this, therefore, is a point of the required shadow. As many others may be found as desired in the same way, the advantage of this method being the ease with which the slices are drawn, and the fact that the shadows upon them are all exactly alike, so that they may be traced or transferred upon each in turn, care being taken only to locate the shadow properly each time, by means of its centre which is the corresponding shadow of the centre of the sphere.

179. In Figure 136 the shadows of the front edge of the upper part of the niche are all arcs of circles, described from the shadow cast upon each plane by the centre o, o'. The arc 1 is its shadow (only a part being drawn, as the rest is unnecessary) on the plane I, I; and a^1 where it crosses the contour or edge of this first slice, is a point in the required shadow. Arc 2 described from o^2 (the shadow on II, II, of the centre o, o'), crosses the second contour at a^2, and so on. The shadows of the sphere on the several planes will be equal ellipses, whose centres will be the corresponding shadows of the centre c, c' of the sphere; namely, c^1, c^2, c^3, and so on. The points where these ellipses cross each the edge of the slice to which it belongs, together give us the distorted oval b^1 b^3 b^5 b^6 b^7 which is the shadow of the sphere. A comparison with Figure 137, in which the shadow is cast by the common slicing-method (the secant-planes or vertical sections being taken as usual at 45° to $V'P$), shows the identity of the results obtained, while emphasizing the greater simplicity and directness of the more special method just described. Either of these methods may be used in obtaining the shadows on the flutings of a column. In Plate V, No 5 and 5A, the common method, illustrated in Figure 137, was the one employed.

180. In Figure 138 is an example of the general method of slicing applied to a Tuscan capital. In actual practice, however, this slicing would be employed only for certain parts of the shade and shadow on such a capital, as a considerable portion of the work may be accomplished by familiar special processes. Thus, the lower left-hand edge of the abacus casts its shadow at 45° across the echinus and neckings, as far to the "corner" of the latter at A. The shadow of the front lower edge is a "true section" of the necking, that is, an arc of a circle struck from the point where the oblique shadow just drawn intersects the axis of the neckings (see Figure 103, No. 766 of the *American Architect*). This shadow, however, soon runs into the shadow cast upon the necking by the line of shade on the fillet under the echinus, and the latter into that cast by the echinus itself; these, one has to draw by means of slicing. The shadow of the lower edge of the astragal may be drawn without slicing by the process shown in Figure 108 (No. 766 of the *American Architect*); the line of shade on the echinus may be drawn by the "five-point" method, (Rule XV, § 116; Figures 93, 95, 96, in No. 755 of the *American Architect*). For the straight shadow along the top of the abacus, slicing is obviously unnecessary.

181. This combination of the general method with special processes is a fair example of the course the draughtsman has to pursue in solving the ordinary problems presented by architectural forms in geometrical elevation. It is, therefore, of the highest importance to master the ordinary special methods so thoroughly that their application shall instantly and instinctively suggest itself to his mind wherever they will serve to simplify or abridge his work. In this respect they are like the special methods in algebra, familiarity with which enables the mathematician so greatly to reduce the labor of his calculations. In both cases the expert discovers many opportunities for their employment, where one less thoroughly trained fails to note their applicability, and laboriously solves his problem by the cumbrous processes of the general method.

182. In Plate V, No. 1 represents a Corinthian base and capital, with half plans of the flutings, abacus and "bell." The details of the capital are shown in simple block-form; and the processes for drawing the shades and shadows on the abacus and bell, and on the flutings on either side of the central one, are shown in Nos. 3, 5 and 5A. It will be noticed that the "corner" features on the left side of the capital — the "horn" of the abacus, the double volute with the leaves curling under it, and the tall leaf under these — cast all their shadows, as they ought, upon the corner itself, limited by 45° lines from the extremities of the features that cast the shadows. The casting of the shadows of the other leaves is largely a matter of experience and judgment. The central channel of the fluted shaft is our old friend, the semi-cylindrical niche with hemispherical head or hood, and its foot the inverted niche; both are treated in detail in §140 and Figure 119 (No. 766 of the *American Architect*) and need no further explanation. The two channels to the left of this one are shown in No. 5 and the two to the right in No. 5A, where they are treated by the "slicing" method with oblique vertical slices; the other method shown in Figure 136 might have been employed with equal accuracy.

183. No. 2 illustrates the shadow on a Greek Doric capital — that of the temple of Zeus at Ægina being selected on account of its large echinus and wide projection. The shadow is a very curious one, the shadow of the abacus forming a sort of horn across the

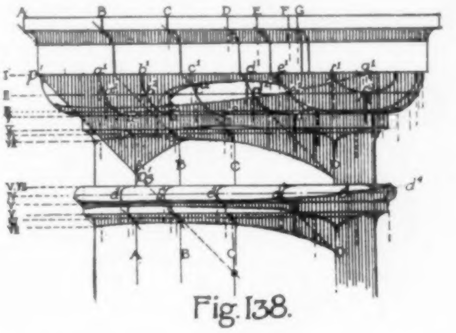
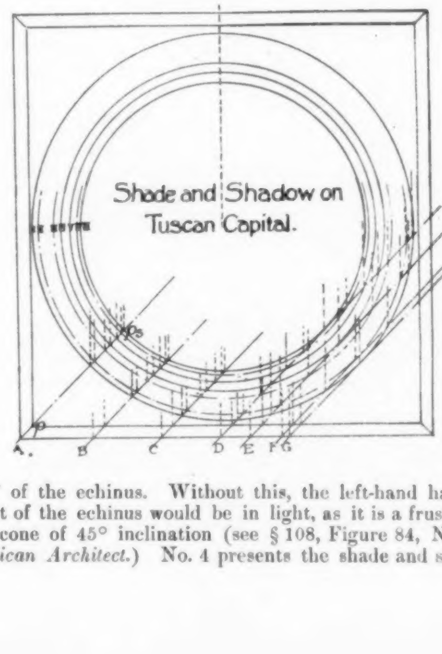


Fig. 138.



"corner" of the echinus. Without this, the left-hand half of the lower part of the echinus would be in light, as it is a frustum of an inverted cone of 45° inclination (see § 108, Figure 84, No. 755 of the *American Architect.*) No. 4 presents the shade and shadow on the left-hand half of the Roman Ionic capital, that on the right-hand half offering no special interest or difficulty.

184. These examples and the foregoing discussion, by no means exhaust the scope or the varied applications of the method of slicing. But they should suffice to make it, not only intelligible, but practically useful in the solution of nearly all the problems of sciography that are in any way capable of a geometric solution. In the next chapter the reader will find instructions with regard to the artistic rendering of architectural elevations, and certain suggestions as to the best method of procedure in attacking large and complicated problems. These, with illustrations from some of the best work of the Ecole des Beaux-Arts, will bring this series of papers to a close.

(To be continued.)

THEATRICAL ARCHITECTURE.[1] — V.

THE STAGE.

HAVING dwelt in detail upon the various points in the auditorium to be observed when building a theatre (with one exception, that of lighting, which I will speak of in conjunction with stage lighting) we have now, in like manner, to deal with the parts behind the curtain, still having the one great object in view, the prevention of fire and panic.

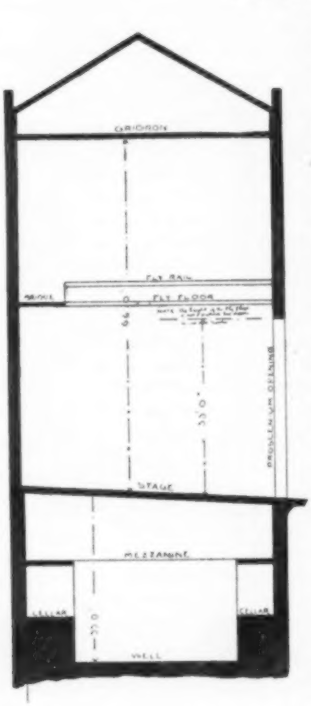


Diagram showing Height and Depth of Stage in Relation to Proscenium-Opening.

In describing the stage for our present purpose, it will be unnecessary to enter fully into the details of the various traps, sliders and bridges in the stage-floor, or of the flies, gridiron, wings, borders, rows or stage machinery. I need only mention that as much of the machinery as possible should be of iron, and that the ropes by which the traps and sliders are worked should be of wire.

The proportions of the stage, however, is a matter in which the architect is concerned. The width of the proscenium-opening may be taken as the datum upon which the whole proportion of the interior of the house depends, for in the various classes of theatres the width and height of the proscenium-opening varies; in opera-houses the opening is larger than in small theatres — forty to forty-five feet being the general width for the former, while twenty-eight to thirty or even less, is the average for the later. Covent Garden Opera-house has the widest proscenium-opening in London, measuring forty-five feet. The larger the opening the bigger the scenery, and the more money it costs to mount a piece. The width of the stage, should be, from side-wall to side-wall, at least twice the opening, that is to say, with a proscenium-opening of thirty feet; the stage should not be less than sixty feet wide or have fifteen feet at either side or wing, and the reason for this is that when the scenery is divided in the centre it may be taken off out of the sight of the audience right and left — or to the P. and the O. P. sides — without rolling or folding.

The same rule applies with equal, if not greater, force to the height; whatever the height of the proscenium-opening, the height from the stage-floor to the gridiron, from whence the scenery suspends, should be equal to that of the opening, to allow the scenes to be lifted bodily out of sight without rolling. This is insisted upon in London by the authorities. Still, again, the depth from the stage-floor to lowest cellar of the stage should be equal to the opening, to permit of scenes and "sets" being lowered into the cellar on the "bridges."

The advantages gained by adhering to these rules of proportion are immense, as the saving of fire-risks, by not having to fold the scenery is great, and the scenes wear better, last much longer and cost the management considerably less per annum than where they are on rollers. In the Royal English Opera-house all these rules are strictly observed.

The stage-floor should rake upwards at an inclination of half an inch to the foot, this should never vary, for this is the slope the actors are accustomed to, and the dancers have learned to dance upon: any variation would put the performers completely out. Below the stage is the mezzanine floor, from which the machinery of the lower part of the stage is worked; below this, in large houses, there is sometimes a second mezzanine, and at the bottom of all, the cellar or "well," as it is sometimes called. Above the stage there are one or two tiers of "flies" or galleries on either side of the stage, from whence the scenery above the stage-level is worked, and right over the whole area of the working stage-floor is the rigging-loft "gridiron" floor, which receives its name from its likeness to that domestic

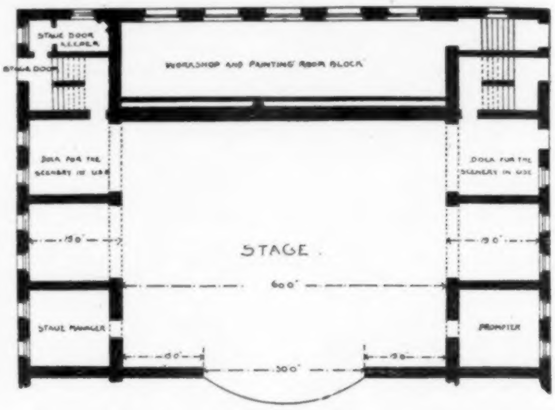


Diagram showing Width of Stage in Relation to Width of Proscenium-Opening.

utensil, being formed with narrow battens laid on joists, with openings between adjacent battens. From the gridiron the scenery, or what are technically called the "cloths," is hung.

All the floors above and below the stage should be used for machinery purposes only. Here too often we find rooms, cupboards and stores constructed of highly inflammable matched-boarding: this is a most dangerous practice, and is indulged in when extra dressing-rooms or band-rooms are wanted. A separate fire-resisting staircase should be provided for the "fly-men," as well as the "cellar-men," and all who work the scenery.

On the level of the stage, and immediately in connection with it, there must be a scene-dock, of sufficient size to shift the scenes into that are in actual nightly use; this dock must not, however, take the place of a scenery-store, but must only be used to relieve the stage of encumbrance; no more scenery should be kept on the stage than is absolutely necessary for the week's performances.

PROSCENIUM CURTAIN.

I have already described the brick wall dividing the auditorium from the stage, but I purposely postponed the consideration of how the proscenium-opening in this wall should be filled till dealing with the stage. The opinions of authorities differ widely as to the material of which the dividing curtain should be made, but all agree that there should be a curtain, having properties that will permit it to retard the ingress of fire and smoke into the auditorium, even if but for the space of a few minutes.

The various curtains that have been before the public are:

(1) Single wrought-iron plates, and wrought-iron plates fixed on a frame with an air-space between.
(2) Wrought-iron plates and wire gauze combined.
(3) Asbestos-cloth in various forms.
(4) Canvas curtains with water-spray.
(5) Water-spray curtains.

Now what is required is to obtain a surface which will be fire-resisting, not affected by the great heat, which is the invariable result from fire on the stage and which shall prevent the passage of smoke into the auditorium, this being a source of great danger to the audience. The material should be such that it would not be affected by water being thrown upon it when heated, or by the fire in actual contact with it; it must at the same time have sufficient rigidity in itself to resist falling timbers and the various properties, flats, set-pieces, etc., which might fall against it in case of an outbreak of fire; and, finally, the curtain should be of such material that it would not be of too great a weight to be raised and lowered by ordinary means during the performance.

Iron curtains have been found defective, since they twist and buckle under heat so much as to allow the smoke and flames to pass into the auditorium. Wire-gauze curtains are too fragile: they will not withstand the weight of falling bodies and when damaged they are useless, as flames will pass through them. For the same reason asbestos curtains may be dismissed for they become easily torn; water-and-canvas curtains depend entirely upon the water being spread over the entire surface without a hitch, and water-spray curtains will not stop the passage of smoke into the auditorium.

A London architect, Mr. Max Clarke, has made a special study of fire-resisting curtains, and the result of his investigations is a protected iron curtain, the construction of which is an open iron and wire frame work which is protected with a covering of silicate cotton, or slag-wool on each side. This silicate cotton is covered with wire-netting and forms an absolute non-conducting material, which can be covered on the auditorium side with the traditional "green baize," or be treated as the painted "act drop." This curtain has been

[1] By Ernest W. E. Woodrow, A. R. I. B. A. Continued from No. 831, page 134.

found sufficiently pliable to adapt itself to any strain and yet be fire-resisting and smoke-proof. It can be raised by man-power, by hydraulic-power, or pneumatic-pressure, and can be lowered from different points inside or outside the theatre.

To be of any service, the fire-curtain must be used nightly, and between every act; by this means there is an assurance that it is in working order. If a fire-curtain is only lowered when fire exists, it would advertise the danger to the public, and immediately cause a panic; so in order not to create alarm, the people should be accustomed to see the curtain go up and down.

FIRE-RESISTING DOORS.

The division of stage from the auditorium would not become effectually completed unless the smaller openings were filled with self-closing, fire-resisting doors, and, as they should be of the same material in all other parts of the building where the openings are to be closed by fire-resisting doors, one description will suffice.

It is somewhat difficult, as in the case of the fire-curtain, to decide upon the material of which these doors should be made, for, if to be of any service, metal doors would have to be made so thick and heavy that they would become impracticable. A good two-inch oak door, especially if lined on both sides with sheet-iron to protect it, would be very serviceable. I have seen concrete doors cast upon an iron and wire frame; but they crack and crumble with the jarring of opening and shutting the door. Asbestos doors have been used lately; they are made of iron frames, and are light, and appear to answer the requirements. A hollow iron door filled with alum or sawdust, surrounded by an outer casing of iron, after the manner of safe doors, has been advocated for dividing the various risks. These would be heavy and expensive. The ordinary iron door, one-quarter of an inch thick in panels, is certainly better than a thin wooden door, but not much, as it would twist and bend in a fire.

DRESSING-ROOMS.

Too frequently the dressing-rooms are not thought to be worthy of the architect's attention; such, at any rate, seems to have been the state of affairs in the past, for many theatres have dressing-rooms which are a disgrace. Dark holes under the pit floor or stage, boxes without light or air; overheated and insanitary rooms, constructed out of thin matched-boarding, have to serve as dressing-rooms for the poor artist to prepare for the amusement of his public.

Lately, the municipal authorities have become alive, in London, to the importance of the safety of the actor as well as the safety of the public, and steps are being taken to weed out the dressing-rooms without light and air; to provide better sanitation, and to acquire safe exits for the "mummers." The overcrowding of dressing-rooms where large numbers are employed in the ballet or chorus is an evil of management that the architect has no power over, but he can remember that it is nearly sure to happen, and must, therefore, provide ample ventilation, so that the vitiated air from the gas-burner over each "make-up" glass may be extracted, and fresh air automatically admitted, in such a manner that the performers cannot stop such ventilation. Fresh air is not draught, but many would term a cool inlet a draught, especially those coming heated off the stage, so, if possible, the incoming air should be previously warmed. Windows are, of course, an absolute necessity, but one cannot depend upon the occupants of dressing-rooms opening them.

It must be remembered that the class from which the "crowds," "ballet" and "chorus" at most theatres are drawn is a poor class, who can be taught many useful lessons within the walls of a theatre apart from their actual work. Cleanliness and tidiness should be encouraged, and it is a necessity to provide in every dressing-room, whether for the leading actor or the "extras," washing-basins with hot and cold water laid on, with a properly trapped waste-pipe. For each performer a separate drawer should be fixed, to hold his or her costumes, and each one should have a looking-glass with a light at the side, or immediately over, to "make-up" by.

Dressing-rooms should be placed on the right and on the left of the stage, or in some other convenient position, according to the site, in two blocks, separated the one from the other, the one for the women, the other for the men. A band-room and band-master's room must not be forgotten, in a convenient position near the orchestra.

THE PAINTING-GALLERY, ETC.

There are many more trades connected with a theatre than any one who did not know the details of the business of a theatre would imagine. It is, of course, necessary for the architect to know all about theatrical management before he can construct a building containing all the requirements of a play-house. It is a strange thing, but every architect thinks his one great forte is to build either a cathedral or a theatre, and, if every architect in the world built one cathedral and one theatre, there would be more good cathedrals than theatres, so few have the opportunity of learning what is required, as there is a kind of sacred mystery in all that goes on behind the curtain which only the chosen few are permitted to gaze upon.

Artists, scene-painters, modellers, carpenters, joiners, property-makers, decorators, upholsterers, papier-maché workers, smiths, gas-fitters, electricians, firemen, needlewomen, dressmakers, wig-makers and cleaners have all to be provided for. Band-master, master-carpenter, property-master, head gas-man, chief electrician, house-keeper, stage-doorkeeper and stage-manager have all to be considered apart from the workshops in which their various staffs are employed. Rooms must be found for scene-stores, property-stores, music-library, armory, wardrobes and furniture-stores. I do not for a moment say my list is a complete one. Many trades are carried on quite apart from the theatre, but in the majority of theatres nearly everything is done in the "shops" on the premises, as it is cheaper for the manager to employ his own staff of workmen.

All these shops should be entirely separated from the stage by solid brick walls, with as few doorways as possible connecting the block with the theatre. Workshops should never be permitted in the space either under or over the auditorium. In old houses, the roof over the auditorium was almost invariably used as the carpenter's shop, and nothing more dangerous could well be imagined, separated from the audience, as it was, by only a lath and plaster, or a canvas ceiling and boarded floor. The extreme heat of this space made the shavings even more inflammable than they would have been under ordinary conditions.

The painting-gallery must be provided with movable paint-frames, upon which to stretch the canvas. These frames must be the same size as the proscenium-opening, and made to lower through the floor, to allow the painter to reach any part of the canvas. In connection with the painting-gallery must be a private room for the artist to make his sketches and models in.

Wardrobes must be fitted with presses, carpenters' shops with benches, armories with racks and stands, and so on for all the various trades.

GAS AND LIGHTING.

It is on account of the use of gaslight in such large quantities, and in close proximity to highly inflammable materials, that theatres are such dangerous fire-risks. No precaution should, therefore, be left untried to mitigate the danger arising therefrom. The use of the electric-light, which is becoming almost universal in London theatres, has reduced this danger more than any other step that has yet been taken.

Gas has been, and is still, used in a most careless manner, for in illuminating the scenery temporary pipes and rows are constantly being connected and disconnected, as they are laid-on for one scene and removed for the next. It is during this "shifting" and "setting" of scenes that the strictest supervision is needed to prevent the escape of gas. An expert and experienced gas-man should be attached to every theatre; his duties are most onerous; the least carelessness on his part might at any moment create a panic. We may suppose, for an example, that he mistook a stop-cock and placed the auditorium in darkness: an alarm would be sure to follow, for the public know that the first thing done when a building is on fire is to turn off the gas. Again, if by mischance he shifted one of the movable ground rows without turning the gas off in the main pipe, and the escape ignited, a fire would soon be raging among the scenery. In order to make a gas-man's duties as light as possible, he should, of course, be provided with perfect fittings. At the side of the stage — the "prompt side" for preference — there should be a large indicating-plate, with all the various stop-cocks arranged and labelled permanently, so that there could not possibly be a doubt in knowing what portion of the gas system such cock governed. The temporary connections made on the stage should be of such a pattern that, when they were disconnected, the gas would be automatically cut off in the supply-pipe.

To minimize the risk, there should be separate supplies to each section of the house, with a separate meter, the stage distinct from the auditorium, the dressing-rooms from the workshops, and the entrance staircases and corridors from the offices and saloons. The meters should be placed in a specially built brick chamber, with plenty of ventilation and means of outlet for escapes of gas. These chambers should be easily reached from the street, so that the gas might be cut off from outside the building when required.

No soft metal or rubber pipes should be used for the gas-supply: iron or brass alone should be employed. With regard to the fittings they should be neither jointed nor of telescope pattern, nor should swinging pendants be used; stiff brackets are alone permissible. All gas-burners within reach of the audience should be so arranged with secret taps that no mischief-minded person could tamper with the light; the taps should be turned on and off by a key in the possession of the gas-man. Fixed wire guards or globes must be fixed to protect every gas-jet. This is particularly essential in the dressing-rooms. All gas-fittings on the stage, foot-lights, battens, wing-lights, groined-rows, etc., must be protected by strong wire guards.

Where colored mediums are required for stage effect, glass should be employed: there is great danger from the mediums of silk or light fabric which are used over the battens on the stage.

Great mischief may ensue from carelessness in lighting-up a theatre. Of late years the risk has been reduced by the introduction of the "flash" system to the foot-lights, hanging battens and other gas-fittings which are placed among the scenery, the old method of lighting by cotton wool steeped in spirits on the end of a long cane was most dangerous: by the "flash" system the "pilot-light" is kept always alight to each batten, and the whole stage can be instantaneously lit up by turning one of the handles on the gas-plate. In other parts of the house the "lighting-up" should be done by the electric spark: matches should never be permitted in the building.

It was but a few weeks ago that a panic, fortunately unattended by loss of life, occurred at the Odéon, Paris, through the use of matches on the stage: a match was dropped, subsequently trodden on and ignited; the smoke it made alarmed the people who jumped up from their seats in a state of alarm.

Sun-burners have superseded the huge glass "chandeliers" in all modern houses. Sun-burners have a dual advantage as they act most efficiently as extractors for the foul air; there is no chance of their falling on the heads of the audience, and they do not obstruct the view of the stage from the gallery as the "chandeliers" used to. Care, however, should be taken to keep sun-burners clean, or else incandescent carbon is likely to fall into the pit or stalls. All gas-fittings need periodical inspection.

The grave importance of all care and watchfulness over the lighting of a theatre is duly recognized in all Continental cities, the rules enforced are most stringent, and the instructions given for regulating the arrangements of the stage lights most minute.

A subsidiary system of lighting is always needed in case at any time the prime illuminating power fails; therefore in all passages, staircases and corridors and over all the exit-doors in the auditorium, safety-lamps, fed with colza oil or composite candles, should be hung on the walls. The glass in front of these lamps should have the word "exit" printed on it in red.

The introduction of the electric light into theatres has done much, as I have already said, to reduce fire-risk, but yet we know there is risk attending even the use of electric lights. It scarcely comes within the scope of these papers to consider any details of this system of lighting: suffice for our present purpose to say every precaution should be taken to ensure a perfect installation that will not fail in giving light, and that the machinery for generating the light should be in a chamber entirely separated from the theatre. In America electric light is more universally used than it has been in London up to the present time; indeed it is only within the past few months that the district within which our theatres lie has been supplied from a common centre, those theatres, consequently, where the light has been used, have had to generate it on the premises.

There is one other illuminator used in a theatre about which I have but one word of caution. I refer to the "lime-light." This, when generated or kept in bags or gasometers on the premises, should be kept in a specially built brick ventilated chamber, in the same manner as the gas-meters.

CONSTRUCTION AND MATERIALS.

The architect cannot give too much thought to the choice of the materials of which to construct a theatre. Were it possible a theatre should be *fireproof*, but the accepted significance of the term "fireproof" is an erroneous one, for materials that are incombustible are not of necessity "fireproof," although they are *fire-resisting*. Take for example iron and stone, both of which are incombustible and neither of them will feed a fire, but in the conditions under which they are employed as building materials, neither of them is *fireproof*, for they are among the first to succumb to the influence of fire. Iron, under great heat loses its strength, is liable to fracture and to give way and bring down the superstructure in its fall. By its contraction and expansion, under the rapid changes of temperature from fire and water, iron adds to the dangers, as columns snap off short and girders twist like hoop-iron.

Where iron is used, it must be completely embedded in a protecting casing of concrete or plaster, held to the ironwork by a key of wire lathing, so that the fire and the water will not act directly upon the surface of the iron: under these conditions ironwork is admissible in theatre construction and may be considered as a fire-resisting material. All the theatres recently built in London have had the tiers and corridors constructed with steel girders and columns embedded in this manner. To avoid the obstruction of the sighting by columns, the tiers have been supported upon huge steel cantilevers, tied into the back wall and projecting into the auditorium. Upon these cantilevers the floors of concrete and iron are supported, forming an incombustible mass in lieu of the wooden stagings of which old theatres were built. The concrete employed to protect ironwork should be composed of the best Portland cement with an aggregate of some calcined material. Plaster-of-Paris also forms a good protecting substance.

In drawing attention to the unadvisability of using stone for the floors or steps of public buildings, I cannot do better than quote the words of the chief officer of the London Fire Brigade, Captain Shaw. "It yields to fire," he says, "more rapidly than any other material, is the most dangerous of all materials as at sudden changes of temperature it cracks, leaving a passage for smoke." Stone may, of course, be used in walls, but well burnt, hard and sound bricks form the best walls, which should be built in cement. Tiles, terra-cotta and materials that, either by nature or by the aid of man, have passed through the ordeal of fire are suitable for fire-resisting buildings.

Wood, when used in large bulks and of the harder sorts, such as elm, oak, or some of the Australian hard woods, is not as dangerous as is generally supposed: it is when it is used in thin slices that it becomes food for the flames. To again quote Captain Shaw: "Wood will stand a powerful dead heat upon its sides for an indefinite period without igniting, unless transverse sections of the fibre, such as knots present themselves to the action of the fire." Wood blocks can be placed upon the concrete, with perfect safety, for the floors of the various tiers, and they form a warm, comfortable floor and a good fixing for the carpets, seats and fittings.

Plaster is an invaluable fire-resisting agent, it is light, retards fire for an indefinite period, and adapts itself for the entire enrichment and decorations of the auditorium, from ceiling and proscenium frame, to circle fronts and private-box partitions.

Briefly, in choosing materials preference must be given to those which have already been calcined by the action of fire and which do not add food to the flames.

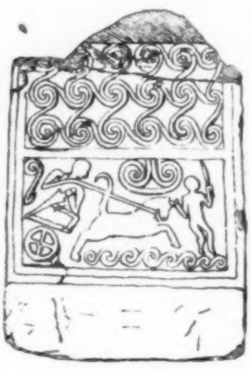
The roof over the whole theatre must be fire-resisting, constructed of iron and concrete, finished on the outside with some weather-resisting material, such as asphalt. There should be access from one roof level to the other, and firemen's ladders leading therefrom to within a short distance of the ground.

It has been found that the intense heat over the stage destroys a wooden roof, as the timbers become desiccated and little better than touch-wood, ready to ignite at any moment.

In halls and places of entertainment of the music-hall class, a sliding roof is generally fitted over the auditorium. This was first tried at the Canterbury Music-hall in London, and the great success of the experiment has led architects to copy this method of ventilating, thus making the atmosphere in such places of resort bearable and breathable. A central dome or lantern light is fitted on wheels which run on rails, and is removed entirely from over the auditorium by the action of a windlass, leaving a space open to the skies.

[To be continued.]

THE PLANNING AND CONSTRUCTION OF AMERICAN FRAME HOUSES.[1]



Relief from Mycenæ.

MR. C. H. BRODIE recently read before the Architectural Association a paper on this subject, illustrated by some sketches, details and tracings by the author, and also by numerous plans and perspectives from the United States professional journals. Mr. Brodie mentioned that he was engaged on business in America during the winter of 1887 and the spring of 1888, during which time he spent considerable time in New York and Chicago, with flying visits to Boston, Baltimore, Philadelphia, Washington, Pittsburgh, St. Louis, Kansas, Milwaukee, St. Paul and Minneapolis, and other cities. Such houses as were illustrated on the walls are, he remarked, the type of American homes, alike in the north, south, east and west. In the actual town areas the erection of timber houses is now forbidden. Still, in the Southern States universally, and over the country and suburban districts generally, it is rarely that any but timber houses are erected. The average time for erecting a frame house is ninety days, but many have been built in sixty days, and whilst the life of the structures may be averaged at fifty years, there are very many in existence even a hundred and some two hundred years old and over.

Again, stone quarries as yet worked are few and far between, and brickworks are not by any means numerous. But the country abounds with the most beautiful timber, with which even the denuded Eastern States are kept plentifully supplied by means of immense rafts floated down the great rivers to convenient points for transport by rail or boat. A frame house may be very expeditiously erected. The drawings on the walls show a basement, rising only a foot or so out of the ground, built of either brick or undressed stone, and on this is a frame of quarter partitions, two stories high, forming inclosure and divisions. These and the joists being fixed in position, the roof can be immediately constructed and covered-in, so that whilst the outside is being completed, the inside, too, is progressing, and during the time that we should be getting up a scaffold, the frame house is built. The plasterwork being then, if necessary, dried by artificial heat, the joinery and other fittings are placed, and the dwelling is ready for occupation in a very short time. Should the worthy owner's family increase, additions to the house are just as easily and expeditiously made. The plans show a basement and two upper stories, and the roofs being mostly of steep pitch, plenty of room for attics is obtained in them. The basement contains a laundry, beer and wine cellars, coal-cellars for both house and furnace coal, larders, and the heating-chamber, containing either a boiler for steam or a furnace for hot-air heating. The heat there generated is distributed by ducts quite evenly over the whole house, and most of the rooms have no fireplaces. This is a stage of civilization to which we have not yet generally attained. Where fireplaces do occur, and this is chiefly on the ground-floor, an ashpit is provided under each, into which, when the hearth is swept up, the ashes, etc., are dropped by moving a dump or hopper. These ashpits are marked on the basement plans. The ducts serve in the hot

[1] From the *Building News*.

weather to distribute cold air over the house, the air in the cellar, whence they start, being naturally cooler than that outside, whilst it can, if necessary, be cooled still further by artificial means.

Coming to the ground-floor or first story, as their plans have it, we find a parlor and dining-room, and also perhaps a library or a second parlor. The dining-room is always in connection with the kitchen through a lobby or pantry. You will note, also, that there is no scullery shown, although on some of the plans is a diminutive space marked "sink-room." On this floor are also various store-rooms and closets, water-closets, lavatory, etc., depending as to size, number and variety on the general dimensions of the house. And here I would call special attention to the very complete way in which all classes of American houses are fitted with cupboards, shelves, drawers, sideboards, book-cases, etc., all conducing in so eminent a degree to the comfort and ease of the occupants. No bedroom that I occupied in any private house in the States was without a cupboard large enough to walk into and turn round in. The convenience of this is too obvious to need expression. The hall is always furnished, and used as a room; most of the American plans have it designated "reception-hall," and some even "sitting-room." The veranda is also a most important feature, and one never omitted. During the hot season it is inclosed with blinds, and becomes the most frequented part of the house. The first floor has the usual bed and bath rooms, linen-closet, etc. You will observe that in most cases the water-closet apparatus is kept away from, and not, as with us, next to the outside walls. This is to avoid fracture by freezing during the intensely cold weather. To return to our first-floor plan.

You will note that all the chief bedrooms have a fixed lavatory fitted, generally in a cupboard, so as to be out of sight. This adds, of course, very considerably to the plumber's bill, but in the long run it is a great saving, for labor of all kinds is terribly costly. Balconies are freely provided on this floor, and are delightful spots in the hot weather, whilst they always form a feature in the elevations. The attics are used for servant's rooms — each still with a good cupboard — box-rooms, store-rooms, etc., or the space is frequently just floored and then left to be cut up as the wants of the occupants may later on suggest. About the elevations, outside and in, or the artistic part, one need say nothing, except that, to our eyes, the calm and dignified treatment of the English example contrasts very favorably with the fussiness and over-picturesqueness and evident striving after "features," which spoils so many of the other designs. The construction you can study at your leisure by referring to a specification printed in blank, which is in the Institute Library. It is indexed under the name of the publishers, Messrs. Palliser, of New York, to whom I am indebted for a good deal of the information this paper contains, and for a drawing and specification hung on the wall. I was struck with the very practical character of the specification. For instance, among the general clauses I read: "The carpenter will make all patterns, etc., and will provide suitable protections to all openings to keep out the cold, rain, etc., and will clear the building of all carpenter's waste materials before the plastering is commenced. The mason must provide coal and stoves in cold weather for heating the building while his work is going forward and until it is dry."

Continuing, we shall get particulars as to how this class of house is put together, and we naturally find after the general clauses the necessary directions as to the excavations. The only unusual point here is: "The bank is to be dug well away from the walls, and left open until the walls are set and dry." The damp-course is to be either slate and cement or asphalt. The brick walls are required to be built to "a true line from one end to the other, even to the cutting of a brick where necessary, so that the carpenter can size the joists to an exact width, and place them directly upon the wall without blocking up with chips or pieces of wood." The facing of these brick walls is to be "neatly tucked and properly cleaned down with aquafortis, and oiled with raw linseed-oil at completion," care being taken not to injure, in cleaning down with the acid, any cut stone-work.

The laths for lathing are to be "laid a full one-fourth inch apart, and joints broken every eighteen inches." Wood-laths, however, are now rarely used. I never saw any at all. The plastering is put on wire-netting, or one of the many forms of pierced or expanded metal now coming into use in this country. The plastering is to consist of "a good coat of brown, well-haired mortar, made of pure unslaked lime, and clean, sharp bank-sand, free from loam and salt, and best cattle or goat-hair, well mixed by continued working, and stacked in the rough for at least —— weeks before putting on." The finish is to be "a coat of best soapstone finish, manufactured by the company, composed of finishing lime-putty (two parts) and patent soapstone finishing (three parts) thoroughly mixed two days before using, and applied in the most careful manner, as per directions" — I suppose of the manufacturers. The order of the trades as they are placed in the specification differs considerably from our usual arrangement; and we next come to the carpenter and joiner. All the timber which will be exposed at the finish is required to be of a certain quality pine. The joists are to be placed, in all cases, with the "crowning" edge upwards, and those over so many feet in length are to be "worked crowning" so many inches before being placed in the building. Describing the partitions — a most important item of a framed house — the specification directs that "all door and window studs are to be set double, and all openings over three feet wide trussed overhead. All angles must be formed solid by blocking and spiking two studs together. No studs are to stand on the floor, nor on the joists, if there are partitions under, but all are to foot on top of the partition-plate below."

The outside of the external partitions, and also the roof, is covered with seven-eighths inch matched-boarding, called "sheathing," which has to be "nailed at each edge at every bearing with 10*d*. nails." Nails are throughout the specification described as so many "penny" ones — a nomenclature common also in Ireland. The whole exterior is then covered with waterproof felt, the joints lapping two inches, and it is tarred under all architraves, friezes, cornices, brackets, etc., "so as to make a perfectly tight job." Outside this felt comes the finish which is actually seen, which on the partitions is weather-boarding, or, as it is called in the States, "clapboarding." This is to be of "clear, dry, bevelled, white pine, five inches in width by one-half inch thick at the butt, and three-sixteenths inch at the thin edge, laid with not less than a lap of one and one-fourth inch, and nailed with 8*d*. box-nails every sixteen inches. The nails to be set in." The veranda floor is to be constructed with one and one-fourth inch by three and one-half inch white-pine boards, laid with "paint joints." The roof is generally covered with shingles, and so also are the gables and other features. The shingles are usually of cypress, which grows abundantly in the swamps of New Jersey and the more southern States. The logs are floated down the river to the various mills, where the shingles are cut in enormous numbers. One mill cuts 300,000 daily. They are about eighteen inches by six inches and are fixed on battens, with on roofs five and one-half inches to the weather, and on vertical parts six inches, each nailed with two nails, and kept three inches from angle of valleys. Sometimes the roofs are of slate, and frequently they are flat, in which case they are mostly covered with tin, although asphaltum or gravel composition is sometimes used. In either case the roof is boarded on the joists with seven-eighth inch boarding.

Coming to the floors, pugging — or, as it is called "deafening" — is used in all the best rooms, and these have also a double floor — a rough deal one and a hardwood finished one, with between them a layer of "all-wool Pyramid-brand, rosin-sized, deafening felt," fixed down by two inches to one-half inch slips, to which the hardwood floor is secret-nailed. The rough floor is described to be fitted carefully round all studs, etc., up to the sheathing, so as to prevent mice circulating. Here is a good clause — "All the plastering is to be finished, cellar cemented, and all mason work done and thoroughly dried through before any of the interior joinery is brought into the building or put in position." The materials used for doors are required to be thoroughly seasoned and kiln-dried, and on the plans the sizes for both width and height are figured. Sliding-doors are much used, while many openings have no doors at all; these would be provided with curtains, which give the desired privacy. There is no question of "draughts" in an American house, which is warmed equally throughout. All the doors have a hardwood slip three-fourths inches thick, splayed each edge, fixed under them. This enables the door to open clear of carpets, etc. The windows are mostly double-hung sashes requiring no special description. All are directed to have a burglar-proof fastening. After a description of the stairs most minute directions follow for the fittings of the various pantries and closets up stairs and down. These include clothes-closets, linen and china closets, and butler's and kitchen pantries, as well as the various store-rooms. Then we get a full description of the refrigerator and ice-safe, which consists of two thicknesses of boarding, two inches apart, filled with mineral wool, then an air-space of one inch, and a layer of rosin-sized waterproof paper, the actual inside being of clean, narrow-matched spruce. The lower part is the ice-safe or tank, and it is lined with sheet zinc, and the bottom covered with a wood grating to prevent the ice cutting the metal. The doors of these spaces are constructed in precisely the same way, and the joints between door and frame are double rebated.

The wood finish is described to be first a certain patent "mineral filling," and then another "patent transparent wood finish." The hardwood floors are to be done in the same way, but with a "vegetable" filler. The tinwork is to be painted two coats of metallic paint, and here I may say that this tin — or to speak more correctly tinned iron — is used wherever we use lead, and also for the rain-water pipes and gutters. Lead is too expensive, and is also more affected by changes of temperature. The hot-air ducts from the furnace in the basement are also made of tin, and are run up in the partitions. The hot-air is delivered into the rooms through a sort of hit-and-miss grating, called a "register." The positions of these are shown on the plans.

Coming to the plumber's work, the soil-pipes are invariably of cast-iron, the joints being made with oakum and lead, well caulked. They are painted on the outside with two coats of metallic paint, one before and one after fixing. Inside they are coated with coal-tar, or the pipes are "Mott's enamelled soil-pipe, not less than three-sixteenths thick." The soil-pipes are kept well within the building, the water-closet apparatus being away from, and not next to, the outer walls. The siphon intercepting the drain from sewer is fixed within the cellar, and the drains, generally, in fact, are inside, and not outside, the building, so as to be clear of frost. The water pipes are of lead, all so arranged that they may be run dry — also to baffle Jack Frost — and laid on wood strips or in wood troughs. And here occurs another very practical passage: "The plumber is not to cut any timbers; that will be done by the carpenters, and he shall not cut any to weaken them." Would that we could enforce that clause on both plumbers and gasfitters! Joints (lead to iron) are made with brass ferrules soldered to lead and caulked to iron as before described. The whole of the drainage has to be done according to municipal plumbing regulations, which are very strict. They often require that all soil-drains, as well as the vertical pipes, shall be of heavy cast-iron, and in all cases that the soil-pipes shall be carried through the roof full-size, and left open at top, and that an air inlet shall be provided on the house side of the intercepting siphon. Also, that all sanitary fixtures shall have a trap as close to them as possible, each of which must have a back-air inlet to prevent siphonage. Brass piping is sometimes used for hot-water connections, but galvanized wrought-iron is much more common, and seems to be equally satisfactory.

As to the cost of these frame houses, one of the buildings illustrated is shown to have cost $2,935, or £587. This is a small house. A friend of mine writes to me that he is just about building a ten-roomed house, which he says will cost from £700 to £850, and he puts the life of this as at least fifty years. A very small house illustrated and described in a local paper is said to cost only $1,500, or £300. In conclusion, I will quote the dedication of a book of designs of houses of this class. Prose is evidently too feeble to properly commend the subject, so the book is inscribed:

"To those who happy homes have always known,
To those who plan and work such homes to own;
To all who building homes would bless mankind,
To all who in their homes a refuge find;
To youth, whom wedded life will soon employ,
To children dear, each day their parent's joy;
To all who favor honor, truth and love,
To all whose virtues promise homes above."

THE ILLUSTRATIONS

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

THE TOWER OF MADISON SQUARE GARDEN, NEW YORK, N. Y. MESSRS. MCKIM, MEAD & WHITE, ARCHITECTS, NEW YORK, N. Y.

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

STUDY FOR THE EQUITABLE LIFE ASSURANCE BUILDING, SEATTLE, WASH. MR. JOHN PARKINSON, ARCHITECT, SEATTLE, WASH.

ST. GEORGE'S CHURCH AND PARISH BUILDINGS, ST. LOUIS, MO. MESSRS. TULLY & CLARK, ARCHITECTS, ST. LOUIS, MO.

ARCHITECTURAL SHADES AND SHADOWS. PLATE VI.

SEE article elsewhere in this issue.

THE COMMENCEMENT HALL, PRINCETON COLLEGE, PRINCETON, N. J. MR. WILLIAM A. POTTER, ARCHITECT, NEW YORK, N. Y.

[**Additional Illustrations in the International Edition.**]

TOMB AT CONSTANTINOPLE. M. G. ALLAR, ARCHITECT.
[Photogravure.]

ELEVATIONS AND SECTION OF THE SAME.
[Photogravure.]

VILLA PAULICK ON THE ATTERSEE, AUSTRIA. HERREN FELDSCHARCK & KÖNIG, ARCHITECTS.
[Gelatine Print.]

HOUSE IN BERLIN, PRUSSIA. HERREN BLUMBERG & SCHREIBER, ARCHITECTS.
[Gelatine Print.]

DESIGN FOR AN ACADEMY OF FINE ARTS. HERR A. STROHMAYER, ARCHITECT.
[Gelatine Print.]

SIDE ELEVATION AND SECTION OF THE SAME.
[Gelatine Print.]

ST. FEDE, COMO. DRAWN BY MR. G. C. HORSLEY.

BISHOP'S THRONE, ST. MARIA IN TRASTEVERE, ROME. DRAWN BY MR. G. C. HORSLEY.

DESIGN FOR A LIBRARY.

THE design illustrated was submitted in competition for the Architectural Association Medal, and was drawn up in accordance with certain requirements. The ground and first floors constituted the main part of the library, the top floor furnishing accommodation for the librarian and the basement for the porter. Each floor contained a book-store, and the whole four floors were connected by a separate stair for the library officials and attendants. There were also separate entrances and staircases for the residences. The external walls were intended for stone or terra-cotta, the roof for permanent green slates, the railing of wrought-iron, and the base of piers at entrance were to be granite. The drawing from which the plate was taken was exhibited this year in the Royal Academy.

CHURCH OF ST. MARY THE VIRGIN, EAST GRINSTEAD, ENG. MR. W. T. LOWDELL, ARCHITECT, LONDON, ENG.

THIS church, which is being built in sections, is to be of brick, with red facings externally and internally, the nave arcading, internal lining of chancel, window and door dressings being of local stone from the Honeywell quarries. The church, when completed, is intended to seat 500. The first contract, which is now being carried out (the cost of which is being entirely defrayed by the family of the late Mrs. Stenning, of East Grinstead), includes chancel, vestries and one bay of nave. This will necessitate a wooden building to accommodate the worshippers until such time that sufficient funds may enable the building to be completed. In the chancel, which will simply be divided from the nave by a low dwarf wall and wrought-iron screen, there is a very prettily-designed sedilia and piscina. All the woodwork in doors, choir-stalls and screens will be of wainscot oak, the floor throughout being wood-blocks. The architect estimates the total cost of the building to be about £5,000.

THE PRIORY, CARTMEL.

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.*]

IRON AND STEEL SKELETON-FRAMES.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Lately there have appeared in many of the leading architectural papers numerous articles relating to the construction of iron and steel skeleton-frames for large buildings. The subject is one of vital importance to all interested in the development of a type of building that marks a new era in the architectural world, and will not only add to the commercial wealth and beauty of our great cities but also afford the advantages of economy of material, durability and fire protection. The rapid improvement in the manufacture of iron and steel within the last decade has made it possible to construct commercial buildings to a height never before attempted. This has the effect of enhancing the value of city property and of concentrating the business portion of a large city within a comparatively small compass. Whether this is an unmixed blessing is very doubtful, and public opinion seems to be setting against the erection of what are now termed "sky-scrapers." The building-laws of large cities which should regulate the construction of these buildings have been unable to keep pace with their rapid development, and from a scientific standpoint are in many cases not up to date. This is especially noticeable in the clauses referring to the allowable strength and the quality of structural materials.

The present building-laws of New York, (Section 491), as well as of Boston, (Section 24), require that all beams, girders and other pieces subject to transverse strain shall be proportioned for an ultimate or breaking load three times greater than that which they are required to support, *i. e.*, to have a factor-of-safety of three, and members subject to direct tensile or compressive strains only are required to have a factor-of-safety of six. This evidently shows that the framers of this law either had in mind the construction of columns of different quality of material from that used for beams or else discrimination was used against columns made of the same material as the beams.

Any beam supporting a load is subject to both tensile and compressive strains at the same moment, and no reason exists why the factor-of-safety under such condition should be less than for a member of the same material subjected to direct compression or tension only. Moreover, the floor beams in a skeleton-frame building are the members which are most likely to be strained to the full load for which they were designed. This is liable to occur from the concentration of heavy loads, such as safes, machinery, or a crowd of people on any portion of the floor directly above the beams. In the case of columns this condition of affairs would have to occur simultaneously over the whole floor area they support before they would be strained to the maximum loads for which they were designed.

Cast-iron is no longer used for compression-members in the construction of railroad and highway bridges. This may be taken as the highest class of iron structural work and one which has engaged the attention and life-long work of many of our leading engineers.

Specifications have been drawn up to govern the construction of bridges by competent engineers and also by many large corporations, whose object has been to secure the use of the very best material for this class of work.

It would be well if building-laws could be based on the same sound principles, but such a movement would meet with great opposition from many whose interest it is to see the present unsatisfactory laws remain in force.

The field for cast-iron in structural work is growing narrower since the introduction of steel. This is noticeable in bridge-work, as before stated; also in the use of steel beams in place of cast-iron lintels formerly used extensively. The reason for this is that the use of cast-iron, owing to its unreliable character, has been discarded for structures liable to shocks. In buildings sudden shocks do not often occur, but there are other conditions which may seriously affect the columns, such as vibrations where machinery is used, wind-strains and eccentric loading. The latter in most cases exists, it being — as a rule — impossible to place the floor girders directly over the columns. All of these conditions are liable to cause bending-strains in the columns, which are especially injurious to cast-iron, and can only be guarded against by extra quantity or quality of material in the column.

The method of manufacturing hollow cast-iron columns is responsible for many of their weak features; among these may be cited "blow-holes" and "honeycomb" due to the presence of confined air in the mould. Again, it often occurs when casting hollow columns that the metal is not of uniform thickness; this is caused by the central core tending to rise on account of its buoyancy when the metal is in a liquid state; also when long columns are being cast the metal is poured in from both ends, and the molten metal becomes too much chilled to properly unite, thereby causing weakness in the column where the greatest strength is required.

Another inherent weakness in cast-iron columns is due to the initial strains caused by the unequal contraction of the metal during the process of cooling. They no doubt exist to a greater or less degree in all castings, and in some cases so weaken them that they are entirely unfit for use. These strains are all the more dangerous because it is impossible to detect their existence. This last is no doubt the cause of cast-iron being so unreliable when subjected to sudden shocks. The whole question reduces to this, viz, whether it is better to increase the quantity of the material or substitute a material that is homogeneous and can be manufactured in shapes suitable for columns without being weakened in the process.

Steel columns under the present building-laws cannot compete with cast-iron in the matter of cost; the more reliable and expensive material having to conform to laws which were framed with a view to cover defects of the cheaper material.

There are also many misleading statements made against the use of steel columns for buildings by the advocates of cast-iron. One of the chief arguments is that cast-iron is less liable to oxidation than wrought-iron or steel.

In the light of recent experiments on the loss of wrought and cast iron plates under different conditions of exposure, by Messrs. Howe & Lodge, this argument no longer holds. A full account of their experiments may be found in Volume I of the "*Metallurgy of Steel*," Appendix 2, in which Mr. Howe sums up by saying: "The most surprising result is the practically identical loss of cast and of wrought iron, not only on a general average of the whole, but in at least three out of four of the sets of cases."

Steel is now universally used for shipbuilding purposes, and steel vessels are known to be afloat that have seen service for twenty years and have shown no signs of unusual corrosion. This is probably the most reliable and at the same time as severe a test as can be obtained, and the use of steel for shipbuilding purposes speaks well for its lasting qualities. Steel columns are usually built in sections and of such form that they can be thoroughly inspected and covered with paint or other preservative against rust before being put into place, whereas, it is impossible to do this with the inner surface of cast-iron columns, where imperfections are most liable to exist and where oxidation is likely to take place.

The best method of protecting steel columns from dampness and other injurious elements, is to enclose the column entirely in a brick casing, the whole being bonded together with hydraulic cement. This will take up no more room than the bare column in the case of Z-bar columns, while it will add only the thickness of the brick in the case of other shapes. The plastering can be applied directly to the brickwork, or the usual terra-cotta casing can be used, which is covered by stucco, giving the column such form as is best suited to the architect's requirements.

Another great advantage which steel columns possess over cast-iron is that they are less liable to be seriously damaged in case of fire. Cast-iron columns, and especially the lugs which support the floor girders, are apt to crack and fail when subjected to heat and suddenly cooled by the application of water which would cause the falling in of the floors.

In the case of steel columns the beams are connected rigidly to the columns by means of riveted brackets, and hence this weakness cannot exist.

The building-laws of New York, Section 491, regulating the determination of the dimensions of materials, reads as follows:

"The dimensions of each piece or combination of materials required shall be ascertained by computation, according to the rules given in Trautwine's "*Treatise for Engineers*," or the treatise of other authors now or hereafter used at the United States Military Academy at West Point, on the strength of materials. The factors-of-safety shall be as one to three for all beams, girders and other pieces subject to a transverse strain, and as one to six for all posts, columns and other vertical supports subject to a compressive strain; and as one to six for tie-rods, tie-beams and other pieces subject to a tensile strain."

This section does not sufficiently cover this most important subject, and a revision to take the place of this paragraph is suggested by the writer. It will be found at the end of this letter, and will be easily understood by all who are engaged in the construction of buildings. It will, no doubt, be satisfactory to all architects and engineers and to all who desire an advancement in the safe construction of buildings. Yours truly, F. H. KINDL, C. E.

SUGGESTED ALTERATIONS TO THE NEW YORK BUILDING LAWS.

SECTION 491, PAGE 43.

Dimensions of materials, etc.; how ascertained; beams, girders, etc.—The dimensions of each member, subject to transverse strain, shall be determined by the following formula, or tables derived from same:

$$\text{Stress}\left\{\begin{array}{l}\text{in outside fibre}\\ \text{in lb. per sq. in.}\end{array}\right\} = \frac{\left\{\begin{array}{l}\text{Maximum bending-}\\ \text{moment in inch}\\ \text{pounds.}\end{array}\right\} \times \left\{\begin{array}{l}\text{Distance of neutral axis of}\\ \text{section to extreme outside}\\ \text{fibre in inches.}\end{array}\right\}}{\text{Moment of inertia of section.}}$$

For members subject to tension only, their dimensions shall be determined as follows:

$$\left.\begin{array}{c}\text{Stress per square inch}\\ \text{in pounds.}\end{array}\right\} = \frac{\left\{\begin{array}{l}\text{Total strain in}\\ \text{member in pounds.}\end{array}\right.}{\left\{\begin{array}{l}\text{Net area of section}\\ \text{in square inches.}\end{array}\right.}$$

Allowable stress per square inch for different materials.—The stress per square inch obtained by the above formulæ shall not exceed the following values: For rolled-steel, 16,000 pounds; for rolled-iron, 12,000 pounds; for cast-iron, 5,000 pounds; for yellow pine, 1,250 pounds; for oak, 1,000 pounds; for spruce or white pine, 750 pounds. Cast-iron and wood should not be used for tension members where practicable.

Steel and wrought-iron columns and struts.—Steel or wrought-iron columns and compression members, whose lengths are not greater than ninety times the least radii of gyration of their sections, shall be so proportioned that the stress per square inch on their cross sectional areas shall not exceed 12,000 pounds for steel and 10,000 pounds for wrought-iron. For members whose lengths are greater than the above limits, these values shall be reduced according to the following formulæ, or tables derived from same:

$$\left.\begin{array}{l}\text{Allowable stress}\\ \text{per square inch.}\end{array}\right\} \text{For steel } 17{,}100 - 57\frac{L}{r}$$

$$\text{For wrought-iron, } 13{,}000 - 37\frac{L}{r}$$

in which "L" is the length of the member in inches, and "r" the least radius of gyration of the section in inches.

Cast-iron columns.—For cast-iron columns and compression members, the allowable stress per square inch shall not exceed that given by the formulæ below, or tables derived from same:

$$\text{for cylindrical columns } 8{,}000 \div 1 + \frac{L^2}{800\,d^2}$$

$$\text{for rectangular columns } 8{,}000 \div 1 + \frac{L^2}{1{,}066\,d^2}$$

in which "L" is the length of member in inches, and "d" the least diameter or side in inches.

For wooden columns and struts whose lengths are not greater than fifteen times their least side, the stress per square inch shall not exceed the following amounts: For yellow pine, 1,100 pounds; for oak, 800; for spruce or white pine, 600 pounds.

For members whose lengths are greater than fifteen and less than forty times their least side, the above values shall be reduced twenty-five per cent; and for members whose lengths exceed the above limits, a reduction of fifty per cent shall be made.

SECTION 492, PAGE 44.

As to iron columns.—1. All iron columns shall rest on steel or iron bed-plates, and have their caps and bases made true and square with the axis of the column.

ARCHITECTURAL SCHOLARSHIPS.

NEW YORK, N. Y., November 27, 1891.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—My attention has been called to the scholarships which are open to young men in the architectural profession.

Is there any chance for a young man of nineteen years to compete? who is practically engaged each day in an architect's office.

What are the requirements; when do examinations occur and what does the scholarship imply?

An answer in your valuable columns will greatly oblige,

Yours respectfully, "THADDEUS."

[UNFORTUNATELY there does not seem to be any scholarship that is open to you. The *American Architect* Travelling-Scholarship, which although the smallest foundation is yet the most liberal in its terms, nevertheless restricts its opportunities to draughtsman between the ages of twenty and twenty-five. The Rotch Scholarship is restricted to two-year residents of Massachusetts, and the McKim and Schoermerhorn scholarships are open only to graduates of Columbia College.—EDS. AMERICAN ARCHITECT.]

TAKING CARE OF THE *AMERICAN ARCHITECT* PLATES.

BOSTON, December 1, 1891.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—I keep my plates in portfolios, made roughly with the pasteboard-sheets which come with the *American Architect*, fitted with backs of enamelled cloth, fastened on with the staple-binders used to bind specifications in the office. The portfolios have the titles written on gummed labels, as "Banks & Office-Buildings," "Hotels & Apartment-houses," "Romanesque Detail," etc. As there are a great many portfolios, the plates on any subject are readily found, and, being laid in loose, they are available for study, without danger of injury when not in use. I put a label on the back of the portfolio, as well as on the side, so that the one wanted can be more easily selected from the shelf. VETERAN.

HARTFORD, CONN., November 30, 1891.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—The inquiry in your last week's issue moves us to describe our method of classifying and preserving the illustrations of the *American Architect*.

Our plate-case is 3′ 8½″ wide, 6′ 9″ high and 10″ deep — inside measurements. There are 32 shelves ½″ thick 2″ apart. As each shelf holds three piles of plates side by side, we thus have space for 96 classifications. As a matter-of-fact, we have only 85, as follows:

1. Large English Gothic Churches.
2. English Gothic Churches of Moderate Size.
3. English Gothic Church Interiors.
4. Large Gothic Churches.
5. Churches mainly Gothic.
6. Gothic Church Interiors.
7. Churches mainly Romanesque.
8. Romanesque Church Interiors.
9. Churches mainly Renaissance.
10. Renaissance Church Interiors.
11. Small Churches. Unclassified.
12. Church Furniture.
13. Mortuary Buildings.
14. Conventual Buildings.
15. Synagogues.
16. Monumental Gateways.
17. Monuments.
18. Sculpture.
19. Capitals and Town-halls.
20. Post-offices and Court-houses.
21. Government Stations.
22. Light-houses and Windmills.
23. Banking-houses.
24. Corporation Offices.
25. Office-buildings.
26. Storage-houses.
27. Prisons.
28. Asylums.
29. Hospitals.
30. Museums.
31. Libraries.
32. Colleges.
33. Schools.
34. Laboratories.
35. Residential Palaces and Castles.
36. Houses of Great Cost.
37. Country Houses. Costly.
38. " " of Moderate Cost.
39. " " Inexpensive.
40. Costly Modern English Houses.
41. Modern English Houses of Moderate Cost.
42. Old English Manors and Halls.
43. Costly City Houses.
44. City Houses of Moderate Cost.
45. Semi-detached Houses.
46. Domestic Interiors.
47. Old English Interiors.
48. Apartment-houses
49. City Hotels.
50. Country Hotels.
51. City Club-houses.
52. Country Club-houses.
53. Y. M. C. A. Buildings.
54. Theatres and Halls.
55. Pavilions, Bridges, etc.
56. Perspective, Engineering, Drainage, Shadows.
57. Exhibition Buildings.
58. Factories.
59. Railway Stations.
60. Armories and Rinks.
61. Baths and Gymnasia.
62. Stables.
63. Gate Lodges.
64. Old Colonial Work.
65. French Domestic Architecture.
66. Hanseatic Architecture.
67. German Domestic Architecture.
68. Scottish Domestic Architecture.
69. Staircases.
70. Costly Mantels.
71. Mantels of Moderate Cost.
72. Furniture.
73. Decoration.
74. Rococo-work.
75. Oriental Art.
76. Stained-glass.
77. Metal-work.
78. Doorways, Dormers, Towers, Oriels.
79. Foreign Exchanges.
80. Architectural Sketches.
81. Pictorial Notes.
82. " Reproductions.
83. Capitals and Other Carvings.
84. Archæology.
85. M. I. T. Classical Studies.

Some of these may sound rather queer and arbitrary, but we could think of no better sort of classification. The bulk of the plates is from the *American Architect*, which we have taken from its beginning, but many other publications are represented. Long ago we gave up the idea of preserving the text, for we found it was never read. Certain articles, however, and some suggestive initial and other cuts, are preserved in classified and indexed scrap-books, so as to be readily available.

To return again to the classification. No. 11 refers to many little churches — frequently of unique and attractive design — but of no especial historic style. This compartment is fairly well filled.

When No. 17 is full, it will be divided into tombs (large tombs go in No. 13), monuments and memorial tablets.

No. 19 will soon need a division to accommodate the many smaller town-halls.

No. 21 includes water-works, fire-engine houses and the departmental buildings of Washington, London and other government centres.

No. 24 refers especially to insurance buildings, and No. 25 to those built mainly for sub-rentals.

It is difficult to classify houses; as it is, Nos. 37 and 38 have been filled twice, removals having been placed on extreme lower shelves, and marked respectively II and III, while the original compartment is marked I.

No. 64 includes only genuine old work, and is much used for reference.

No. 74 was put in to accommodate a large amount of this sort of thing, published five years ago in an English periodical — very incorrect, but curious.

No. 75 includes many interesting bits of work of Eastern origin.

No. 79 comprises the admirable set published under this caption by the *American Architect* in 1882–3.

No. 81 gives some of T. Raffles Davison's more suggestive little groups, but is mainly taken up by little cuts of good pictures in local exhibitions.

This plate-case was made some years ago, and, if we were starting anew, several improvements would be made. But, trusting that the description of this method may be of service to some one, and hoping to hear suggestions from other architects, we remain

Very respectfully yours, Cook, Hapgood & Co.

NOTES AND CLIPPINGS

James Hoban, the Builder of the White House. — The assertion that there have been no famous Irish architects in this country strikes me as the height of ignorance. Did the compiler never hear of James Hoban or of any of the creations of this celebrated architect — the friend of George Washington — to whose genius we owe the White House and other public buildings in the District, who was employed by the year, at the suggestion of President Washington in 1792, at an annual salary of 300 guineas, continuing until 1798, when he was appointed supervising architect of the United States Capitol, admittedly the building par excellence of the United States. James Hoban, born in Kilkenny County, Ireland, taught the profession of an architect in Dublin and was awarded a medal by the Dublin Society. In 1780 he left Ireland for Charleston, where he first settled. When Washington City was contemplated, Henry Laurens of South Carolina, long a State captive in the Tower of London, gave Hoban a letter of recommendation to George Washington. The White House even elicited the admiration of Thomas Moore, when he visited the city in 1804 (the only thing Moore did praise). After filling various high political positions Hoban died here in 1831, leaving considerable property to his children. His own residence is still in existence; he is interred at Mount Olivet Cemetery; he was a devout Catholic. His son, also James Hoban, was a renowned lawyer; he published several books on Irish subjects. His grandson, also James Hoban, is a prominent member of our bar. The District of Columbia is vastly indebted to the Celt for intellectual as well as material progress; they have left shining testimony of their existence. I wonder if the sapient compiler ever read David Ramsay's "*American Revolution*," 1793. An eye-witness, whose impartiality was never contested, says in Vol. II, page 311: "The Irish in America with a few exceptions were attached to independence. . . . The Scotch, on the other hand, were generally disposed to support the claim of Great Britain. — *M. L. Weller, in the Boston Pilot.*

Aloe Ropes. — From a report on mine ropes to the French Government, it appears that hemp or aloes ropes are almost exclusively used for all depths of shaft in Belgium. The makers guarantee the ropes to last one-and-a-half to two-and-a-half years, and should they fail earlier, a twelfth to a twenty-fourth of their cost is deducted for every month short of their stipulated duration. Steel-wire ropes should be of crucible steel having a breaking strength of 70 to 76 tons per square inch. Large pulleys are more necessary for wire than for hemp ropes, the smallest diameter permissible being 1,300 to 1,400 times the diameter of the wire in the rope, if of iron, and 2,000 times if of steel. For mining purposes wire ropes are best made with a hemp core, being more flexible. — *Invention.*

A Soaked-Wood Pavement. — A new system of wood-paving that is now being tried in Paris makes use of pieces of oak about four inches long, split up similarly to ordinary kindling-wood. These sticks are laid loosely on end in fine sand on a bed of gravel from four to four and one-half inches thick. A layer of fine sand is spread over them, and they are alternately watered and beaten several times. In about forty-eight hours the water has completely penetrated the wood, causing it to swell into a compact mass, which is capable of supporting the heaviest traffic, according to reports. — *Exchange.*

TRADE SURVEYS

To-day's reports from Western business centres strengthen opinions recently formed as to an active winter business. Western bank presidents, especially those located in sections where farmers have been good borrowers but poor payers for years, confirm much of what has been said as to the general reduction of the mortgage indebtedness in agricultural districts. Money-loaning companies report to the same effect at many points. The statement has just been made that financiers in New York are about to organize a more efficient method or system for meeting the financial needs of the West, through which much of the comparatively idle money East will find its way more permanently into the West. This is a good move, but until recently conservative business men looked with disfavor on liberal investments in farm lands. One year's good crops will by no means lift the grain-growers out of trouble. There has been an improvement in land-values, but also a depreciation in city and town real estate in some localities where booming influences made havoc. Thirty leading mining companies have already declared a marked increase in dividends. Within sixty days, surveys have been undertaken for the laying of eighteen hundred miles of track next year in the Rocky Mountain region. Land-speculation has reached Northern Mexico, and enterprises are to be pushed there next year which will make possible much heavier investments in mines, coal developments and in railroad building. In short, a Far Western development is probable, which will go far to equalize the unsettled conditions that have been gathering in the East. The weaknesses in business, trade and manufacturing which are often discovered are local, and cannot prove dangers. No general depression is probable, or, for that matter, possible in the United States — a statement which it is scarcely necessary to make. A depression has certainly been avoided, and the elements exist for the return of unfavorable conditions. Investors and promoters are keeping these possible conditions in mind, though not anticipating their coming. The strongest factor to-day is that we have bed-rock prices. The weakest is that we have a producing-capacity apparently far in excess of probable demands. Our future safety lies largely in the present expansion of trade and markets in the newer States, and in the preservation of the nice equilibrium between producing and consuming interests. Reports from jobbing centres during the past few days show the usual decline prior to the holidays. Textile interests will, no doubt, expand production in all branches except hosiery. Southern cotton-mill managers have overcome their fears that stocks would accumulate to a dangerous point. Cotton continues low. All staples are at a low point. The season will close with supplies at moderate proportions — a fact which is largely due to the strength of a multitude of trade organizations. It may be several months, according to the New York financial men, before the real benefit of improving conditions will be felt. According to Western commercial people, a general improvement will show itself before the close of January. A strong feature is that very little foreclosing is going on. Unpaid obligations are extended, banks lend all possible assistance, friendly coöperation is extended among business men, and everything is done to avoid friction or to cause trouble. The year 1891 has developed much producing-capacity that may not be fully used in 1892, but the investments made are largely out of savings, rather than borrowed capital. In short, the country is less in debt for new work done in 1891 than figures of former years show. The extensions made are made largely out of accumulated means, and hence depression or dulness means much less than were a mountain-load of obligations to be met and liquidated, or depression encountered.

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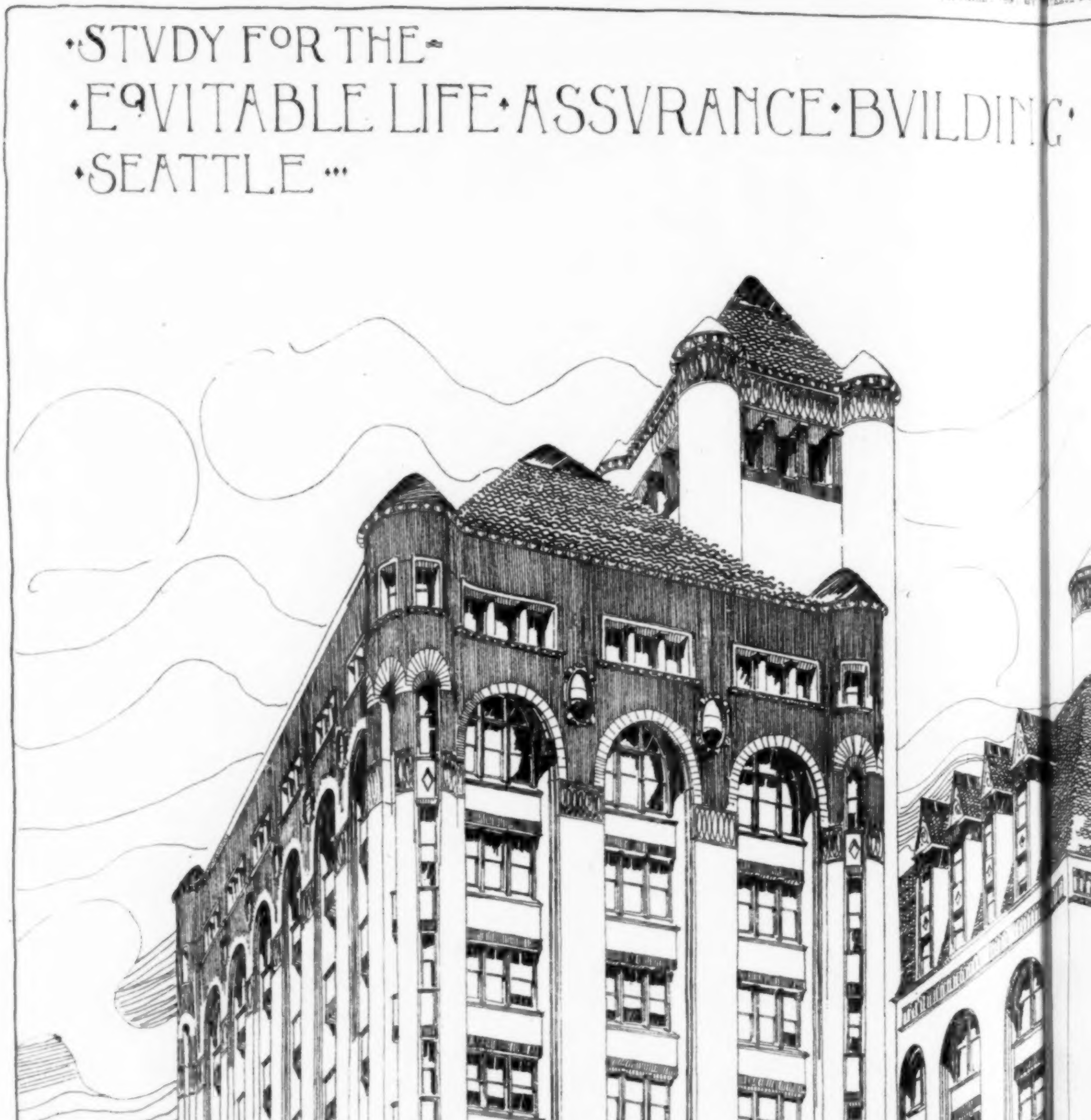

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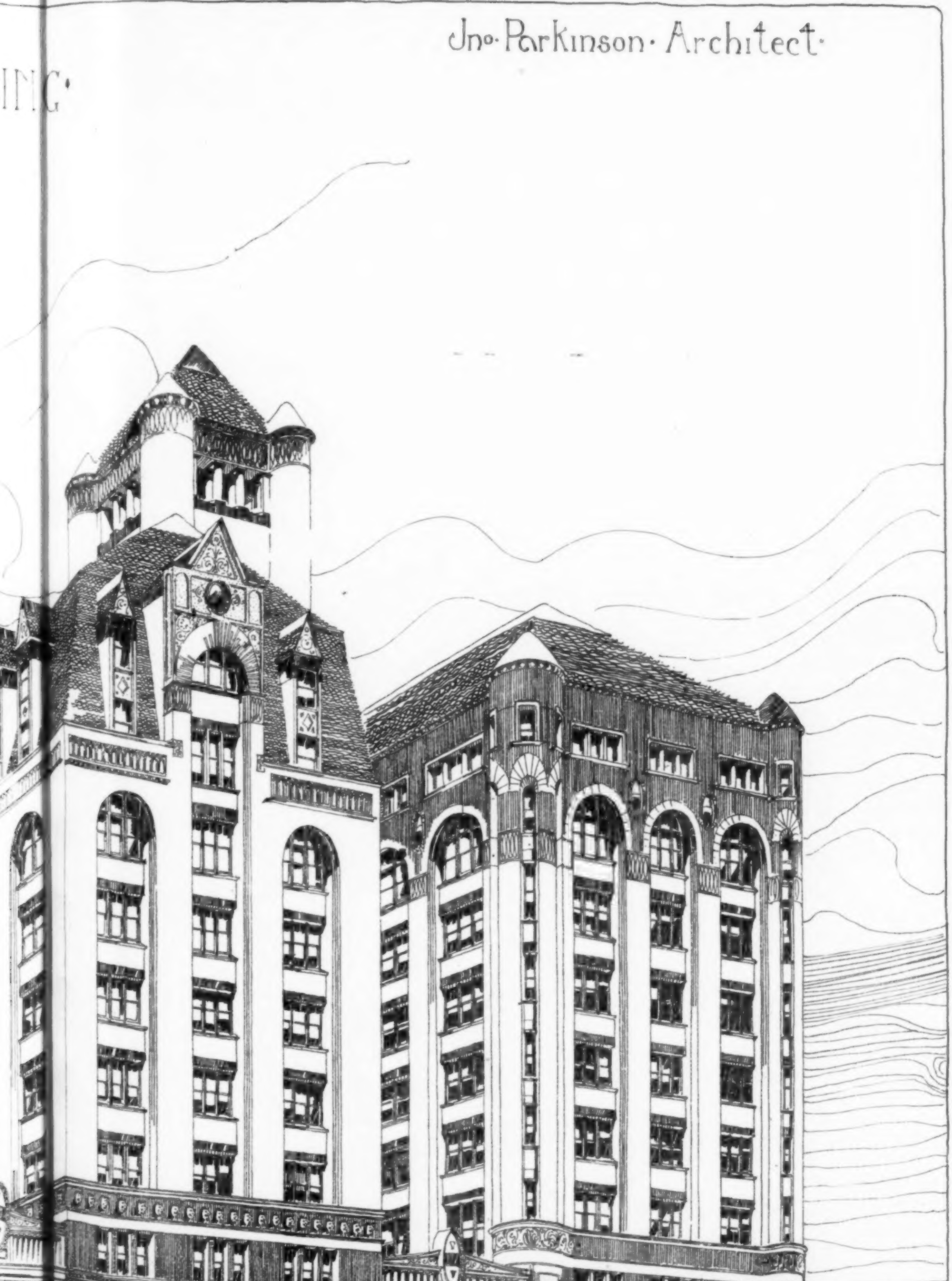

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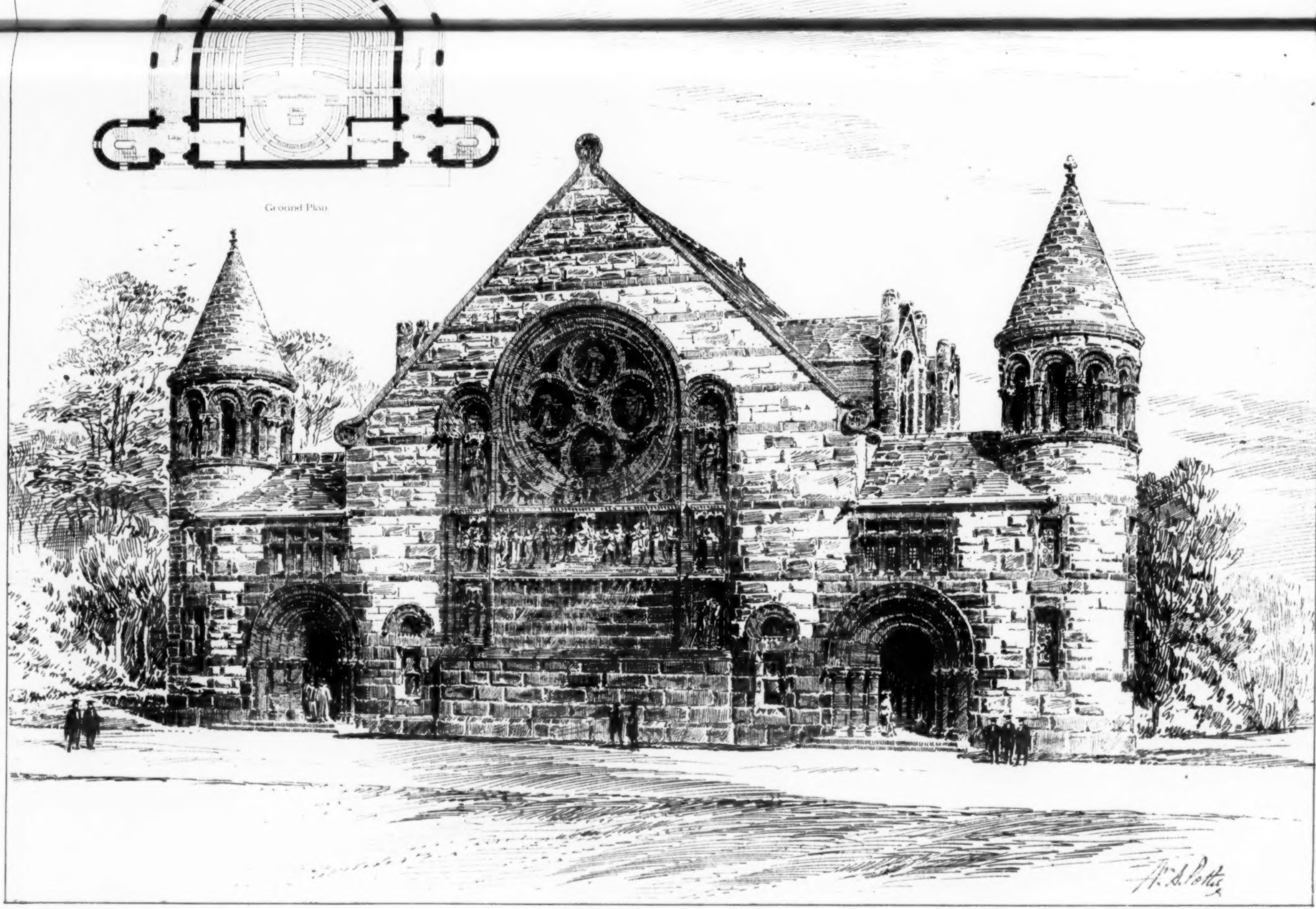

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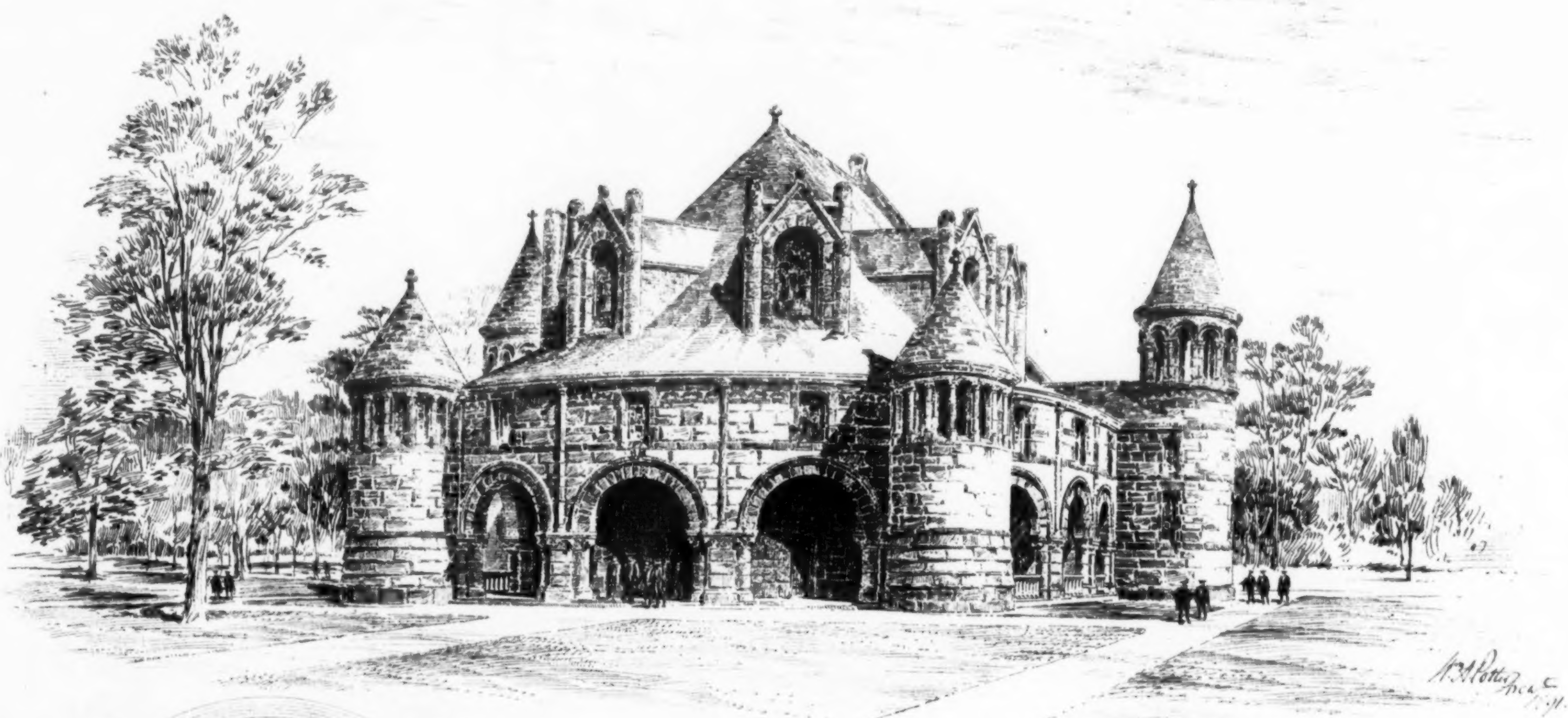
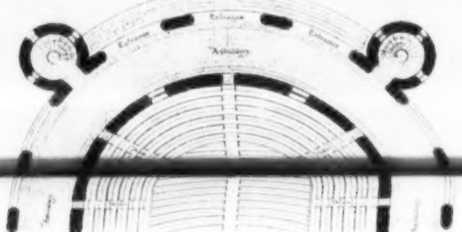
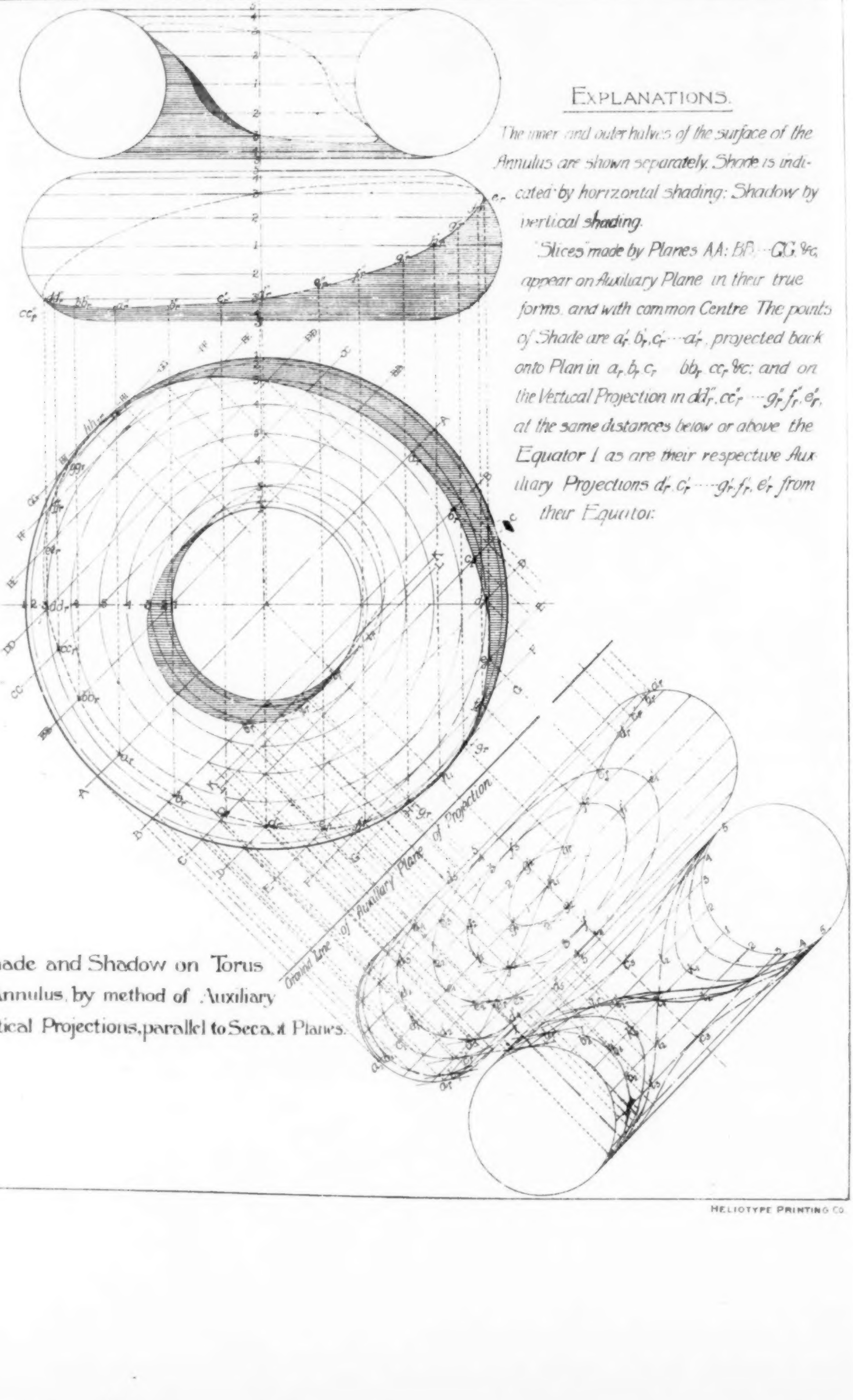




Shades and Shadows. Plate 6.



Explanations.

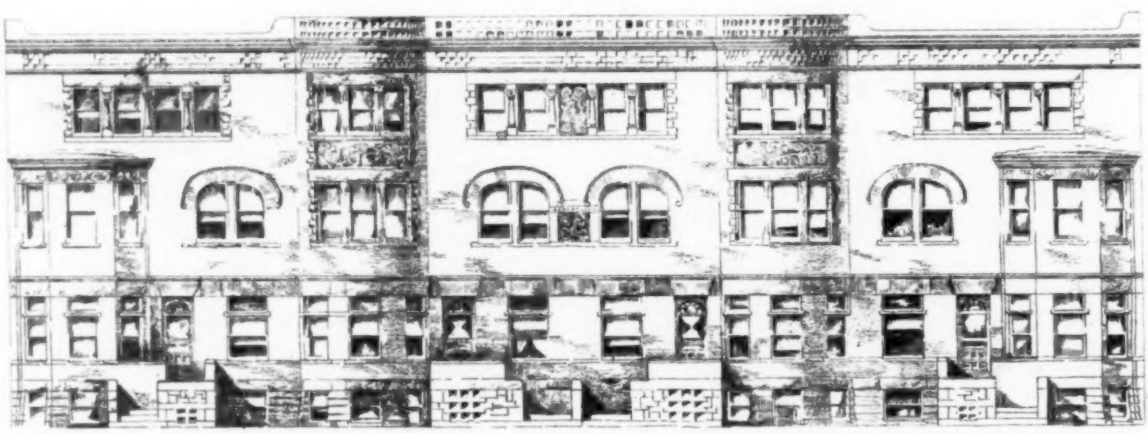
The inner and outer halves of the surface of the Annulus are shown separately. Shade is indicated by horizontal shading; Shadow by vertical shading.

"Slices" made by Planes AA: BB; ... GG, &c, appear on Auxiliary Plane in their true forms, and with common Centre. The points of Shade are a_r', b_r', c_r' ... a_r', projected back onto Plan in a_r, b_r, c_r ... bb_r, cc_r &c; and on the Vertical Projection in dd_r'', cc_r'' ... g_r'', f_r'', e_r'', at the same distances below or above the Equator 1 as are their respective Auxiliary Projections d_r', c_r' ... g_r', f_r', e_r' from their Equator.

Shade and Shadow on Torus or Annulus, by method of Auxiliary Vertical Projections, parallel to Secant Planes.

PASSENGER STATION FOR LINDELL RWAY & MO. PAC R.R. IN ST. LOUIS MO.

THEO. C. LINK, ARCHT.



Sketch for Four Houses 25ft Front.
Jos. R. & Wm. P. Richards. Archts.

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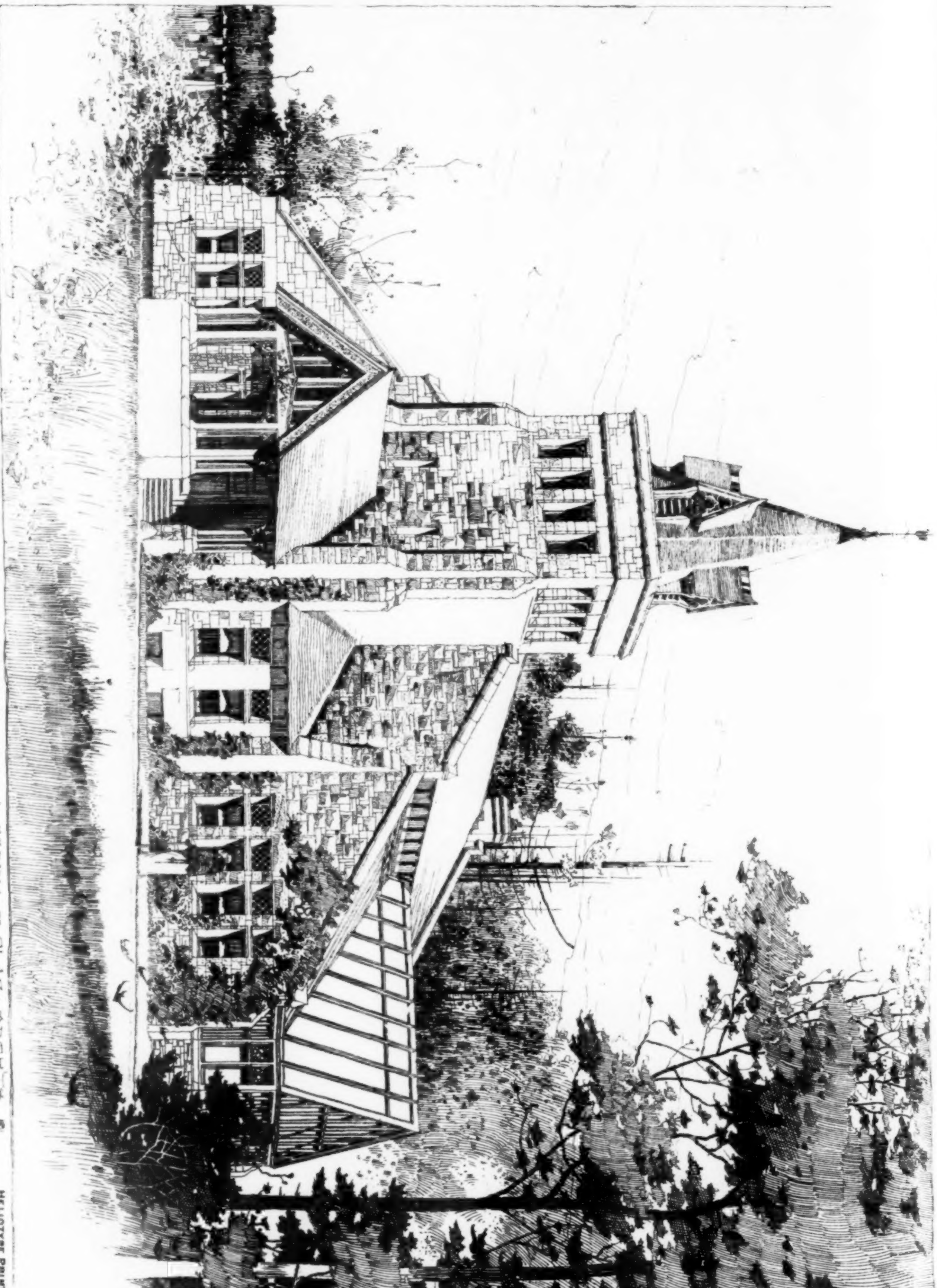

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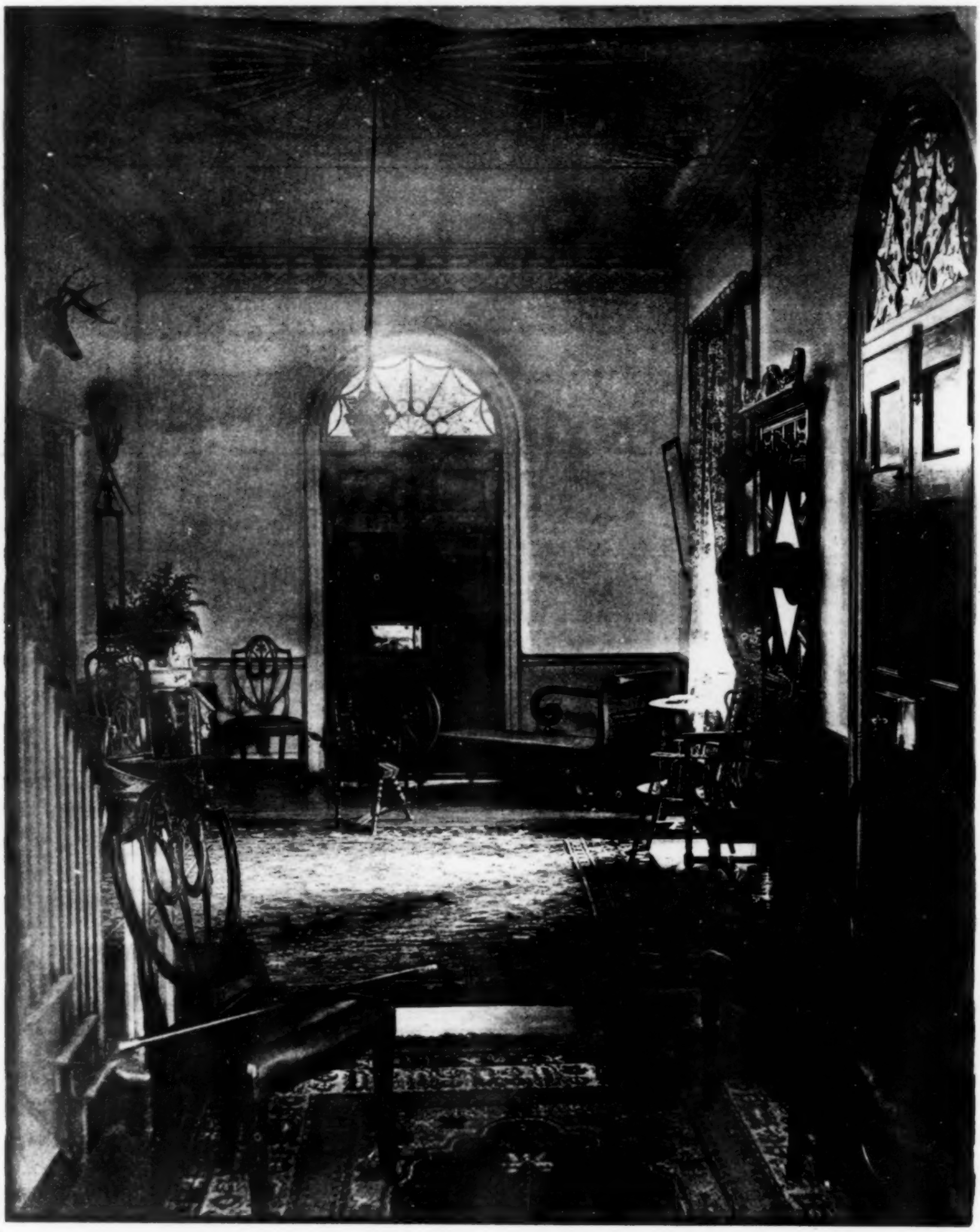

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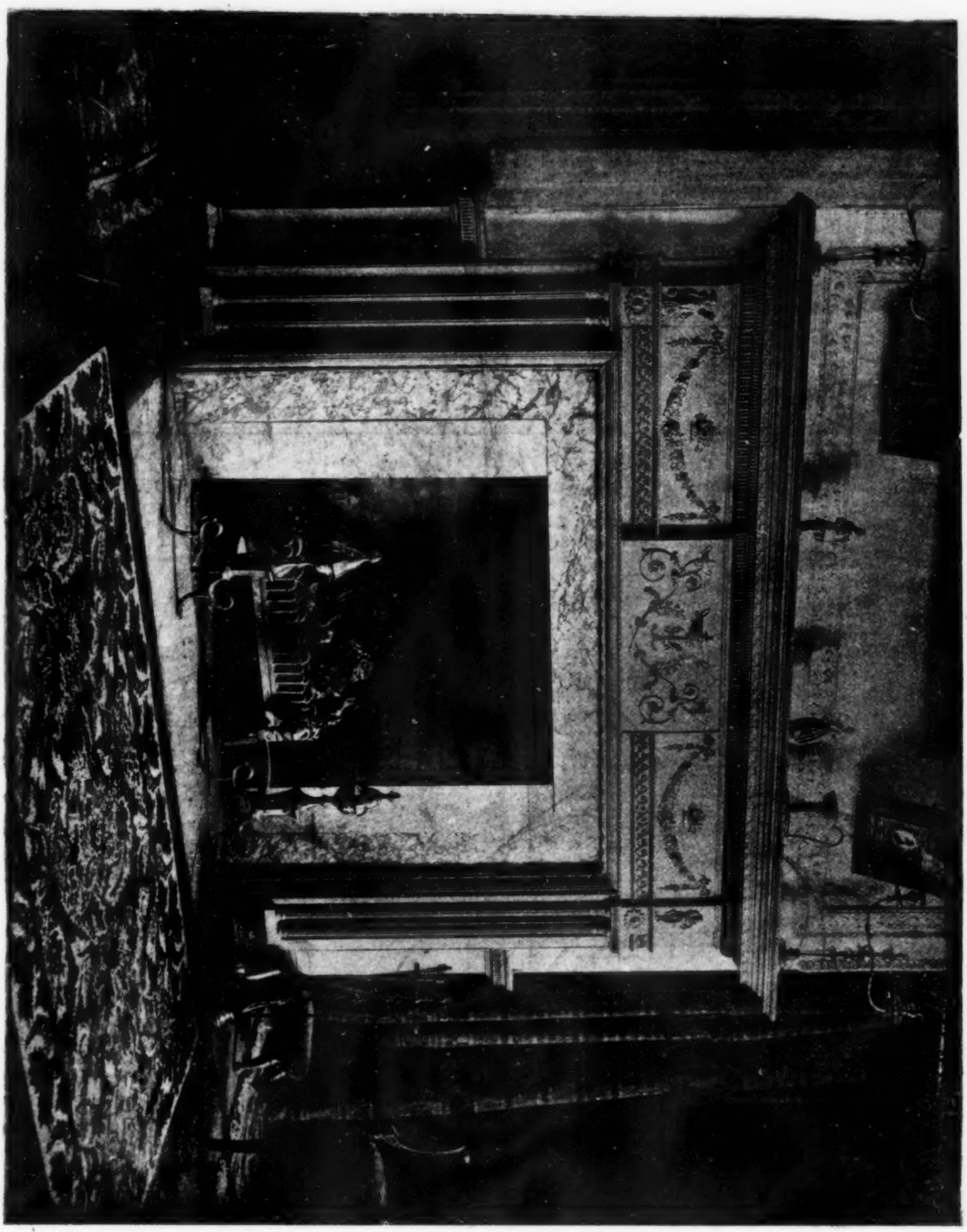

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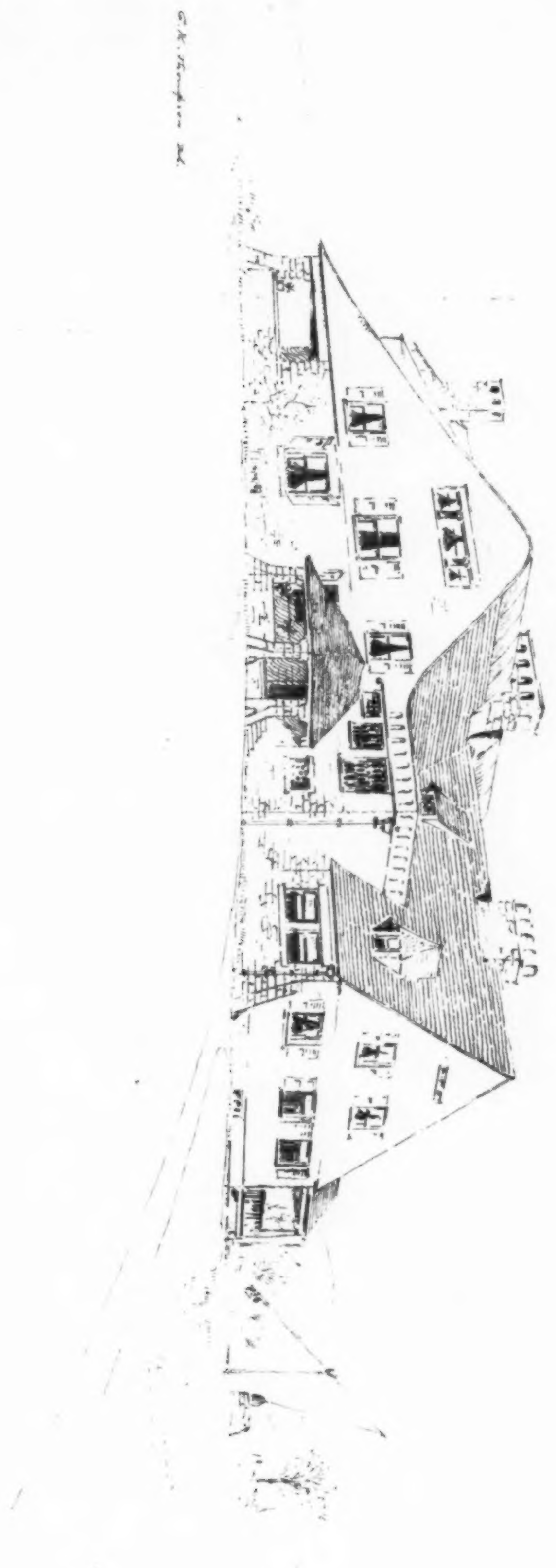

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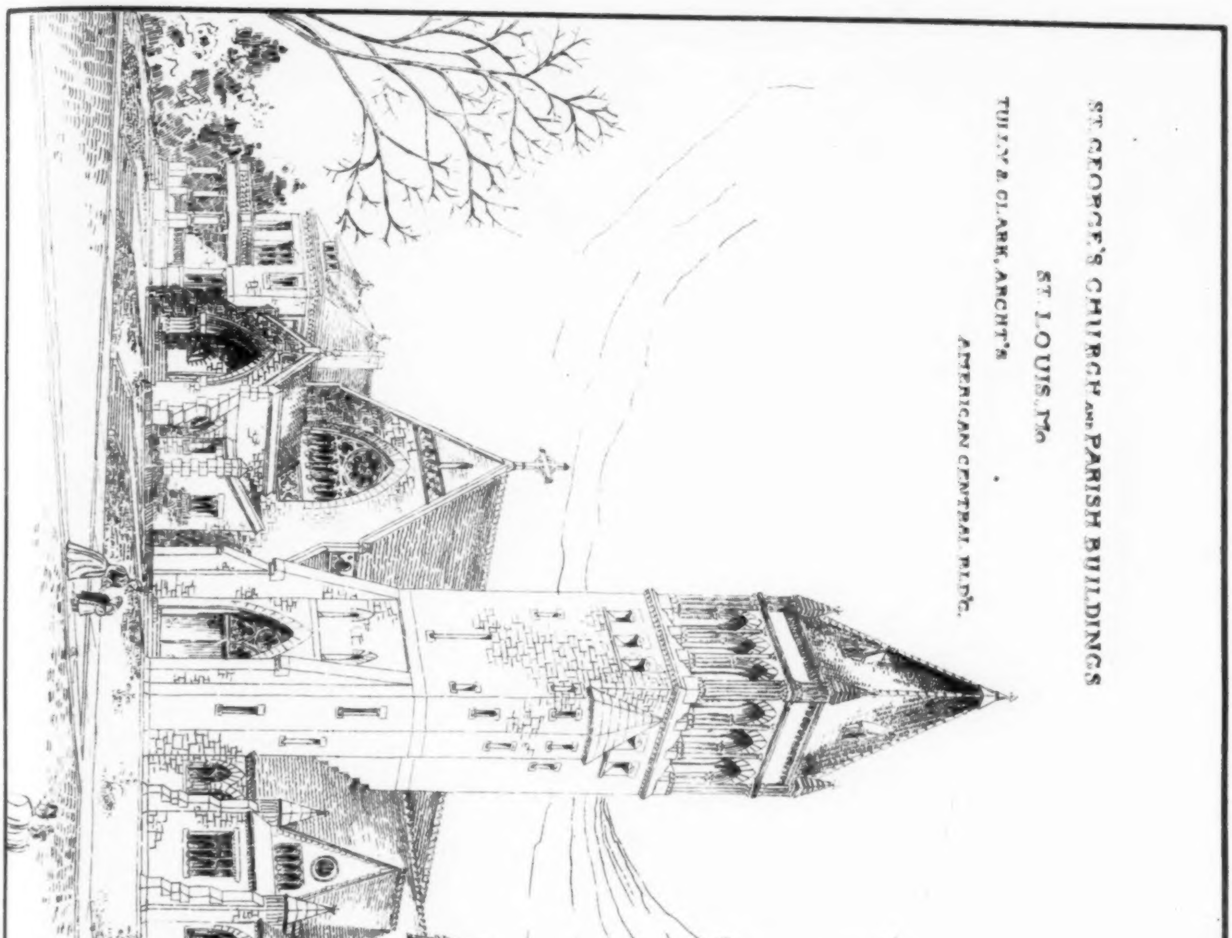
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