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SUMMARY:—

The Convention of the Architectural League of America.— A German Investigation of the Protection of Buildings from Lightning.—The Properties that make a Lightning-rod Efficient.—Copley Square, Boston, and the Height-limit Laws that affect it.—The Crushing of the Coöperative Glass Plants by the Glass Trust.—Municipal Ownership of Public Utilities found unsatisfactory in Taunton, Mass. . . .	73
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THE Architectural League convention, in Philadelphia, seems to have been very successfully managed, if not remarkable for its large attendance. With most architects, April and May are the busiest months of the year; and although they are also the pleasantest months for travelling, it is not often that an architect, particularly a young architect, with the usual frame houses on his hands, to get started so that they can be finished before winter, can leave his office. Nevertheless, the attendance from outside was quite respectable, and the Philadelphians do not need the praise of professional journals for their enthusiasm for their art, and their kindness as hosts. The discussions were, perhaps, more sober than has sometimes been the case, rather to their advantage; and what might, possibly, have become an over-animated review of the matter of competitions was avoided by the reminder from the officers, that, under agreement with other professional bodies, no action was to be taken on the subject by the League at present.

THE German Electro-Technical Society long ago appointed a committee to consider the dangers from lightning, and the best methods of guarding against them. This committee, which consisted of eleven members, many of whom, such as Messrs. Helmholtz, Werner Siemens and Holtz, were, even then, famous throughout the civilized world as men of science, discussed at great length the matters submitted to them, and published two pamphlets upon "The Danger from Lightning" (*Die Blitzgefahr*). These publications excited much comment from persons practically familiar with the protection of buildings from lightning, as well as from scientific men, who did not agree with some of the theories advanced. The committee was continued, and, under its direction, experiments were made for some years upon atmospheric electricity, the results of which were described in various numbers of the *Electro-Technische Zeitung*. In 1897, several members of the original committee having died, a new committee was appointed, including most of the surviving members of the old one, with several new members, and Herr Findeisen, a scientific man of great experience in practical work of the sort, was invited to confer with the committee. His views, although not conflicting with those of the committee, took a different turn, his wish, as a practical man, being to find means for diminishing the cost of protection, without impairing its efficiency. For this purpose, he advocated utilizing the metal-work in a house, so far as possible, as a part of its protective system, and his experience on this point was found so valuable that he was invited to become a member of the committee, and accepted. The results of the labors of the committee have now been made available in condensed form, it having been considered desirable to publish, at the earliest practicable moment, the

general conclusions which had been agreed upon, without referring to theories, in regard to which scientific men are not yet in full accord. A condensed statement of principles to be observed, under seven heads, has, therefore, been issued as a circular by the Electro-Technical Society, the committee being continued for further study of the subject.

THE committee prefaces its list of principles by the observation that the common notion, that an imperfect lightning-rod is worse than none at all, should be emphatically contradicted. An imperfect rod is an imperfect protection, but is a protection so far as it goes, and not a danger. According to the statement of principles, it is necessary to regard lightning-conductors as consisting of three parts—the receiving portions, the conductors through or outside the building, and the earth-connections, or "grounds," as they are called with us. The receivers are, in general, metallic points, surfaces or rods, and the committee advises that all projecting portions of a building, such as finials, chimney-tops or roof-ornaments, should either be of metal, or should have metal attached to them. The conductors proper consist essentially of any continuous series of metallic objects uniting the receivers with the earth-connections. These metallic objects should extend over as large a space as possible, particularly near the roof, and should occupy, so far as possible, the shortest course between the receivers and the earth-connections, without sharp turns. The earth-connections consist of any metallic conductors uniting the conductors with the ground. They should be extended as far as possible, choosing damp soil so far as practicable. Any metallic portions of the building, and large masses of metal in and upon the house, especially those which have an extended connection with the ground, such as gas and water pipes, should be, so far as possible, connected together, and with the lightning-rods; and, so far as they fulfil the requirements specified, they may take the place of special conductors. It is, therefore, very desirable, as lessening the cost of protection against lightning, to arrange the metallic parts of a house so that they may serve as receivers or conductors, in accordance with these principles.

THE protection given by lightning-rods is efficient in proportion to the extent of exposed surface furnished with receivers, the number of intermediate conductors, and the completeness of the earth-connections. In general, extended metallic parts of a building, especially such as lead from the upper portions to the ground, lessen the probability of damage from lightning, even if they are arranged without any purpose of this kind; and an increase of the danger through incompleteness of the conductors is, in general, not to be feared. Branch lightning-rods, if of iron, should not be of less section than one-fifth of an inch square; main rods should be at least two-fifths of an inch square. For copper rods, one-half this section is sufficient; zinc rods should have one and one-half, and lead rods three times, the section specified for iron. All rods should be of forms not likely to be injured by the weather, and securely put up; and connections should be strong and of large surface.

THE recent acquisition by Harvard University of a tract of land in the suburbs of Boston, to which it is proposed to transfer the University Medical School, from its present location near Copley Square, affords food for reflection in regard to the æsthetic future of the Square. It will be remembered that, at the prayer of certain persons interested in the various fine buildings around the Square, the Legislature passed a statute, forever restricting to a height of ninety feet all buildings erected, or to be erected, on land abutting on the south side of the Square, from Clarendon to Dartmouth Street; on the small plot on the corner of Dartmouth Street and Huntington Avenue, now occupied by the S. S. Pierce Company's store; on the lot owned by the Public Library, and that belonging to the Old South Church. Buildings on the north side of the Square were permitted a maximum height of one hundred feet, and no restriction was placed on any lots in the neighborhood of the Square except those mentioned.

AS Copley Square is rapidly becoming a great business-centre, it will soon be necessary for those who improve lots on and near it to build to the limit of height allowed by law, in order to obtain the full benefit of their land, it being well understood that, in mercantile and other buildings, the income from a certain number of stories, varying with the cost of the land, must be devoted to meeting expenses and ground rent, the return from the stories above that furnishing the profit on the investment. Copley Square and the wide streets entering it afford ample light and air for lofty buildings, and the present legal maximum, of one hundred and twenty-five feet, will seem to the investors of the future none too liberal. It is understood that the Hotel Brunswick, beyond the east side of the Square, which is under no special restriction, is to be rebuilt within a few years, and it can hardly be doubted that it will be carried to the legal limit, affording a background to Trinity Church, the artistic effect of which on the church is not likely to be admirable. The approaching transfer of the Medical School will open another unrestricted lot, just behind the Public Library, which we may, therefore, expect to see relieved, not to its advantage, against a towering wall of rough brick. In the same way, the Pierce Building, which occupies a small lot, will, presumably, soon squat meekly in its corner, between two lofty walls, also of rough brick, which will be a particularly conspicuous feature of the Square. The Hotel Nottingham, between the Public Library and the Pierce Building, is unrestricted, and will form an excellent site for a wedge-shaped eleven-story office-building, which will have the advantage—for its owners and occupants—of greatly overlooking its more æsthetic neighbors. The Art Museum lot, which is very large, containing nearly two and one-half acres, is restricted throughout, so that the future buildings upon it must form a modest oasis of low structures, surrounded by the imposing masses of rough brickwork forming the back walls of the buildings on the unrestricted lots around it. That all this will conduce to the artistic beauty of the Copley Square of the next decade is very much more than doubtful. It is possible that a lining of handsome buildings of the full legal height would have injured the effect of Trinity Church and the Public Library, although we are not quite convinced, even of that; but a "snaggly" *entourage*, consisting of a mixture of huge, bare, brick walls, and two-story façades, in different planes, never yet appealed to the love of beauty of any sane man, and probably never will.

ONE of the worst abuses of the power of the trades-unions yet reported is that by which all the coöperative window-glass factories in the United States have been closed. Every one knows that the manufacture of window-glass, one of the most highly-protected articles in use, was, soon after the adoption of the prohibitory tariff, monopolized by a combination of nearly all the factories at that time in operation. The new Trust fixed prices as it pleased, and consumers were, for some years, obliged to pay them. As a window-glass factory is not an expensive affair, and the capital required for operating it is small, new establishments soon sprang up, to take advantage of the high prices. As high prices for a manufactured product do not, by any means, involve high wages for the men employed in producing it, differences arose between the masters and the journeymen, and many of the latter, by uniting their savings, were able to start small factories on the coöperative plan, which enjoyed a modest prosperity. The Glass Trust, naturally enough, does not like to see its rivals prosperous, and various manoeuvres were undertaken to crush the others. After a time, the independent establishments, not including the coöperative factories, united, forming, practically, a second trust. It was not long before the two Trusts came to an understanding, and they have for some time worked in harmony, fixing prices and production to suit themselves. The coöperative establishments, however, still remained outside, selling at what prices they could get, and producing to suit the demands of their customers. This conduct displeased the two monopolies, and, as they could not act effectively directly against the coöperative concerns, they called in the aid of the glass-workers' unions. There are two of these, ostensibly hostile to each other, but, as it seems, capable of acting in harmony when acts of treachery and tyranny are to be done. An arrangement was soon made between the masters composing the two Trusts, and the union leaders, by which the latter were entrusted with the task of crushing the coöperative

associations of journeymen out of existence. They began their proceedings by notifying all the coöperative establishments to close. Some of the bolder ones refused, and were notified that a boycott would be declared against them. Why they should have been seriously alarmed at this, even with its usual accompaniment of violence, is not clear, but the men belonging to them, although their living depended on the continuance of their operations, understood the consequences of resistance too well to expose themselves and their families to them, and the last coöperative glass-factory is said to have closed last week.

IN certain ways, this may be said to be the most important event that has ever happened in this country. That a few poor glass-workers have been left with their families to starve may not seem a serious matter to the casual reader; but that the masters concerned in an organization which aims at monopolizing an important industry should be able to conspire successfully with the professed "champions of the working-man" to crush the attempts of workmen to earn a living honestly at their own trade gives a sad premonition of the industrial future of this country. We do not need to say that we look upon the association of workmen for coöperative production as the key, not only to the industrial, but the political liberty of the future. That the unions, or rather, their self-constituted leaders, have always secretly opposed this sort of coöperation is one among the many evidences of the mediæval and tyrannical nature of their system; but never before, in this country, or, we think, in any other, have the unions so openly joined with worse oppressors than themselves to destroy the last vestige of liberty for workmen. It is an axiom as old as the time of the Romans, that tyrants, whatever their personal quarrels, will always combine against their common enemy, liberty; and it is time for the friends of liberty, of whom we have many left, to make up their minds that no kind of oppression, either of masters against masters, of masters against men, or of men against men, shall be tolerated in this country, before a grand trust of all the tyrants crushes the Republic itself.

NOW that the question of municipal ownership of "public utilities" is beginning to serve as a political test, any facts which go to show the real results of municipal operation of lighting-plants, street-railways, etc., are valuable. One of the examples most frequently referred to as a model of what may be done under public ownership is that of the lighting-plant of the city of Taunton, Massachusetts. For some years the socialist orators have dwelt upon the "profitable operation" of this plant as an argument for the general appropriation, by the public authority, of works of the sort. Now, however, it appears, from the official report of the manager of the establishment, that, while operations have shown a profit over running expenses, no provision has been made for renewals and repairs, and, in consequence, the machinery is antiquated, and nearly worn out, the buildings are so dilapidated that a severe storm might throw them into the river, and the whole plant will have to be rebuilt, if its operation is to be continued. According to the *Boston Advertiser*, other municipal lighting-plants in Massachusetts have had, or are beginning to have, a similar experience. While a private corporation, engaged in such business, would set aside a considerable part of its profits each year to provide for repairs and renewals, the politicians, after they get hold of such a plant, forget all about this. The principal use, to them, of a "public utility" being to furnish "plums" for their supporters, it is, naturally, important to begin by impressing upon the citizens generally the value of the plant as an investment, and the admirable way in which it is carried on by the friends of the politicians. To this end, everything is made to show a profit, and it is only the wiser people, who are also wise enough not to get the ill-will of their rulers by publishing their observations, who note that no provision is made for depreciation. For a time, all goes on admirably. The officials in charge draw good salaries, and are able to make themselves agreeable to a large number of voters, while, in far too many cases, the city fathers themselves share in the blessings of the new dispensation by furnishing supplies of fuel or merchandise, at prices satisfactory to themselves, until, some years later, a call for more funds, to repair or replace the worn out and useless plant, alarms the citizens.

EFFECTS OF THE NEW TENEMENT-LAW IN NEW YORK CITY.



Font in Siena Cathedral. A. Federighi, Sculptor. From *The Builder*.

MAY-DAY in New York was marked this year by the starting of work in the biggest building-movement ever in progress at one time in the city. This movement will be noteworthy not only on account of its size and the importance of some buildings, such as the new Stock Exchange, but also because a large proportion of the work is of a sort that seems destined not to be built to any extent in the city again. The 25-foot tenement, according to a majority of the architects and builders interviewed on the subject, received its death-blow when Governor Odell on April 12th signed the Tenement-Commission Bill. They figure that that clause of the bill which specifies a 5 per cent in-

crease in the required court-area will alone suffice to make the 25-foot tenement an unprofitable investment.

An architect whose entire practice is devoted to tenement-house planning said: "The Tenement Committee who framed the bill are not practical men. They have caused a severe blow to be dealt the owners and builders of New York who have provided most of the homes for poor people here in the past. And for what? Merely for a few extra feet of court-area which the tenants have no use for. They don't open their windows except in very hot weather, depending upon the hallways for ventilation. They would freeze in winter if they did open them, for the kitchen-range is usually their only means of keeping warm. Therefore it stands to reason that they would much prefer the increased air-space inside the building rather than outside. But the Committee have decreed for some unknown reason that hereafter tenement-buildings shall occupy only 70 per cent of the lot. Now, a very little figuring will convince that if the rooms are made the required size (viz, 600 cubic feet minimum, except for bath-rooms and closets) not more than twelve, instead of the customary fourteen, will it be possible to juggle in upon a floor. Taking the average rent of the regulation four-family fourteen-room house at, say, \$3 per room, two rooms less per floor would make a difference of over \$500 a year for a seven-story house. This would indicate a depreciation of upwards of \$5,000 in the value of the property. According to the figures of Dr. Gould, himself one of the reform committee, the average net return on tenement-investment is now but 7.03 per cent when the property is mortgaged to two-thirds of its value, and but 5.81 per cent when not mortgaged at all. This makes it clear that tenement-investment is not such a bonanza at best."

The substance of the above remarks having been repeated to a representative of the Tenement Committee, the latter said: "There are various good and sufficient reasons for increasing the court-areas, not the least of which is so that tenants shall open their windows. I don't blame them for not doing so in the past. Nobody wants to open a window upon a narrow slit of a shaft that merely serves as a flue for the conveyance of dirt, noise, heat and disease from floor to floor and from flat to flat. Many of these light-wells between houses have fifty bedroom-windows opening upon them, each window being directly opposite another in the adjoining tenement, the space between being narrow enough for a person with a good reach to easily span. Under such circumstances, as far as privacy is concerned, one might as well sleep out on the sidewalk as in these rooms when the windows are open. The best way to gain a proper understanding of the tenement question is to live in a tenement-house; designing them alone doesn't suffice. They that have lived in them for this purpose—the social students and tenement workers, etc., know that the ordinary 25-foot, seven rooms deep, double-decker dumb-bell type is a curse to the city. No sanitary tenement of more than two or three rooms deep can be planned for a 25-foot lot."

Notwithstanding this, the old law died a hard death. In the last two weeks of its operation, tenement-plans representing \$35,000,000 worth of building were filed in the Building Department. This is an amount about equal to the total value of such buildings erected during the entire year of 1900.

The Building Department was literally swamped with plans. So great was the rush that many of the drawings filed were of the crudest description imaginable, the officials in power showing a leni-

ency which it is safe to say would not be tolerated under ordinary circumstances.

The tenement-architects were so overworked that all that they had time to do in getting out many of the plans which their clients were clamoring for was to correct a figure here and there and to change the owner's name on copies of the same old tracings that had done duty on scores of jobs in the past. This system of "doing" architecture is well recognized among the tenement-building fraternity. It is not architecture, properly speaking, and they who make it their sole practice, never drawing a line themselves, although ostensibly architects, are virtually only intermediaries between the Building Department and the owners. Their duties are usually completed when the plans are filed and the permits granted for the erection of the buildings. For these services, they receive a stated sum, usually ranging from \$5 to \$125. Only for the larger and unusual-shaped buildings are the tenement-architects' fees based upon the percentage system.

Most of these duplicated plans "went through" the Department on account of an agreement which permits builders who have filed plans by April 10th and whose contracts for excavating are dated not later than June 1st, to complete their buildings under the old law, provided that their work shall have progressed to the setting of the first tier of beams by August 1st.

Thus a vast amount of hardship was spared the owners and builders, and a vast amount of work assured the contractors and material-men for the next six months or more.

Besides the new buildings, there will be a great deal of alteration work made necessary by the new law. Careful observers predict that the present building-forces of the city are inadequate to accomplish all of this work within the specified year. People are watching out for interesting developments in this matter. Unless a great many of the servants' bedrooms in high-priced flats are altered so that they shall contain the required 600 cubic feet of air-space, it will be necessary to prohibit their use as sleeping or living rooms. It will be the duty of the landlord to enforce such prohibition; and there is much speculation as to how he is going to do it.

A much more serious and far-reaching question than this, however, has been raised by the new tenement-law. If it proves true that the latter shall result in legislating the small speculative builder out of the tenement-building business, the query arises, Who will take his place? Of New York's 4,300 tenement-buildings, housing 1,500,000 souls, a large proportion are of the 25-foot type and these have been built by the speculative builder. According to one authority on this subject, if the scale of operations in tenement-building necessary for a substantial return on the investment becomes too big for the average builder's resources, the latter will withdraw from the field, as the jerry-builder has done in England. More money can be borrowed in proportion by mortgage on a small tenement than on a large one, and the loan-operators are less chary about accommodating the builder in the case of a proposition that has been well tried out and in which the investment is of moderate size.

It is not thought likely that even if 25-foot houses continue to be built, but with fewer rooms per floor, the rents could be raised sufficiently to make up the difference. Poor people will seldom pay more for superior sanitary accommodations; many who can afford more prefer the cheaper houses just because they are cheap. Students of the tenement question are asking, even if higher rents could be obtained, what would become of the thousands of poor who cannot afford over \$6 or \$9 a month for housing their entire families? How would the vast and constantly increasing army of denizens of the lower East Side—the unskilled laborers who earn \$30 or \$40 per month—be housed in the future?

Unless the Suburban Homes Company and other semi-philanthropic, semi-commercial enterprises increase their amount of tenement-building enormously, there may be danger of seeing the conditions described in Sir Walter Besant's recent book on East London duplicated in New York. There, according to Sir Walter, so crowded are the tenants that not only do many families live in single rooms, but even the beds are sublet at least twice in the twenty-four hours. Thus, one set of lodgers will occupy them from 6 A. M. until 2 P. M.; another set from 2 P. M. until 10 P. M.; while the original tenants will enjoy them for the rest of the time.

Those who hold that municipal ownership is the inevitable and true solution of the problem of housing the poor consider the new tenement-law to be a step towards this end. Many more steps will probably be necessary, however. In the meantime, the carpenter and the mason and the rest of the building craftsmen are assured a year of prosperity.

P. C. STUART.

THE CLEVELAND, O., MUNICIPAL CEMETERY.—Seattle has secured ownership of a tract of 100 acres, with a view to conducting a municipal cemetery, in imitation of a project successfully carried out in Cleveland. There, a level, finely-situated tract of land has been acquired by the municipality, and burial-plots are sold without regard to location at the uniform price of seventy-five cents per square foot. This price includes the actual maintenance of the plot at the expense of the city in perpetuity. The maintenance includes grass-seed, sowing, mowing, and a general caretaking. Flowers and shrubs, when required, are, of course, charged additionally. The purpose is to defeat speculation in land for burial-places, and to ensure perpetual care of the graves. In Cleveland the enterprise is self-supporting, although the charges are very low.—*N. Y. Evening Post*.

DOMESTIC ARCHITECTURE IN ENGLAND DURING
THE MIDDLE AGES.¹—III.

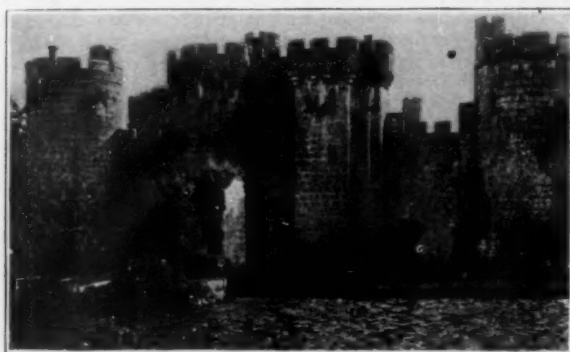
NORMAN PERIOD.



Entrance to Carisbrook Castle.

BROADLY speaking, the duration of the Norman period of architecture extends from the middle of the eleventh century to near the close of the twelfth century, and includes the reigns of William I, William II, Henry I, Stephen and Henry II.

In the previous chapter we have considered the nature of the sites usually selected, and such surrounding features as the fosse, moat, dry-ditch, ballium and outer walls, the objects which governed their selection and use, their almost universal application, and how, seeing these salient features, we have the key to the date of their erection



Bodiam Castle, Sussex: Entrance Front.

and the history and social state of the times in which they took their rise.

One of the earliest Norman words introduced into the English language was "castle." The name and building were alike foreign: to possess one was the object of every Norman noble, for once his donjon, or keep, was built, he was lord-paramount of the country round, and, until regular siege was laid to it, he might laugh at the law and his adversaries. A splendid specimen of the donjon is the "White Tower" of London, built for King William I by Gundulf, Bishop of Rochester, on the banks of the Thames, who also built again in the latter city on the banks of the Medway.

During the eleventh century most of the bishops carried on work vigorously, rebuilding their cathedral churches, and the abbots their monasteries.

Every great land-owner was bound, according to the amount of



Grand Gateway: Raglan Castle.

land he held, to attend his liege in person, and to bring a proportionate number of mounted followers into the field; this applied not to laymen alone, but to bishops and monastic bodies, who all held lands by military service; therefore, the defensive element entered, more or less, into the erection of all habitations, civil or ecclesiastical.

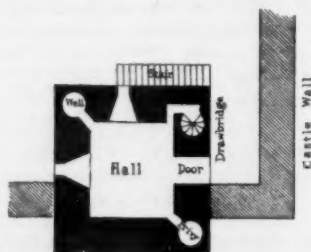
¹ Continued from No. 1325, page 53.

Wars, tournaments and hunting (their principal occupations) took the knights away from home most of their time; thus they became extensively acquainted with the outside world, and became members as it were, of one great community.

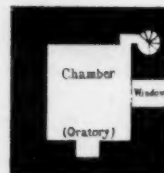
The frowning entrance, with its heavy mouldings, its deep recesses, its studded gates and threatening portcullis, flanked by massive barbican-towers, is the first evidence we come upon of studied defence. The height and width of the gateway was governed by the necessity of admitting the passage of two horsemen side by side, every dimension being most carefully adapted to the ascertained necessities of the case. The gates themselves were of massive oak, bolted and barred in the securest manner. Usually, a small postern-door, or sally-port, is contiguous.

A few feet in advance of the gates was the portcullis, a massive frame of oak in small open squares, strengthened and spurred with iron. This hung from heavy chains, in a groove in the jambs of the gateway, and was used not only as defence to the gate itself, but when strangers approached the door it was dropped suddenly behind them, securely entrapping the unwary between itself and the gate. These may be seen at the Tower of London, but most of them have disappeared, the stonework and grooves alone remaining.

Any openings in the walls are mere slits, with a slight chamfer on the edge outside, but deeply and widely splayed on the inside, so that the defenders might have the widest range of vision and watch unseen the movements of the approaching party, and, while securing



SECOND STAGE.

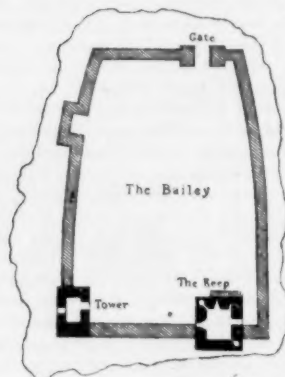


THIRD STAGE.

(There are only three stages in this example.)



FIRST STAGE

BLOCK PLAN
approximate

Scale 1 inch to 30 Feet

Castleton Castle, Derbyshire.

to themselves the greatest freedom for the use of the bow and arrow, presenting externally the smallest possible mark or chance to the enemy outside.

The barbican was covered with a flat roof, forming a floor, and was surrounded by a curtain-wall with splayed embrasures, the lower portion being breast-high, forming a perfect shelter for the defending archers, and offering the minimum of exposure with the maximum range and freedom for offence.

The parapets around the roof of the barbican-towers were usually carried over, or in advance of, the face of the walls below on a series of corbels, so as to admit of horizontal openings in the floor through which arrows might be shot, or bars of iron, stones, molten lead, pots of quicklime, noxious substances or other offensive missiles dropped on the heads of those in the gateway beneath. Raglan Castle is a perfect example of this. It was from the top of the barbican that a parley was held and the object of the visitor's errand ascertained before the gates were opened.

The outer walls were backed up by the earth thrown from the moat, forming a broad terrace, the front of which was protected by the curtain, or parapet, of the outer wall, behind which the sentry kept watch and ward, and from the covert of which flights of arrows could be shot amongst the hostile below.

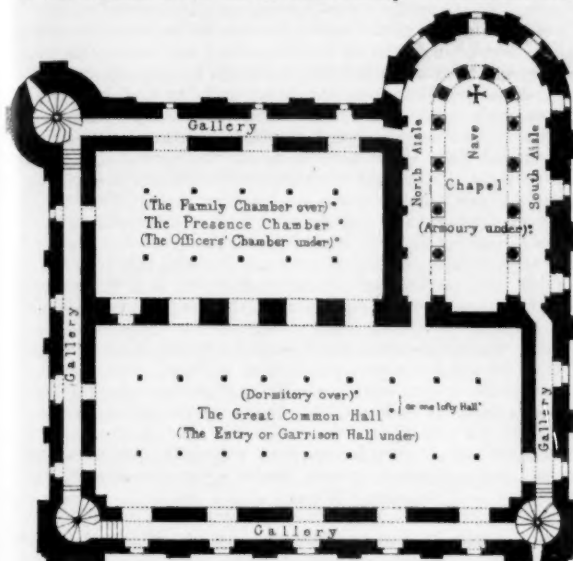
The construction of the walls, gateways, portcullis, barbicans, parapets, loop-holes, etc., was entirely without precedent, and was

the direct and spontaneous growth of the exigencies of the times, the necessities of the day: the salient features of the Feudal architecture of the Norman era of the eleventh century. Concurrent with these

they were, required extraneous support at points of concentrated thrust, and the buttress was the outgrowth of necessity and of the rude and inferior workmanship of the day. At this time the buttress was straight from base to weathering, offsets not being used. These salient features are irrespective of style; they originated in the Norman, were improved in the twelfth and thirteenth centuries, were beautified and idealized in the fourteenth century, and, finally, became purely ornamental in the fifteenth century, advancing period by period. We can readily trace the gradual settlement of the country, the abandonment of habits of private or predatory warfare, the cessation of civil wars, the increase in wealth, and the desire for comfort.

Although primarily considering the external features of domestic building, it will be well to briefly glance at the usual accommodation met with in buildings of this class and date.

The typical process, as described by Professor Kerr, was the selection of a suitable piece of ground, from, say, half an acre to several acres in extent, possessing within its limits an eligible knoll or mound. Around this was dug a deep, wide fosse (when not protected by natural escarpments), and the material thus excavated thrown up in the form of a bank, in front of which was erected a massive stone wall, as before described. A gate-house was erected over the entrance, which contained a gate within an archway and an apartment over for its defence, in front of which a drawbridge crossed the ditch. On the mound within there was erected the keep, or citadel, the dwelling-tower of the owner, and wherever most convenient



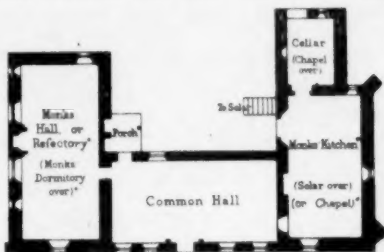
THIRD STORY

Scale 1 inch to 30 Feet

Tower of London: The White Tower.

we find the round arch, essentially a Roman feature, but entirely remodelled in its treatment.

Between the outer wall and the dwelling itself was a broad open space, or green, upon which the retainers could be marshalled and drilled in the arts of war. It was here, too, jousting and tournaments and other festivities were held. This was essentially a martial



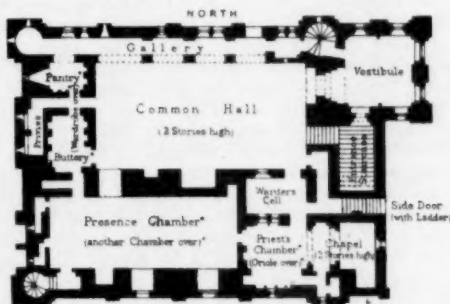
GROUND FLOOR

Scale 1 inch to 30 Feet

Charney Bassett Grange, Berkshire.

age, the days of the early crusades, when feats of arms and deeds of bravery were the only passports to fame and favor. This green formed the mimic battlefield whereon aspiring knights and esquires became proficient in those arts on which their future renown and fortune depended.

In the house itself the same motif of defence is everywhere



HALL STORY (THE SECOND STAGE)

Castle Rising, Norfolk.

apparent, the same massive doorway, the narrow external openings in the walls for light, with their deeply splayed embrasures within; the use of the parapet to every roof and wherever a defender could be placed to repel attack. The walls, thick and ponderous as



Norman Doorway, Lilleshall.

within the walls were placed the requisite outbuildings, barns, stables, cabins, etc.

The keep in small cases may be twenty feet square, with walls 10 feet to 12 feet thick and four stories high; each story a single apartment and covered with a flat roof. The entrance was up a long, unprotected flight of steps to the second floor, which was the hall, or entry-place. Below this was the cellar, approached only by a trap-door in the floor or by stairs in the thickness of the wall. Above the hall were two floors of chambers and the flat roof, which was, in fact, a fighting-deck surrounded by a parapet-wall and approached by stairs in the thickness of the wall. In one angle of the wall the well was usually formed.

This is simply a typical tower, for we find much larger plans adopted in superior examples, as in Rochester, where the keep is 70 feet square internally; Canterbury, 87 feet; Windsor, 90 feet diameter; London, 116' x 96', and many others, all early instances.

In the larger examples the outer fortifications were correspondingly augmented, both in extent and in strength. The first line of wall and fosse became surrounded by a second, forming outer and inner balliums.

From shortly after the conquest to the latter part of the twelfth century is the Norman period of architecture; it is distinguished by its massive character, round arches, roll mouldings, chevron and billet decorations, simple fillets, plain, splayed and rounded strings, and the capital of its columns, which have the appearance of a cushion rounded at the angles to the circular shaft, with ornaments

either raised or sunk on the face. Its individuality is most pronounced; it is the outgrowth of the requirements and limited skill of the time, which gradually became amplified and beautified as circumstances improved. It is in fact, the primer of architecture executed in stone, and we can, by a little careful study, note, decade by decade, the progress in proficiency of the architects and masons of the day and the demand made upon them by their lordly patrons. The steady rise from the rudest point to those of beauty, delicacy and richness has rarely been excelled.

The builders worked out their own education by the practical execution of forms best adapted to the purpose and materials at hand. Priest and layman worked with mason and sculptor, all intent upon producing the best possible work, and improving every part and every detail in each succeeding work. The amount of thought and contrivance evidenced in their later work and more monumental structures is truly wonderful.

Amongst the more notable examples of the buildings of this period may be named the earlier portions of Windsor Castle, the Tower of London, Rochester Castle, Warwick, Kenilworth, Chepstow, Carrisbrook, Manorbere, Pembroke, the Episcopal Palace of Llanhadden, Christ Church, Conway, Carnarvon, and most of the great abbeys, all of which are accessible to the student, and of which good photographs are obtainable.

Of Kenilworth, Sir Walter Scott gives an admirable description in his romance of that title. "The outer wall of this splendid and gigantic structure," he says, "included seven acres, part of which was occupied by extensive stables and a pleasure-garden, while the rest formed the large base-court, or outer yard, of the noble castle. The lordly structure itself, which rose near the centre of this spacious enclosure, was composed of a huge pile of magnificent castellated buildings, evidently of different ages, surrounding the inner court, and bearing names attached to each portion of the magnificent mass. The large and massive keep, which formed the citadel of the castle, was of uncertain, though great, antiquity. It bore the name of Caesar, perhaps from its resemblance to the Tower of London, so called. On the exterior walls frowned the scutcheon of the Clintons, by whom they were founded in the reign of Henry I, and the yet



Kenilworth Castle.

more famous Simon de Montfort, by whom during the Barons' War, Kenilworth was long held out against Henry III. Here Mortimer, Earl of March, once gayly revelled while his dethroned sovereign, Edward II, languished in its dungeons. Old John of Gaunt, 'time-honored Lancaster,' widely extended the castle, erecting that noble and massive pile which yet bears the name of Lancaster Buildings; and Leicester himself had outdone all former possessors, princely and powerful as they were, by erecting another immense structure, which now lies crushed under its own ruins. This lordly palace, where princes feasted and heroes fought in the bloody earnest of storm and siege, or tilted in the games of chivalry where beauty dealt the prize which valor won, all is now desolate." In the year 1634 Kenilworth Castle was still in tolerable repair, but during the wars it was seized by Cromwell, and by him given to some of his officers, who soon reduced it to what it is now—a pile of ruins.

A notable feature, which was strictly local, and shows the utilitarianism of the age, was the use of flints in the counties of Norfolk and Suffolk: they were found under the chalk cliffs as pebbles on the sea-shore. They are found in a country devoid of building-stone, but in use they necessitate the employment of stone to bond-in the angles. To avoid this, the towers were frequently built circular and the little stone that was used was water-borne from a distance and confined in use to the necessary openings and such bonding as was indispensable to secure good and stable work.

As the Feudal proprietors built their castles and consolidated their power, so they were better able to protect the Church. No doubt the monastery was in the early days an ordinary dwelling-house. For a small number of monks, a hall and chamber attached to their church sufficed, but, as their numbers increased by immigration, as their discipline refined, and monastic duties became more extensive, and as education and wealth added to the dignity of the brotherhood, so the demands for household accommodation increased and amplified. Later, and as the lord abbot and even the prior, became personages of great importance, and vied with the noble owners of the castles in hospitalities and retinue, the halls, kitchens, larders, cellars, refectories and dormitories were added and increased in size. A library, parlor, hostelry for wayfarers, an almonry for the poor, an infirmary, etc., were added as time went on.

The Church was the seat of learning, and the architects and directors of works were from amongst the ecclesiastical bodies. Their freedom from the dangers of war enabled the monastic buildings to expand more rapidly towards refinement, luxury and magnificence, and to dispense with such defensive features as the outer fortifications, the grim barbican and the moat, and also permitted their seeking more favored situations on which to plant their dwellings. All these considerations had their refining and improving effect by example upon their more warlike neighbors. Thus, the Church took the lead henceforward in architecture and building.

The towns of those days were more in the nature of villages inhabited by petty traders and craftsmen who clustered for protection under the castle-walls of their respective lords. They were mostly built of wood and clay, one story high, and roofed with thatch, and there was nothing in their condition calculated to produce any advancement of building in that direction.

But beside the castles and the monasteries we find the manor-house and the grange, which represent the dwellings of the agriculturist, maintained respectively by the lords of the castles and the monasteries. They were convenient centres for the chase and for the collection of the fruits and produce of the soil, and extensive enough to provide temporary accommodation for the owner of the castle or for a party of the brotherhood, or even for the lord abbot himself.

The "King's-houses" of the day were evidently similar to the manor-houses, but augmented in size, providing accommodation for a larger retinue, and possessing in every case a chapel, as a matter of superior dignity.

Amongst the examples of twelfth-century work of this description, Parker names Boothby Pagnell, Lincolnshire; Christ Church, Hants; Moyse's Hall, Bury St. Edmunds, and Oakham Hall, Rutland.

THOMAS C. SORBY.

[To be continued.]

THE TEAK INDUSTRY OF SIAM.



AN interesting account of the teak industry in Siam is given by Hamilton King, United States Consul-General at Bangkok, in a report to the State Department. The teak-lumber industry is now one of the chief industries of that country, the wood being the most valuable in the world for shipbuilding. The area in which teak forests are found is practically restricted to Burma, Siam and Cochin China, and the demand for the wood is so great that the British Government has tried to solve the problem by planting new forests, but many of these attempts have failed. The trees grow on the mountain-sides, distributed sparsely in forests of other wood, and elephants are imperatively demanded for the collection of the logs, and their transportation to the streams. The expensiveness of elephants, and the fact that they can be worked only five hours a day, and for not more than five days a week and seven months in the year, are items which add to the value of teak lumber.

Siam, the Consul says, furnishes about one-quarter of the teak of the world. The forests are in the upper provinces, several hundreds of miles from Bangkok. Regarding the methods of lumbering, he says:—

In these forests, which are leased for terms of years to the up-country traders, the trees are first "girdled"—that is to say, at the proper season of the year the bark and sap are cut through all around the trunk close to the ground, in order to make the wood lighter and better for land and water transport before it is carried away, and to prevent what is known in America as sap-rot. This operation must be completed at least two years before the trees are cut. The trees are then felled at the proper time and made ready for transport. They are afterwards hauled by means of elephants to the creek or small stream which is nearest to them. These several operations—girdling, felling and transporting to the creek—require a period of about three or four years; but it is after the butts reach the creek-side that the most formidable causes of delay begin to operate. Even if the season should be favorable and the brooks full of water, the logs float at a slow pace down them, and have to be worked forward with the aid of elephants by the process called "ounging" until they reach the larger streams. Here, their progress is impeded by blocks and obstacles of all kinds, and the assistance of elephants is still needed. The transport of a number of logs, after arriving at the larger streams, to the rapids—about 150 miles—requires on an average four months (in a good season), and thence downward to Bangkok, seven to ten weeks. Under the most favorable circumstances, they may reach Bangkok in six months from the time of arriving at the main streams, or three and a half years from the time of being girdled in the forest. Unfortunately, it is by no means in every year that there is enough water in the creeks to float the logs at all, and still less certain is it that they will be floated as far as the deep stream before the floods subside. Out of ten years, there will not usually be more than two or three when there are full floods, and three or four when there are floods of average height and duration. The other three or four, or even five, years will be "dry" years, and will only permit of a very small quantity of wood being brought out of the forests.

Thus, taking one thing with another and allowing for the average delay caused by more or less dry seasons, it appears that from the time when money begins to be expended upon a teak tree until it

arrives in Bangkok and can be exported, a period of from three and one-half to seven years, or even more, must elapse, during the whole of which money continues to be expended on the tree, either in working it or watching it, while no returns can be had. Besides the actual expenses of felling and transporting by land and by water, there is the royalty to be paid to the lessor of the forest and the Government royalties payable on the main river. It is also necessary to keep a considerable staff of watchers to guard against the continual pilfering of logs, and against fires.

The teak trader must also find and keep reliable and well-paid agents at the principal towns on the river where the rafts are made up, and at the station where the duties are levied. He must, during his visits to Bangkok and to places within his district, entrust his valuable elephants and other movable property to the charge of employes, who, if not punctually paid, are apt to leviant with the animals or other things and sell them at more or less ridiculous prices for their own benefit. In short, the teak trader of the forest must have at his command a very large reserve of capital, to be employed during bad years in keeping up the huge staff which is absolutely necessary for successfully carrying on his business.

The cost of working teak in Siam has been greatly enhanced during the last ten years. The royalties to the Government have increased 200 per cent, the price of elephants has increased over 100 per cent, and the cost of labor to work the forests has advanced over 200 per cent; and to this increase has been further added a heavy difference in exchange, which works to the disadvantage of the producer.

Beyond the headwaters of the Menam, in northern Siam, and on the other side of the divide which forms the water-head that separates the waters of the Menam and the Mekong Rivers, are large tracts of virgin teak forests of splendid quality. The Mekong penetrates this region 2,500 miles from its mouth; but its rapids and waterfalls render rafting impossible, and must prove destructive to individual logs in their journey to the sea. Thus shut off from approach from the north, and inaccessible from the south because of the mountain-range, these valuable forests will probably remain undeveloped for years to come, buried treasure for the future of Siam.

BOOKS AND PAPERS

SCOTTISH CATHEDRALS¹ is a useful little book published in the Guild Library Series. The story of the abbeys and cathedrals of Scotland is a dismal one of general destruction. The Church which has such a glorious past, founded by St. Ninian and St. Columba, counts very few buildings at the present time which are not, more or less, in ruins. Of the great Abbey of Paisley, nothing remains but the nave of the church, saved from utter destruction in 1782, when it was considered to be so ruined that pulling it down was the only means of having a "commodious kirk." Luckily more reasonable opinions prevailed, and it was restored. And the same story is told of most of the abbeys and cathedrals. Kelso, Jedburgh, Melrose and Haddington "fell before the English invader." Iona was ravaged by Danes; internal lawlessness ruined others, as Elgin, which suffered from the vandalism of a Highland chief. Religious zeal destroyed St. Andrews, Lindores, Perth and Paisley. Still Scotland remains a land for the study of fine architecture, even though it may generally be in fragments. St. Giles, Dunblane, Linlithgow, St. Vigens and Arbutnott have been restored.

The earliest buildings of the Celtic period have all disappeared; but the Abernethy Round-tower, the Priory of Restennel, Forfarshire, and St. Regulus's Church, St. Andrews, illustrate the transition from Celtic to Norman architecture. The date of the first is put by Dr. Skene at about 870; but the upper windows and doorway are either twelfth-century additions or, "as this was an early Irish house in Scotland, may illustrate what has been asserted, that in Ireland a form of Romanesque was introduced before the Anglo-Saxon invasion."

In France, Pointed architecture preceded by nearly one hundred years the same style in England, where the Transition may be put as between 1180-1200, and the Pointed as the thirteenth century. But in Scotland the Transition extended into the thirteenth century. We find the same in the later Decorated style; Scotland being much later than England.

Glasgow Cathedral was restored by Sir Gilbert Scott; but in 1845 and 1848 its two western towers were pulled down: why, no one seems to know. It has an upper and lower church, the former had twenty-four altars, the latter six, at one of which Robert the Bruce received absolution, and King Edward did homage.

At the end of the book is a general survey of Mediaeval architecture arranged in periods, and giving a concise account of every building in its respective style; and an appendix of definitions of leading architectural terms—useful when the book is used as a text-book, which it deserves to be.

"Hans Memling"² is one of the best of Bell's series of Great Masters, being the work of a student who has devoted many years

to the study of the art of the Netherlands. After his appointment to the librarianship of the Art Library at South Kensington, he had for a time to abandon his work in Holland and Belgium; but being now free from official labors, he has gathered some of his notes together, and published this life of Memling. That Mr. Weale is a careful and thorough student is proved by his list of some one hundred and ten works of chronological bibliography with which, presumably, he is well acquainted; and from these he recommends twenty-seven as "best worth perusal." In each book he is careful to cite volume and page for reference, so that the reader who is not satisfied with Mr. Weale's authoritative account may compare the works of other authors upon Memling without any loss of time. But most persons will have confidence in Mr. Weale.

The author's remarks upon the variety in the spelling of this painter's name are interesting: whether with the "initial H or M, and a final C or G? The first point is now settled beyond doubt; the second still remains an open question. His name occurs forty-nine times in contemporary written documents in the archives of Bruges; thirty-two times with the termination INC, fifteen with YNC, once with YNCGHE, once YNGHE, never ING, which ending is not met with in contemporary Netherlandish family names."

Mr. Weale divides his book into: 1. "Authentic Works"; those whose "authenticity is established beyond dispute." 2. "Unauthenticated Works: some genuine, but to which no date can be assigned with certainty, but only estimated by careful comparison with dated examples; others are contemporary pictures, the ascription of which to him appears to me doubtful, in some cases quite contrary to evidence." 3. "Other Attributed Works."

It is a pity that such an interesting and well-illustrated book could not have been more carefully bound. In our copy, some of the photographs are already loose at one end, and the letter-press is giving way, and yet we have only turned over the leaves for the purpose of this review.

Mr. G. Clinch's book³ is a reprint of a series of articles which have appeared in a serial. He takes a district of England and then reviews its churches and their contents, as for instance, the Norman, or partly Norman, buildings of Walmer, Deal, St. Margaret's-at-Cliffe, Barfreston, Romney and Rochester Cathedral. Stone [sic] church, near Gravesend, is a beautiful example of Decorated work, thought by some to have been built by the architect of Westminster Abbey. Of the Renaissance "as developed by Wren," many examples are given; but we should say that except that Wren revived the Classic style, his architecture cannot be called Renaissance in the sense in which it is understood in France and Italy.

Another small book which is worth commending to the attention of architects is "*Old Cottages and Farm-houses in Kent and Sussex.*" It is written and illustrated by Mr. E. G. Dawber and Mr. W. G. Davie. The author discourses upon chimneys, windows, doorways, porches and all manner of details. Half-timber houses with verge-boards are now as interesting as would be a living specimen of the dodo, for in England no more timber or thatch is to be used. Of course, the danger of fire makes the decision reasonable; but that being so, at least we might have gables which do not represent sham timber—plaster, painted brown. If half-timber is to go, let us have something safer by all means, but as true, and as picturesque, if possible. The book bristles with examples of charming cottages and houses which still remain in the more out-of-the-way parts of the country.

ILLUSTRATIONS

[Contributors of drawings are requested to send also plans and a full and adequate description of the buildings, including a statement of cost.]

A COMPETITIVE DESIGN FOR THE CLUB-HOUSE OF THE UNION CLUB, NEW YORK, N. Y.: TWO PLATES. MR. DONN BARBER, ARCHITECT, NEW YORK, N. Y.

THE TOWER OF LONDON IN THE TIME OF ELIZABETH.

THIS plate is copied from the *Builder* as an illustration of the article on "English Domestic Architecture" elsewhere in this issue.

THE CATHEDRAL, FROM THE BRIDGE, ROCHESTER, ENG.

THIS plate also illustrates the same article

[The following named illustrations may be found by reference to our advertising pages.]

DETAILS FROM AN APARTMENT-HOUSE, AVENUE DE LA RÉPUBLIQUE, PARIS, FRANCE. M. SCHOELLKOPF, ARCHITECT.

THIS plate is copied from *La Construction Moderne*.

HOUSE AT BROMLEY, KENT, ENG.

THIS plate is copied from the *Building News*.

³"Old English Churches: their Architecture, Furniture, Decoration and Monuments," by G. Clinch, F. G. S. (Gill).

¹"Scottish Cathedrals and Abbeys," by Rev. D. Butler, M. A., with introduction by the Very Rev. R. Herbert Story, D. D., Principal of the University of Glasgow. 1s. 6d. London: A. C. Black. Edinburgh: R. & R. Clark.

²"Hans Memling," by W. H. James Weale. London: Bell & Sons, 6s.

[Additional illustrations in the International Edition.]

MEDICAL COLLEGE: CORNELL UNIVERSITY, NEW YORK, N. Y.
MESSRS. MCKIM, MEAD & WHITE, ARCHITECTS, NEW YORK, N. Y.

NO. 198 BROADWAY, NEW YORK, N. Y. MR. WILSON EYRE, JR.,
ARCHITECT, PHILADELPHIA, PA.

SCHLOSS ROSENSTEIN, BERG, NEAR STUTTGART, GER. GIOVANNI
DE SALUCCI, ARCHITECT.

LUTHER'S HOUSE, FRANKFORT-ON-THE-MAIN, PRUSSIA.

THE ROYAL LIBRARY, BERLIN, PRUSSIA. HERR BOUMANN, AR-
CHITECT.

RATISBON CATHEDRAL, FROM THE DANUBE.



THE STANDARDIZATION OF BRICKS.—A conference of engineers, architects, and brick-makers was held at the Agricultural Hall recently to consider if it was possible to arrive at some agreement as to a standard size for bricks. In the North of England and in Scotland bricks are much larger than in the southern counties, being sometimes as much as $\frac{3}{4}$ inches thick. In the Midlands, makers have to provide bricks to suit both northern and southern requirements. Apart from these large differences there are minor ones in the bricks of different makers in the same district, and, as a consequence, it is often inconvenient to use bricks from different fields in the same work. As the result of a careful examination into the matter, a committee of the Royal Institute of British Architects and of the Institution of Civil Engineers have recommended that the standard should be such that eight laid end to end, frog upwards, should measure 72 inches, and if laid side by side should measure 35 inches. As to thickness, eight bricks, piled alternately frog to frog and back to back, should measure 21 $\frac{1}{2}$ inches. From the attitude of the brickmakers at the conference, it is to be feared that architects and engineers are likely to receive little assistance from makers, but if the former are firm there is little doubt that the makers must give way. Apparently, the maker wishes to supply hard-burnt bricks and mild-burnt ones from the same mould and the same clamp, and it was claimed that under these conditions the length of a brick might vary as much as $\frac{1}{8}$ inch. We learn, however, from another brickmaker that hard-burnt bricks from the same kiln and the same mould will not vary more than $\frac{1}{16}$ inch to $\frac{1}{8}$ inch; while a third brickmaker stated that with the semi-dry process there was practically no difficulty in working to any desired standard. Hence, if the engineers and architects fix such a standard we have little doubt that brickmakers will, in one way or another, manage to comply with it, within reasonable limits of toleration. As regards the dimensions suggested, it was stated at the meeting that these were based on a measurement of a very large number of stock-bricks by different makers. A smaller brick would have been preferred by the committee, save for the fear that the union bricklayers would do even less walling per day than at present. A practical bricklayer, however, cautioned the meeting against the adoption of too large a brick, pointing out that in America, where laying is done much more rapidly than anywhere else, a small brick is in use. — *Engineering*.

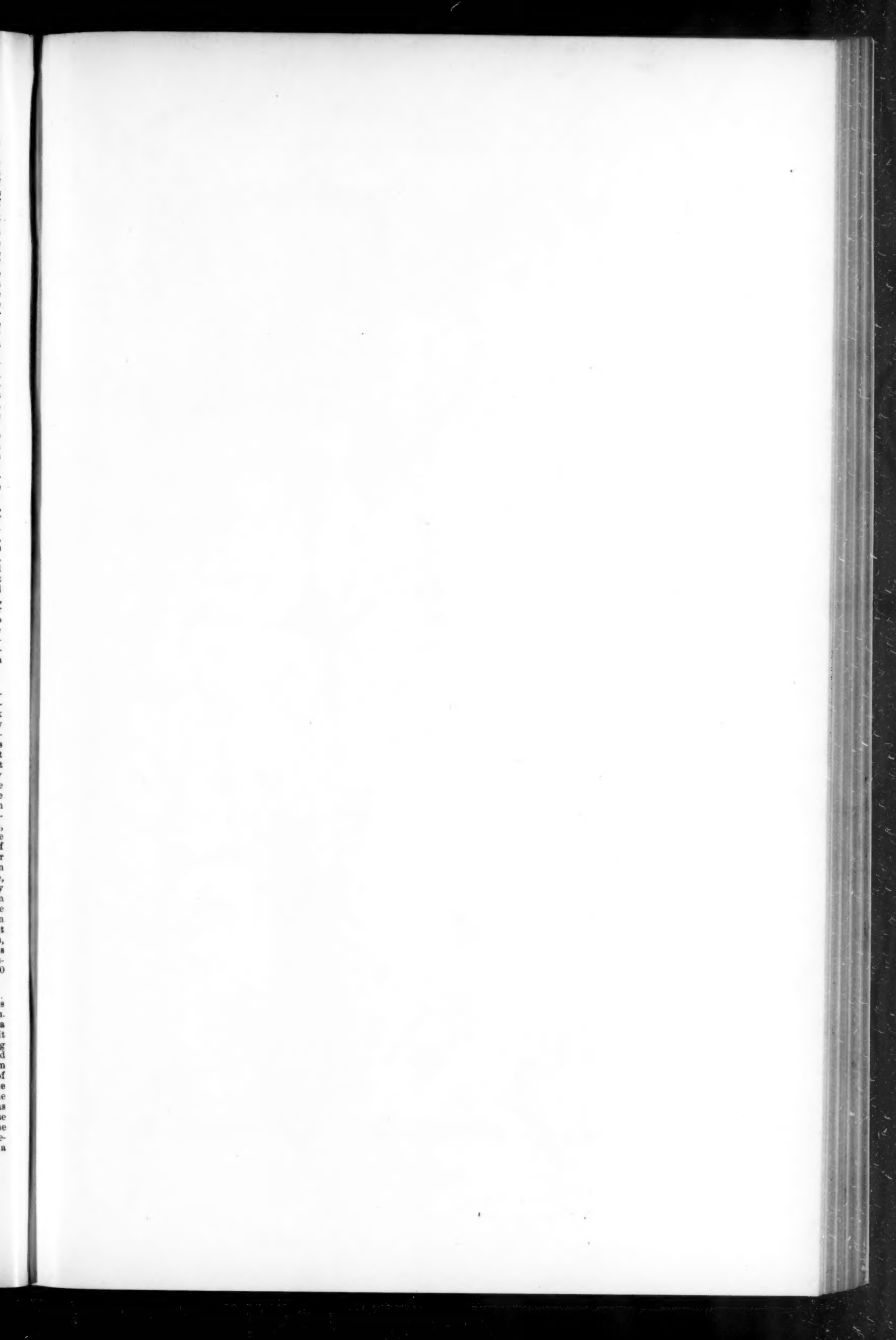
ELECTRICAL LOSSES.—The Electrical Bureau of the National Board of Fire-underwriters reports numerous losses during the last quarter. These aggregate more than \$1,361,000, but since the origin of some fires could not be ascertained with accuracy, particulars in all cases are not given. The report cites these interesting incidents: Four fires caused by sparks from motors occasioned loss of \$11,714, and in one case a total loss, the amount of which was not recorded. Seven fires are reported of breakdowns in motors. Thirty-three incipient fires and burnouts are reported as due to defective wiring and general breakdown of insulation, mostly on old work. Three fires each, due to sockets and flexible cord, show that the standardization of these articles has not been without effect in reducing the losses occasioned by their use. Eleven cases of grounds on awnings and building-fronts are recorded. Three losses are on file due to overheating of rheostats and motor-starting boxes. Three losses are noted as caused by the breakage or heating-effect of incandescent-lamps. Four fires are traceable to defective-chandelier switches. Three cases are noted where fires have started by arcing between water and gas pipes, caused by a difference of "potential" between them, produced by breakdowns in Edison underground service-wires. Nine burnouts and crosses reported as occurring during wind and sleet storms emphasize the necessity of placing wires underground. — *Exchange*.

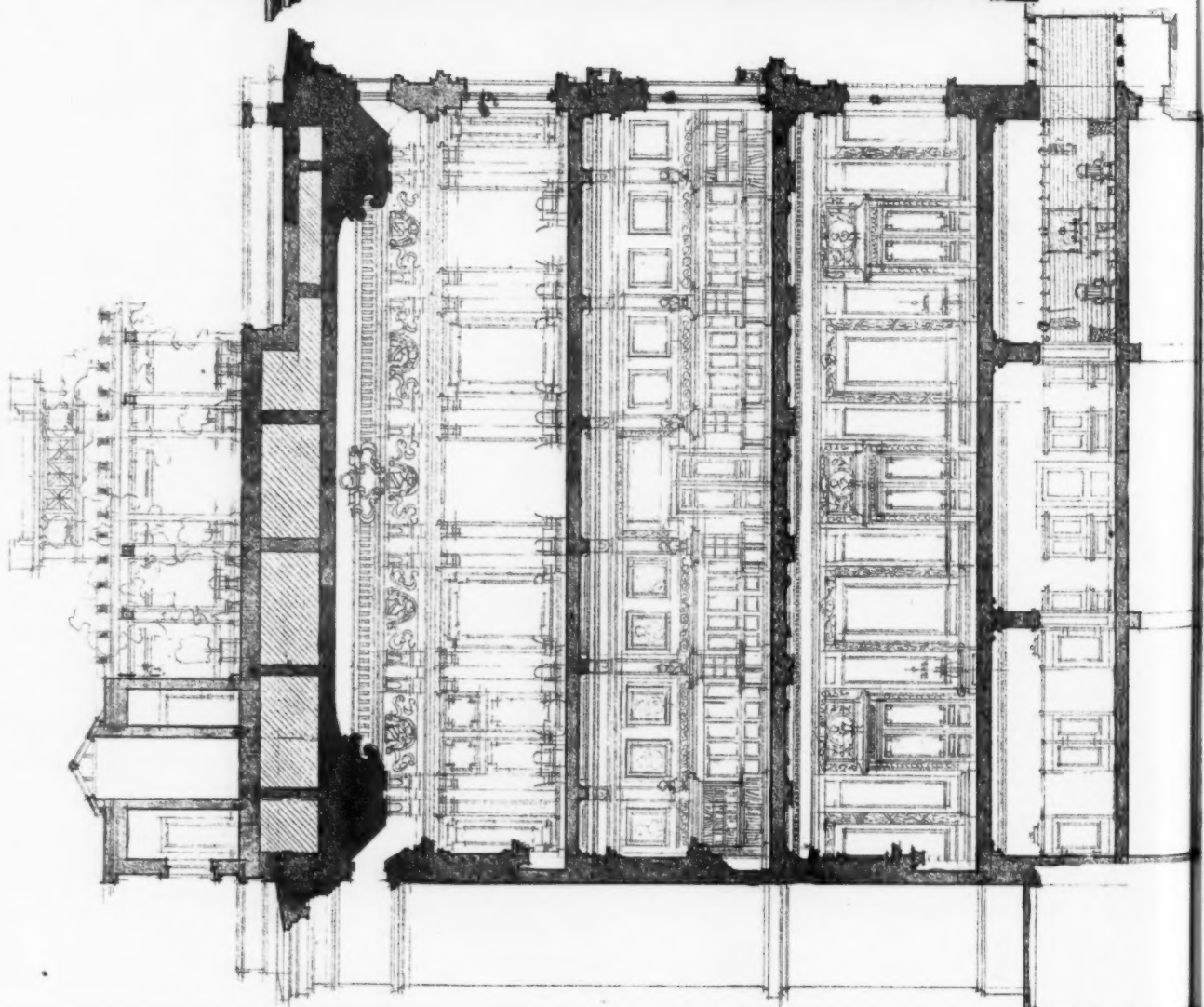
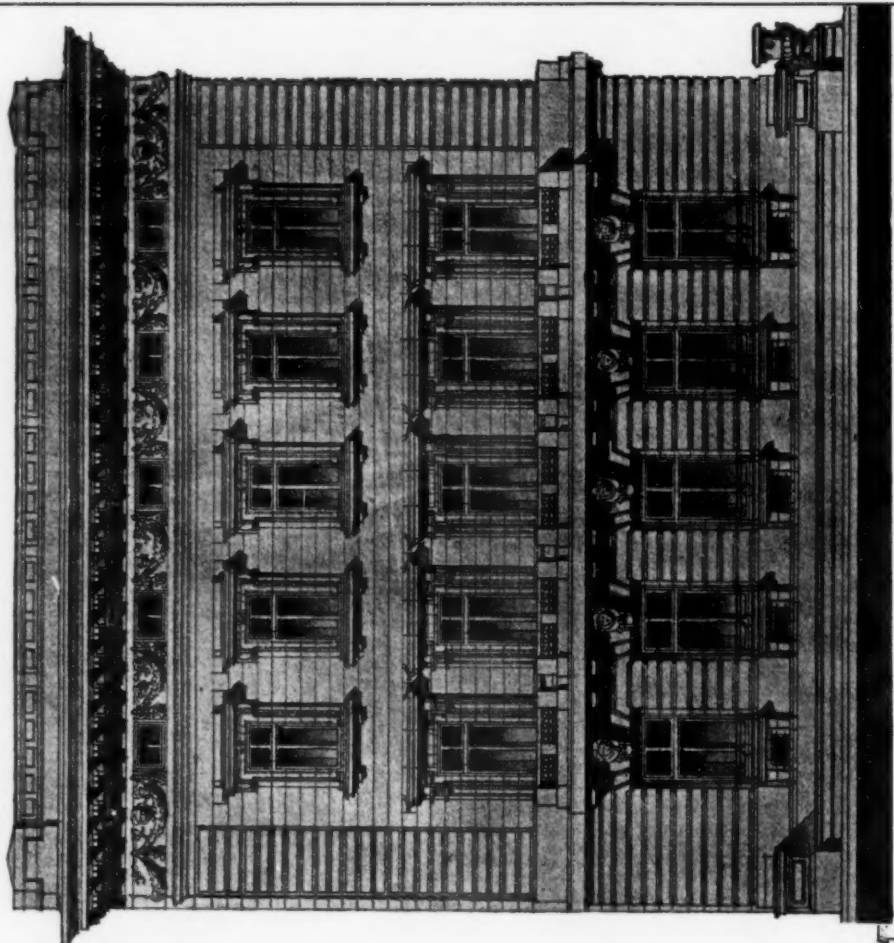
LEON'S SUPREME SIGHTS.—Oh, this Cathedral of Leon, with the matchless spire! The blue sky gleamed through its lofty lattice-work so that the effect was as if the spire itself were inlaid for hundreds of feet with slabs of turquoise. The inevitable restoration was in progress. A maze of scaffold-poles and platforms covered its southern front like a web, and the tick-tick of masons inside the building responded to the louder blows of other masons outside. So it has been for years, and probably years more will elapse, and architect will succeed architect, ere the stately fane—"ditissima pulchraque templa"—stands under the heavens in its naked magnificence. They do these things tardily in Spain. But all in disarray as it was, with its monuments bound up in sackcloth, with whistling, cigarette-smoking mechanics perched about it like seagulls on the face of a cliff, and the dirt of decades in its

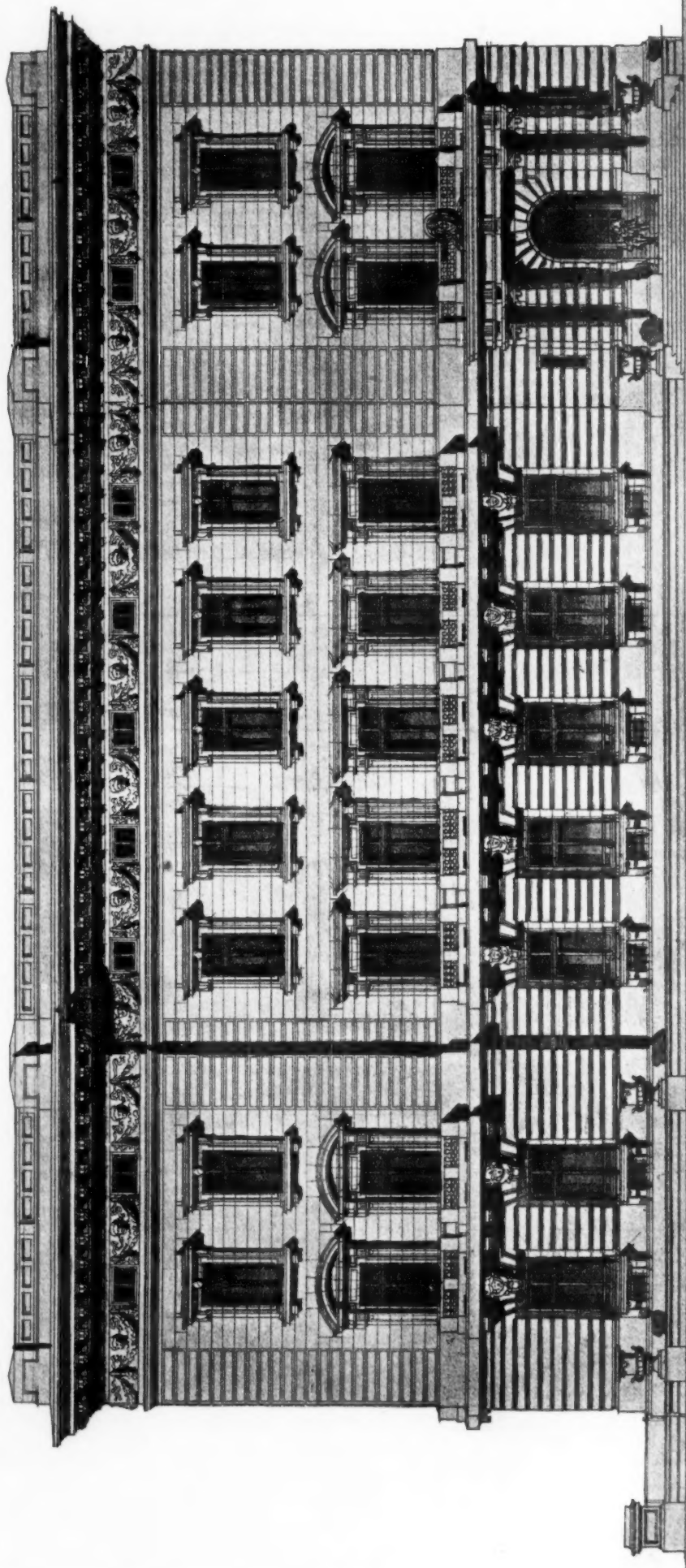
aisles, one could still do homage to the lovely building. Admission was, of course, prohibited, save to those concerned in the restoration; and equally of course a *peseta* made one free of the interior, from the Chapel of the Consolation, in the extreme east, to the marvellous statuary groups in alabaster and gold of the *trascoro*. Hundreds of emerald and ruby lights caught the sunshine and filled nave and aisles with a glow almost voluptuous in its glamor. Tombs and relics of eight centuries adorn the cathedral, the body of which, as it stands, dates from about 1300 A. D. only. And here, as with the cathedrals of Oviedo, Santiago and the other chief places of Northwest Spain, one may in the west façade alone find material for hours of study. Of the three supreme "sights" of Leon, the cathedral ranks first. The Church of St. Isidro the Royal may come next. Here lie the bones of those early kings of Leon who trembled in spite of themselves at the dread name of Almanzor. Soult's soldiers amused themselves with these dry bones, and their horses were stabled in the aisles of the church, the shell alone of which they left unpolluted. It is for its age and associations that one esteems St. Isidro the Royal, rather than for its untroubled beauty. The third imperative "sight" of the city is the Convent of San Marcos. This I postponed until the heat of the day was past. The convent impresses more even than the cathedral. It is as dead as Charles V, but superb even in its slow, happily very slow, decomposition. The knights of Santiago, for whom it was originally designed, have, of course, long gone the way of the age they graced. But one may judge of their importance in the extraordinary elaborateness of this long façade of bronzed stone. Busts, medallions and friezes—there are enough of them there, of the highest quality, to endow a dozen art-schools with worthy material for inspiration. The lone woman who had charge of the enormous building said, "*Muy bueno!*" to every part of it. She could have said no more if she had had the honor of playing cicerone to Alfonso XIII himself, and she spoke truth at random every time. The omnipresent scallop-shell testified here, as throughout Galicia, to the commanding influence in the past of that moribund sanctuary of Santiago, which still has its acres of ecclesiastical buildings and its scores of clergy. To one empty chamber there was a ceiling of cedar-wood some twenty yards by eight, gloriously carved. The courtyard, toward which we looked from an upper cloister, was a tangle of roses and tall grasses, with a stagnant well in their midst. Leon rejoices, without enthusiasm, in this matchless convent. The city has but 11,000 or 12,000 inhabitants, and no industry of size, and there are so many other relics of the past within its boundaries that it cannot be expected to vote large sums for antiquarian purposes. It is something that the convent has been turned into a provincial museum. The name does not mean so much to the Spaniard as it would mean to the Northerner. Here, in the South, they do not spend their leisure moments looking at accumulations of Roman inscriptions, noseless heads and tombstones. Spain's provincial museums are for the stranger rather than the aborigine. But better half a loaf than no loaf, and one may feel glad at least that there is a key to the noble door of the Convent of San Marcos to keep Leon's beggars from stalling themselves in its labored midst with as little respect for their environment as the horses of Soult's dragoons felt for the aisles of San Isidro the Royal. — *London Globe*.

FIRE-TEST OF WIRE-GLASS.—Wire-glass windows and standard fire-shutters of two different makes were recently subjected to three interesting tests in this city, under the supervision of the New York Building Board and in presence of several insurance-men, with a view to showing the relative efficiencies of each. An expert insurance-company's inspector who was present has drawn the following conclusions from the tests: "The first test was unsatisfactory, for the reason that it is an open question whether or not the excelsior mattress in the test structure subjected to an exterior fire was ignited by radiation or by sparks coming through the only partly-closed ventilators under the roof. Judging from the low temperature of the outer glass while the interior fire was in progress, it is hard to conclude that radiation ignited the mattress. The other tests, the fire in the third being interior, were entirely satisfactory, and demonstrated that wired glass, when in approved frames similar to those used in these tests, is more reliable than the common iron shutters, and in many cases is capable of taking the place of standard shutters, provided that in windows over roofs, or when exposure is within, say, 15 feet of the risk, or when openings are in interior division walls, the panes of glass are double, with air-space between. Even the double sashes, however, can hardly be considered the equal of the standard tin-clad wooden shutter, on account of the chances of warping, the radiation of heat, and the chance of breakage by falling walls, etc. From other tests it has been shown that inflammable material should be kept at a distance of about 4 feet from the window when single panes are used, and at about 15 inches, with double-ventilated panes. The softening point of wired glass is claimed to be about 3,000, a temperature seldom reached by an exposing fire—while the melting-point of ordinary window-glass is from 800 to 1,000. — *Fire and Water*.

IRON-PLATING A LIGHTHOUSE.—An ingenious use of steel-plates has been made at a lighthouse at Grandé Pointe au Sable, in Michigan. The lighthouse, which is about 80 feet high, is formed of brick with a stone base. It was erected in 1867, but almost from its completion it has suffered from the violent rain-storms of the district. For a long time pointing was undertaken regularly, but at length it was determined to encase the lighthouse with metal. The bent plates used varied from $\frac{1}{8}$ of an inch to $\frac{3}{8}$ inch in thickness, and they were united by means of angle bars. As a further precaution, a space was allowed between the brickwork and the metalwork, which was filled in with concrete. The work was carried out by Mr. E. L. Woodruff, and the total cost has been about 5,000 dollars. For that outlay a serviceable lighthouse has been secured, and it is believed that owing to the success of the experiment several others of the numerous lighthouses that are required near the big lakes and rivers of America will be treated in a similar way. — *The Architect*.





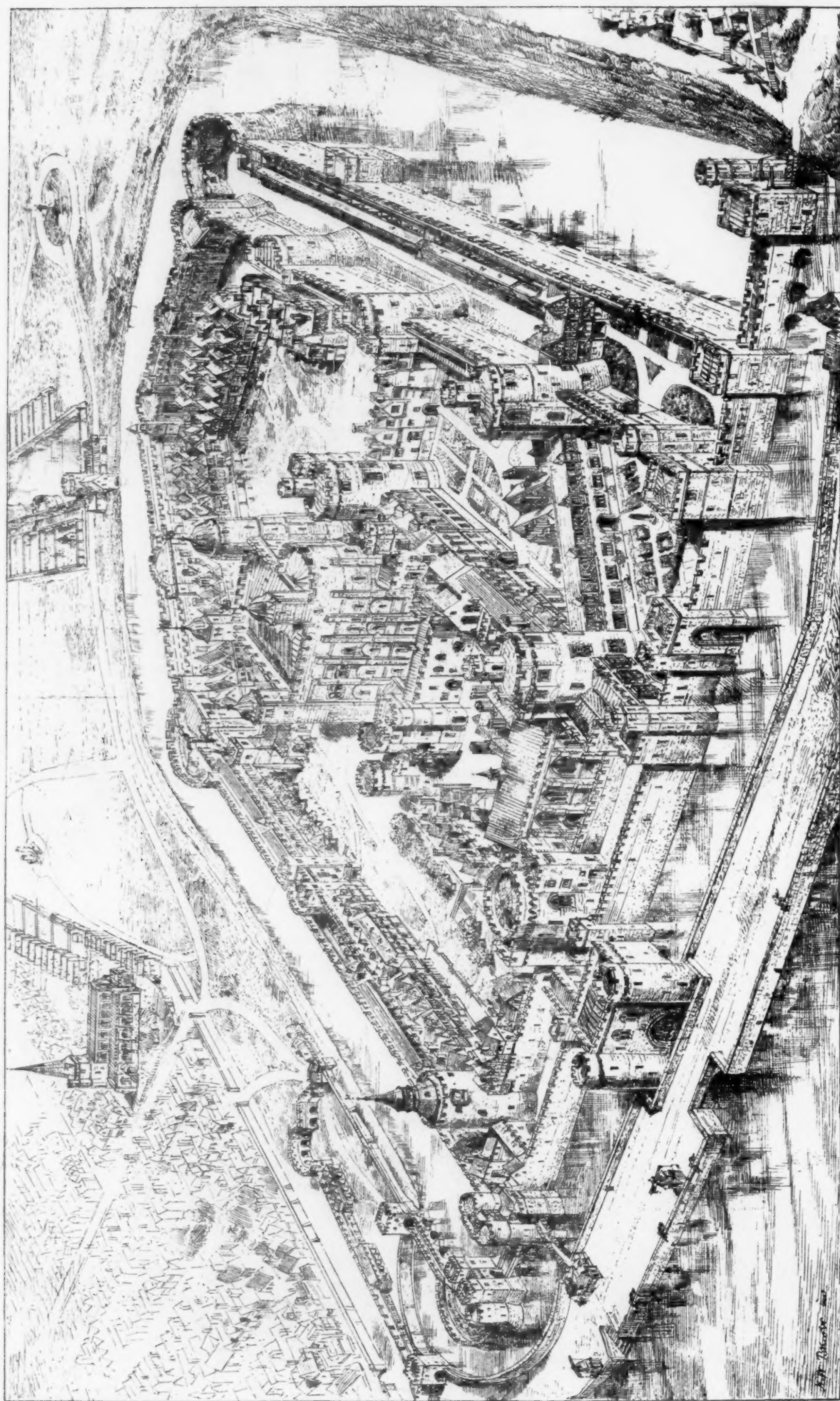


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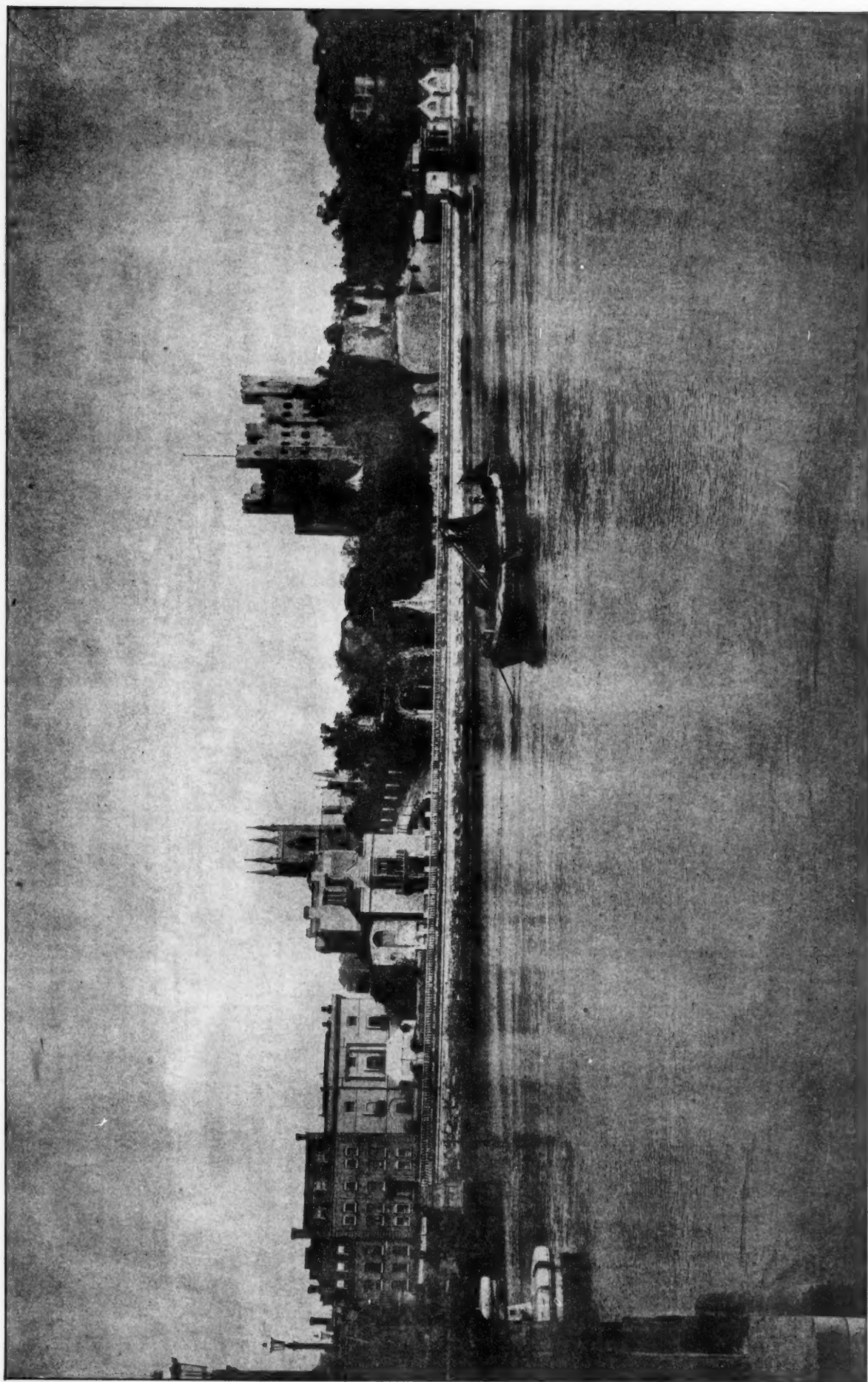
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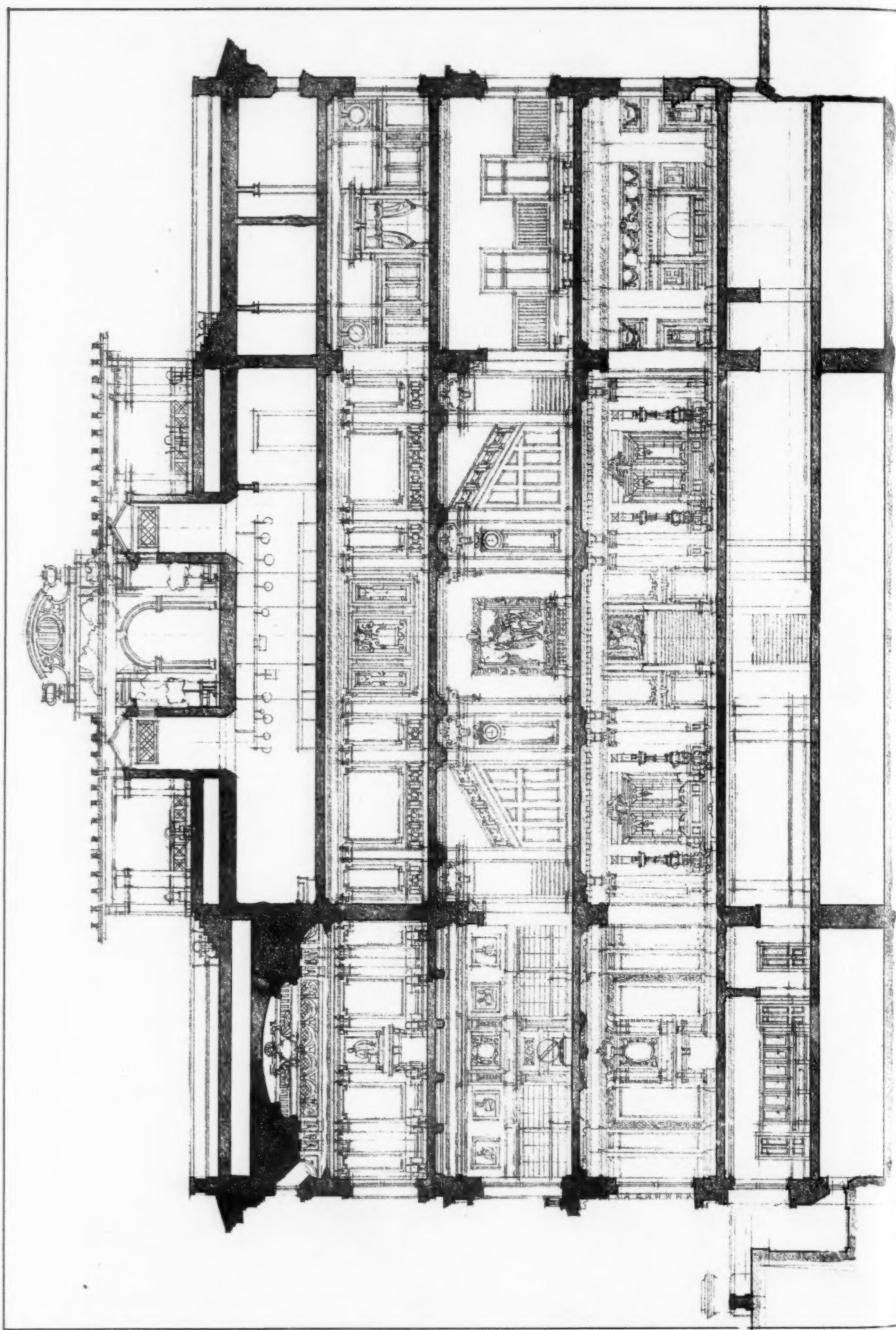


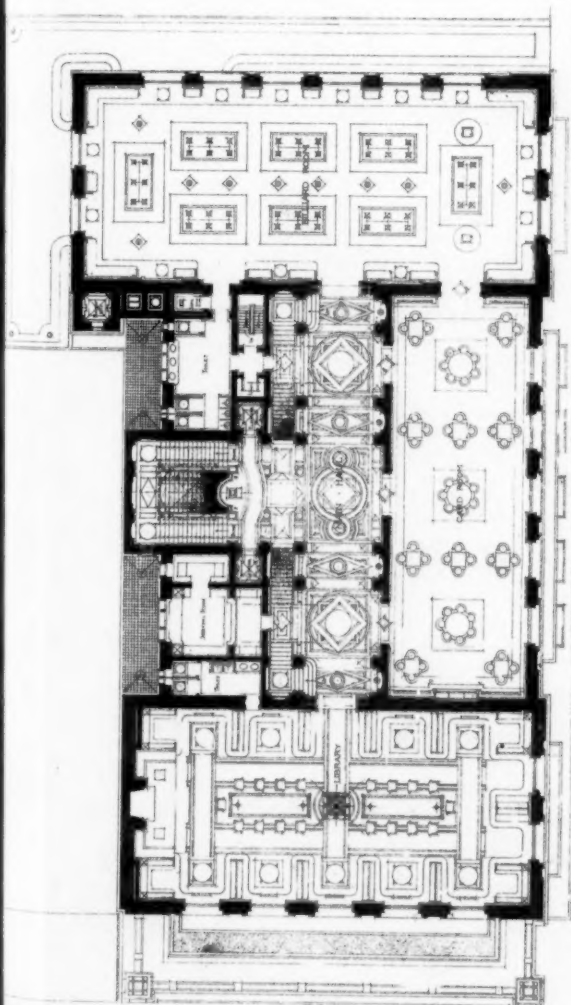
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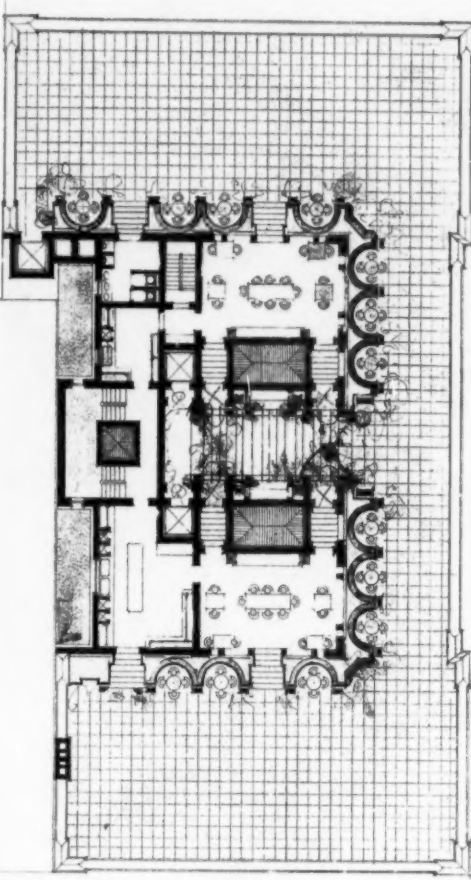
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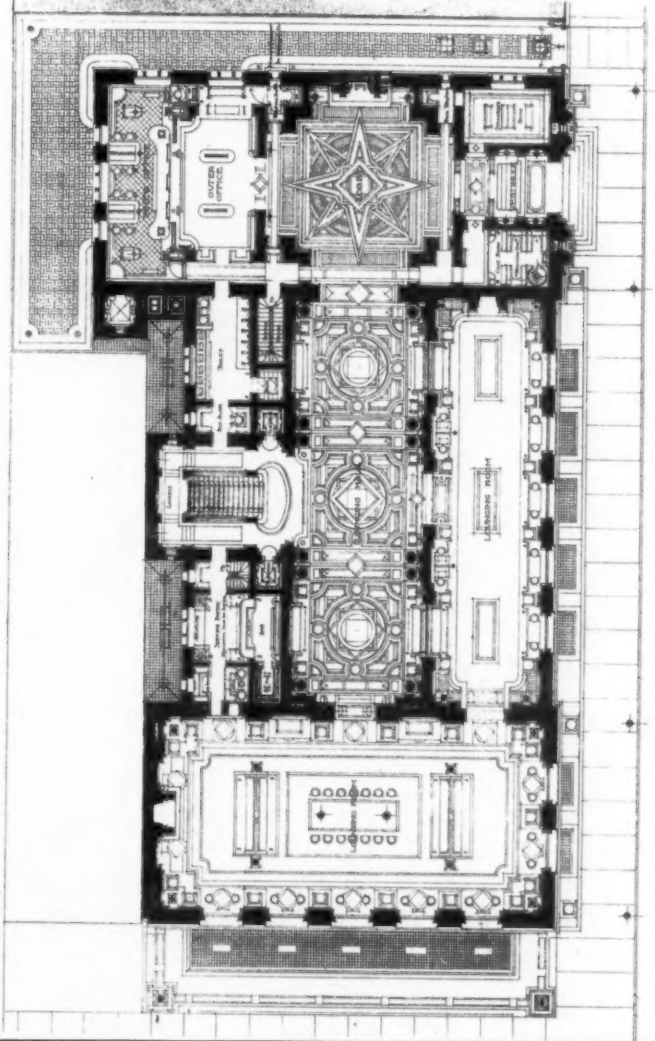




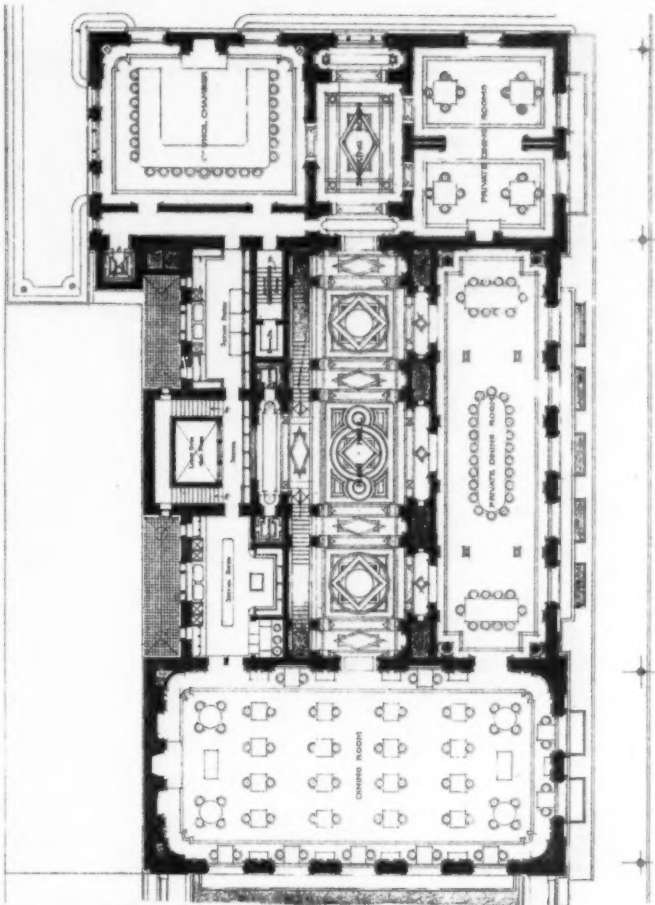
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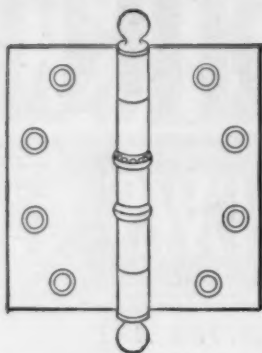
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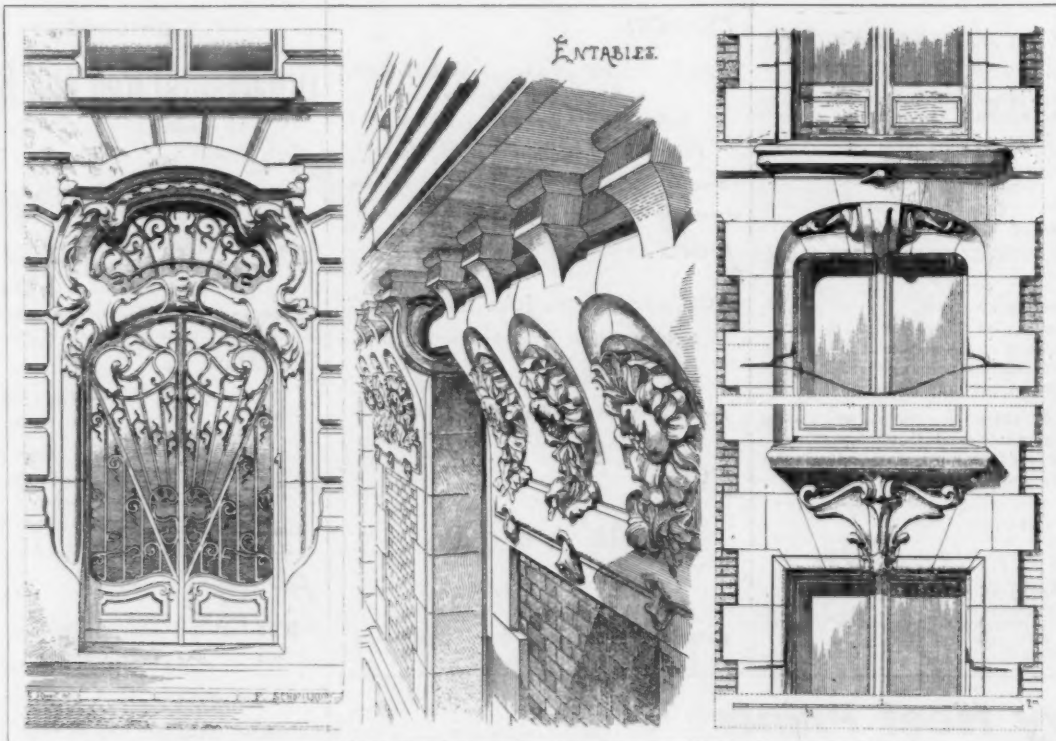
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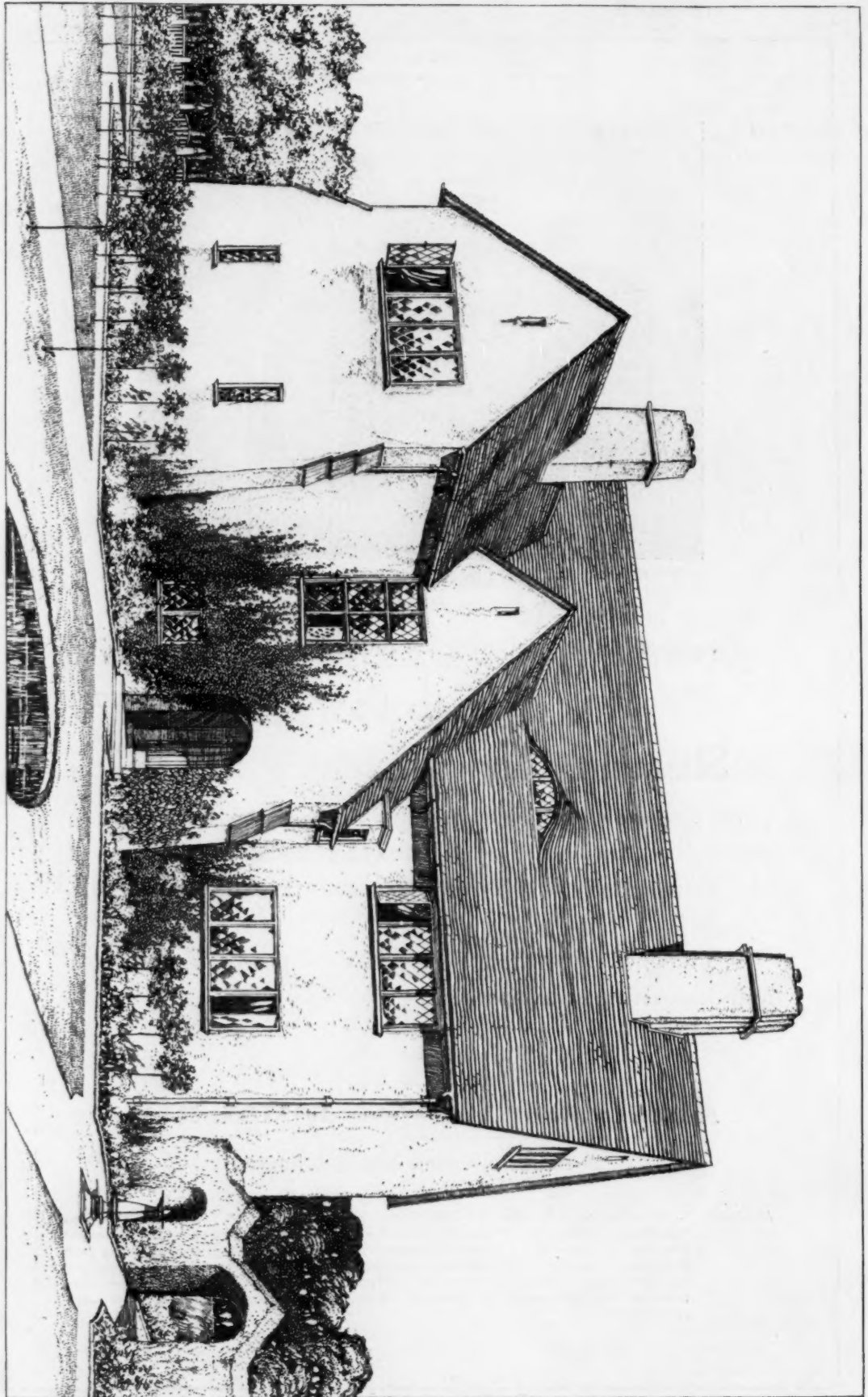
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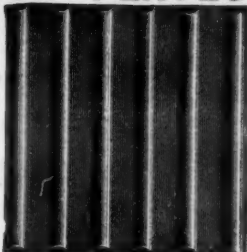
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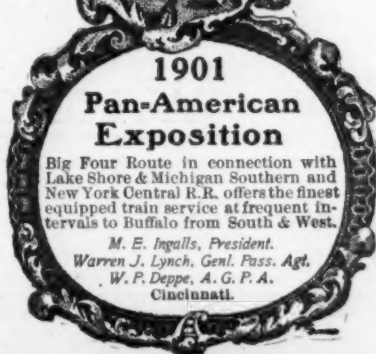
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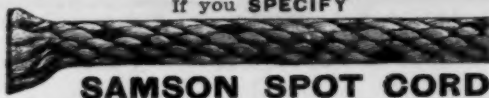
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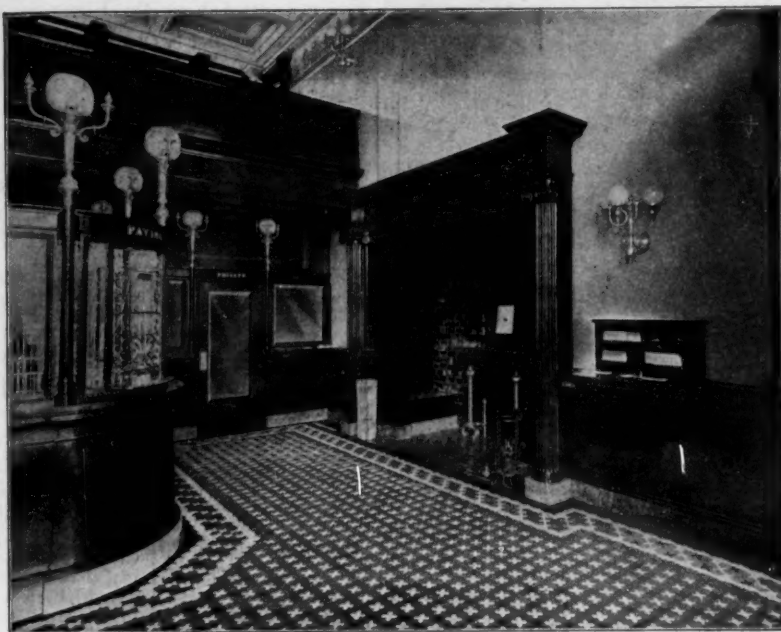
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New Advertisements.

VAPOR HEATING CO. (York, Pa.), Heating Apparatus. Page iii.

See last or next issue for the following advertisements:—

Burlington Venetian Blind Co.
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ARCHITECTS' REMOVALS, Etc.

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BUILDING INTELLIGENCE.

(Reported for the American Architect and Building News.)

[Although a large portion of the building intelligence is provided by their regular correspondents, the editors greatly desire to receive voluntary information, especially from the smaller and outlying towns.]

ADVANCE RUMORS.

Akron, O.—Plans have been drawn by Meade & Garfield, Garfield Building, for a \$70,000 theatre to be erected on Mill and High Sts.

Battle Creek, Mich.—Plans have been completed for a \$37,000 Y. M. C. A. building.

Boston, Mass.—Announcement was made at the annual reception to the Senior Class of the M. I. T., at the Brunswick, recently, that the Institute was to have a new building for the Department of Electrical Engineering. It was also announced that the erection of the Walker memorial gymnasium was practically assured, \$80,000 of the necessary \$100,000 to be raised having been secured. The new Engineering building will probably be erected on land facing Trinity Pl., which was formerly a part of the Providence yards. It will be in all respects a model building. The Walker gymnasium will, doubtless, adjoin the Pierce Building of the Institute, facing Trinity Pl. The



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SAN FRANCISCO, 12 Front St.

BUILDING INTELLIGENCE.

(Advance Rumors Continued.)

plans call for a building five stories in height, to be the headquarters of the students socially as well as in athletics.

The contract for extensive alterations in Copley Sq. Hotel has been awarded Nicholson & Co., builders. Plans furnished by Fred Pope, architect, 630 Tremont Building, City. Work includes changes in heating, plumbing, etc.

Charleston, S. C.—The plans of Joseph M. Huston, 1102 Witherspoon Building, Philadelphia, Pa., have been accepted for the Philadelphia Building to be erected on the grounds of the S. C. Interstate and West Indian Exposition; cost, \$20,000.

Chelsea, Mass.—At a recent meeting of the aldermen an order was introduced appropriating \$48,000 for a new grammar school in the Williams District and \$150,000 for the construction and furnishing of a new high-school building on the lot now occupied by the Broadway Grammar School. The orders were passed to a second reading and referred to the committee on public property.

Chicago, Ill.—Work has begun on the first of eight new buildings to be erected for the Chicago University at a total cost of \$900,000. The buildings will include the University Commons, club-house and Mandel Assembly Hall. The group will cost \$400,000. In addition to these will be built Hitchcock Hall, a dormitory for men, to cost \$125,000; Bartlett Gymnasium, to cost about \$150,000; the Press Building, \$100,000, and the heating plant \$150,000.

Frost & Granger, 806 "The Temple," have prepared plans for a depot to be erected at Wells and Kinzie Sts., for the Chicago & Northwestern Ry. Co.; cost, \$1,000,000.

The same architects have also prepared plans for a residence for Fred'k T. Haskell, to be erected at 2824 Prairie Ave., to cost about \$50,000.

Report states that Chas. A. Stonehill, of the Chicago Mercantile Co., will erect a \$75,000 residence on Drexel Boulevard and 48th St.

Holabird & Roche, 1618 Monadnock Building, have prepared plans for an eight-story building for J. B. Clow & Sons, to be erected on Franklin and Harrison Sts., to cost about \$250,000.

Fairfield, Me.—The contract for building the dye and boiler house for the American Woolen Co., in this town at a cost of \$10,000 has been awarded to H. Purinton & Co., of Waterville. The plant will be one-story high, constructed of brick.

Frederick, Md.—A \$50,000 building is to be erected by the Masonic Temple Association.

Hanover, N. H.—Mr. Edw. Tuck has given Dartmouth College \$100,000 for the erection of a building for the use of the Amos Tuck School of Administration and Finance.

Ionia, Mich.—Plans are being drawn by Joseph E. Mills, 803 Chamber of Commerce Building, for 3 new buildings for the State Asylum, to cost \$80,000.

Knoxville, Tenn.—It is stated that E. J. Sanford and Dr. C. Deadrick will erect a seven-story office building; cost, with land, \$300,000. Architects, Baumann Bros., 612½ Gay St.

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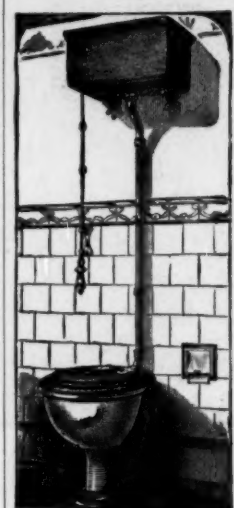
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BUILDING INTELLIGENCE.

(Advance Rumors Continued.)

New York, N. Y.—Report states that the American Order of Hibernians have purchased a plot at the corner of 5th Ave. and 116th St. and will erect thereon a building to be devoted to the uses of the order, with stores on the ground floor, and a bowling-alley in the basement; estimated cost \$250,000.

It is stated that John D. Rockefeller has placed at the disposal of a body of prominent medical men, \$200,000 for immediate expenditure by an association incorporated under the name of "The Rockefeller Institute for Medical Research." The laboratory, staff and equipment will be in this city.

Report states that the Mayor has approved the ordinance providing for the issue of \$300,000 bonds for the purchase of sites and erection of new buildings for the Fire Department and telegraph system of that Department.

It is said that the old ice palace, Lexington Ave. and 107th St., will be reconstructed into a modern theatre building. Plans by Samuel Cohen, 115 E. 82d St.; estimated cost, \$150,000.

COMPETITIONS.

COURT-HOUSE.

[At Olivia, Minn.]

Plans and specifications will be received by the Board of County Commissioners until June 28 for court-house, including ventilating and heating, to cost about \$75,000. J. T. BROOKS, clk. 1330

PROPOSALS.

Treasury Department, Office Supervising Architect, Washington, D. C., June 5th, 1901. Sealed proposals will be received at this office until 2 o'clock P. M., on the 27th day of June, 1901, and then opened, for a screen for the stamp clerk, document cases, etc., in the U. S. Post-office and Sub-treasury building, Boston, Mass., copies of the drawing and specification may be had at this office or the office of the Custodian of the building, at Boston, Mass. JAMES KNOX TAYLOR, Supervising Architect. 1329

SEWER.

[At Fort Terry, N. Y.]

Sealed proposals for constructing a sewer from hospital at Fort Terry, N. Y., will be received here until June 17, 1901. Information on application. GEO. A. NUGENT, Q. M. 1328

HEADSTONES.

[At Boston, Mass.]

Depot Quartermaster's Office, 170 Summer St., Boston, Mass. Sealed proposals, in triplicate, will be received here until 11 o'clock A. M., June 13, 1901, and then opened, for supplying 20,000 (subject to increase or decrease of 20 per cent) American white marble headstones, in slabs. Firms that may be unable to supply the entire 20,000 headstones may submit bids for such number that they can furnish; and all bidders should state the greatest number of average daily deliveries of headstones, complete, they can guarantee, and the earliest date after July 1, 1901, deliveries can commence. Government reserves right to reject or accept all or any

(Continued on page xii.)

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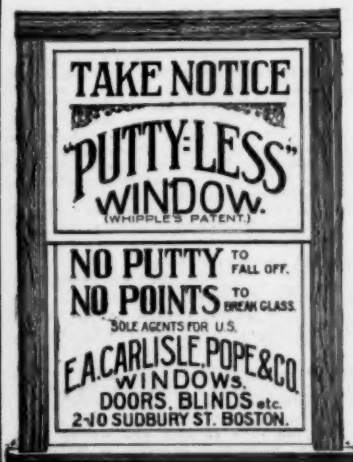
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Professor of Architecture, Lawrence
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["UNIVERSITY OF PENNSYLVANIA," *Phila., Pa.*]

The scheme embodied in your "Topical Architecture" is most welcome, because it presents this great abundance of illustrations properly classified for immediate reference.

WARREN P. LAIRD,
Professor of Architecture.

["SYRACUSE UNIVERSITY," *Syracuse, N. Y.*]

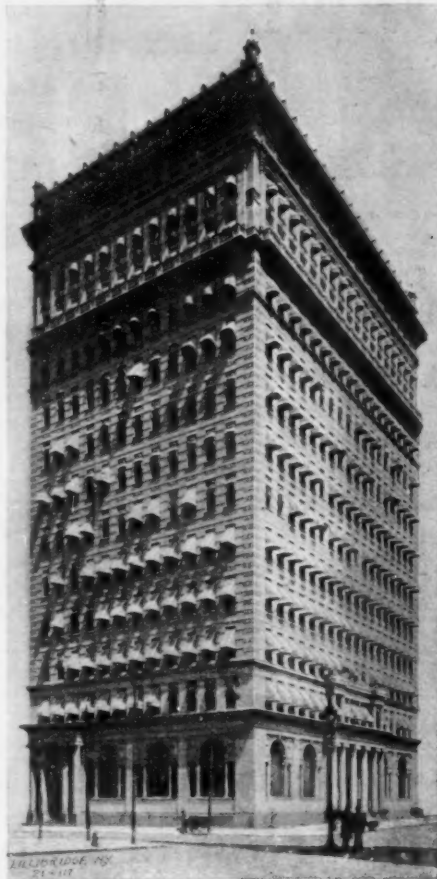
Should find its way into the reference-room of every public library, as well as into the draughting-rooms of the architects, and the studies of cultured men.

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PROPOSALS.

part of proposals submitted. Preference given to articles of domestic production or manufacture, conditions of quality and price (including in the price of foreign productions and manufactures the duty thereon) being equal. Information furnished on application. Envelopes containing proposals should be marked "Proposals for Headstones," and addressed to MAJ. W. H. MILLER, Depot Quartermaster, Boston, Mass. 1328

SCHOOL.

[At Ware, Mass.]
Sealed proposals for building a twelve-room school-building for the town of Ware, Mass., will be received by the undersigned until June 12th, 1901. Also proposals for heating, ventilating and plumbing for the same. Plans and specifications may be seen at the Supt. of Schools Office, Ware, or at the office of Ellsworth & Kirkpatrick, archts., Holyoke. D. M. Ryan, chairman. S. W. HALLETT, supt. 1328

SEWERAGE SYSTEM.

[At Monroe, La.]
Sealed proposals for the construction of a system of sewerage for the City of Monroe, La., will be received by the Mayor and City Council until Monday, June 17, 1901. Plans may be seen at the office of the Mayor, Monroe, La., or at the office of the engineers, Nashville, Tenn. A. A. FORSYTHE, mayor, Monroe, La. Schuerman & Brown, engineers, Nashville, Tenn. 1328

BUILDING.

[At Shepherdstown, W. Va.]
Bids are wanted June 17 for erecting a building for Shepherd College State Normal School. R. S. CARR, Sec'y Bd. Regents, W. Va. Normal Schools. Harrison Albright, archt., Charleston, W. Va. 1328

HOSPITAL.

[At Richmond, Va.]
Bids will be received June 15 (on revised plans), for erecting the Charlotte Williams Memorial Hospital; cost, \$100,000. Address JOHN L. WILLIAMS, pres., Percy Griffin, archt., 9 Hanover St., N. Y. City. 1328

OFFICERS' QUARTERS.

[At Fort Preble, Me.]
Sealed proposals for constructing, plumbing, heating and electric wiring, one field officers' and one company officers' quarters at this post, will be received here until June 15th, 1901. C. J. BAILEY, Qr. Mr. 1328

PROPOSALS.

BANK AND OFFICE BUILDING.

[At Madison, S. D.]
The Independent Order of Odd Fellows and the First National Bank of Madison, South Dakota, will receive bids until June 10th for the construction of a two-story and basement brick and stone store, bank, office and lodge hall building in Madison, S. D. Plans and specifications for same may be seen at the First National Bank at Madison, S. D., or at the office of A. R. Saunders, architect, Brookings, S. D. Ivan Hubbell, chairman building committee. F. D. FITTS, pres. First National Bank. 1328

BUILDINGS.

[At Champaign, Ill.]
Bids are wanted June 21 for erecting the gymnasium, mechanical engineering workshop and laboratory at the University of Illinois. N. S. SPENCER, supt. 1329

ELECTRIC WIRING, STEAM HEATING, ETC.

[At Birmingham, Ala.]
Bids are wanted June 25 for electric-wiring and elevator, also for steam-heating, plumbing and gas-fittings for the new city-hall. D. A. HELMICH, archt., 306½ Nineteenth St. 1329

BOILER-HOUSE.

[At Bremerton, Wash.]
Sealed proposals will be received at the bureau of yards and docks, Navy Department, Washington, D. C., until June 29, 1901, for constructing a brick and steel building about 43' x 50' at the naval station, Bremerton, Wash. For plans, specifications and forms of proposal address Commandant, Naval Station, Bremerton, Wash. MORDECAI T. ENDICOTT, chief of bureau. 1329

CHURCH.

[At Antigo, Wis.]
Bids are wanted June 20 for erecting a church for St. Mary's congregation. REV. F. KOLAR, pastor; W. E. Reynolds, archt., Green Bay. 1329

Treasury Department, Office Supervising Architect, Washington, D. C., May 31, 1901. Sealed proposals will be received at this office until 2 o'clock P. M. on the 26th day of June, 1901, and then opened, for the new high-pressure boiler-plant and the steam-heating apparatus, etc., for the U. S. Custom-house and Post-office at New Orleans, La., in accordance with drawings and specification, copies of which may be obtained at this office or at the office of the Custodian

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PROPOSALS.

of the building in New Orleans, La., at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect. 1329

Treasury Department, Office Supervising Architect, Washington, D. C., June 3, 1901. Sealed proposals will be received at this office until 2 o'clock P. M. on the 25th day of June, 1901, and then opened, for the installation of an electric elevator in the U. S. Court-house and Post-office building at Harrisburg, Pa., in accordance with drawing and specification, copies of which may be obtained at this office, at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect. 1329

SEWERS.

[At Washington, D. C.]
Office of the Commissioners, D. C., Washington, D. C. Sealed proposals will be received at this office until June 22, 1901, for constructing sewers in the District of Columbia. Specifications and blank forms of proposals may be obtained at this office. HENRY B. F. MACFARLAND, JOHN W. ROSS, LANSING H. BEACH, commissioners, D. C. 1329

Treasury Department, Office Supervising Architect, Washington, D. C., May 28, 1901. Sealed proposals will be received at this office until 2 o'clock P. M. on the 24 day of July, 1901, and then opened for the construction (except heating apparatus, electric wiring and conduits) of the U. S. Post office at Joliet, Ill., in accordance with the drawings and specification, copies of which may be had at this office or at the office of the Postmaster at Joliet, Illinois, at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect. 1328

LIBRARY FOUNDATIONS.

[At New York, N. Y.]
Bids are wanted June 13 for contract No. 3 for the New York Public Library foundations at 5th Ave., 40th and 42d Sts., Boro. Manhattan. GEO. C. CLAUSEN, commr. of parks. 1328

Treasury Department, Office Supervising Architect, Washington, D. C., May 27, 1901. Sealed proposals will be received at this office until 2 o'clock P. M. on the 26th day of June, 1901, and then opened, for the installation of a conduit and wiring system for the U. S. Post-office building at Menominee, Michigan, in accordance with the drawings and specification, copies of which may be obtained at this office or at the office of the Superintendent of Construc-

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PROPOSALS.

tion at Menominee, Michigan, at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect. 1328

Treasury Department, Office of the Supervising Architect, Washington, D. C., May 27th, 1901. Sealed proposals will be received at this office until 2 o'clock P. M. on the 1st day of July, 1901, and then opened, for furnishing the heating apparatus complete in place for the U. S. Post-office at Menominee, Mich., in accordance with the drawings and specification, copies of which may be had at this office or at the office of the Superintendent at Menominee, Mich., at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect. 1328

Treasury Department, Office Supervising Architect, Washington, D. C., May 23, 1901. Sealed proposals will be received at this office until 2 o'clock P. M. on the 20th day of June, 1901, and then opened, for the installation of an electric conduit and wiring system for the U. S. Post-office, Monmouth, Illinois, in accordance with the drawings and specification, copies of which may be obtained at this office at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect. 1328

PROPOSALS.

Treasury Department, Office Supervising Architect, Washington, D. C., May 24, 1901. Sealed proposals will be received at this office until 2 o'clock P. M. on the 25th day of June, 1901, and then opened, for the construction (except heating apparatus, electric wiring and conduits) of the U. S. Post-office and Court-house at Abilene, Texas, in accordance with the drawings and specification, copies of which may be had at this office, or at the office of the Postmaster at Abilene, Texas, at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect. 1328

Treasury Department, Office Supervising Architect, Washington, D. C., May 24, 1901. Sealed proposals will be received at this office until 2 o'clock P. M. on the 24th day of June, 1901, and then opened, for furnishing the heating apparatus complete in place for the U. S. Post-office and Court-house at Beaumont, Texas, in accordance with the drawings and specification, copies of which may be had at this office or at the office of the Superintendent at Beaumont, Texas, at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect. 1328

PROPOSALS.

ELECTRIC PLANT. [At Ft. Greble, R. I.] U. S. Engineer Office, Newport, R. I. Sealed proposals for furnishing electric-light plant for Fort Greble, R. I., will be received here until June 19, 1901. Information furnished on application. GEO. W. GOETHALS, major, engr. 1328

BUILDING. [At League Island, Pa.] Sealed proposals will be received at the Bureau of Yards and Docks, Navy Department, Washington, until June 15, 1901, for constructing a brick and steel building at the navy yard, League Island, Pa. For plans, specifications and forms of proposal address "Commandant, Navy Yard, League Island, Pa." MORDECAI T. ENDICOTT, chief of bureau. 1328

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PROPOSALS.

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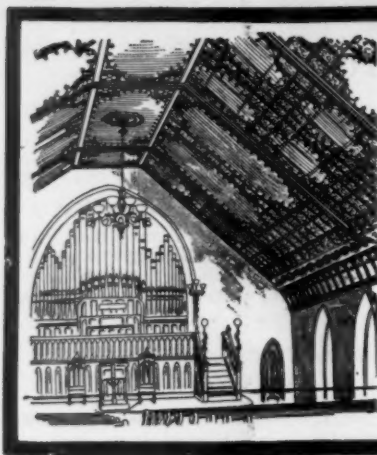
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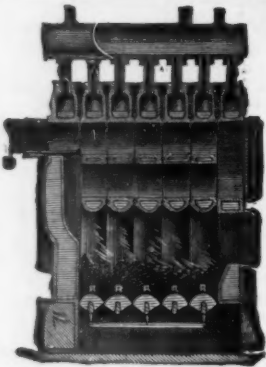
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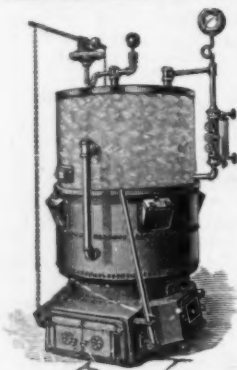
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CLASSIFIED ADVERTISEMENTS.

[Advertisers can be indexed only under a single head free of charge.]

ARCHITECT'L ORNAMENTATION.

Lombard & Co., A. P., Boston

ART METAL WORK.

Ludlow Saylor Wire Co., St. Louis,
Mo. (mon)

ASPHALT.

Neuchatel Asphalte Co., New York..
New York Mastic Works, New York.

ASPHALT ROOFING.

Warren Chemical & Mfg. Co., N. Y.

AUTOMATIC SPRINKLER.

Internat'l Sprinkler Co., Phila., Pa...

BLINDS (Venetian).

Burlington Venetian Blind Co., Bur-
lington, Vt.

BLUE PRINTS

Moss, Chas. E., Boston.....
Spaulding Print Paper Co., Boston
..... (eow)

BOILERS (Side-Feed).

Gorton & Lidgerwood Co., New York.

BRASS WORK (Ornamental).

Ingalls Wire and Iron Works, Wm.,
Detroit, Mich.....

BRICKS (Red Oxide).

Wisconsin Graphite Co., Pittsb'g, Pa.

CALIFORNIA REDWOOD.

Carlisle, Pope & Co., E. A., New York.

CAPITALS.

Lombard & Co., A. P., Boston

CAPITALS (Carved).

C. T. Nelson Co., The, Columbus, Ohio

CARVING.

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CEMENT.

Alsen's Cement Works, N. Y.... (eow)

Atlas Cement Co., New York.....

Lawrence Cement Co., The, New York

Thiele, E. New York.....

CEMENT PAVING.

Stamsen & Blome, Chicago, Ill.....

CHLORIDE ACCUMULATOR.

Electric Storage Battery Co., Phila-
delphia, Pa.....

COMPOSITION ORNAMENT.

Lombard & Co., A. P., Boston

CONDUCTORS.

American Steel Roofing Co., The,
Cincinnati, Ohio.....

CONSERVATORIES.

Lord & Burnham Co., Irvington-on-
Hudson, N. Y.....

CONTRACTING.

Flynt Building & Construction Co.,
Palmer, Mass.....

CONTRACTING.

Southard, R. P.,

CONTRACTOR AND BUILDER.

Rutan, William L., Boston.....

CORDAGE.

Samson Cordage Works, Boston. (eow)

CREOSOTE STAINS.

S. Cabot, Boston.....

CUTLER PAT. MAILING SYSTEM.

Cutler Mfg. Co., Rochester, N. Y....

DEAFENING QUILT.

Samuel Cabot, Boston, Mass.....

DECORATORS.

L. Haberstroh & Son, Boston.....

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Kinnear Mfg. Co., The, Columbus, O.

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E. Eldon Deane, New York.....

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Morse, Williams & Co., Philadelphia.

Whittier Machine Co., Boston.....

ENGINES (Hot-Air).

Rider-Erison Engine Co., New York.

FAUCETS.

Union Brass Works, Boston, Mass...

FILING DEVICES.

Art Metal Construction Co., James-
town, N. Y.....

FILTER.

Loomis-Manning Filter Co., Phila., Pa.

Sealife & Sons, Wm. B., Pittsb'g, Pa..

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Kinnear Mfg. Co., The, Columbus, O.

FIREPROOFING.

Johnson Co., E. V., Chicago, Ill.....

FIREPROOF LATHING.

Hayes, Geo., New York.....

FIREPROOF SHUTTERS.

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Ogden & Wallace, New York

FLOOR POLISH.

Butcher Polish Co., Boston.....

FLUSH-VALVE.

Peck Brothers Co., Chicago, Ill.....

GALVANIZED IRON.

American Sheet Steel Co., New York

GATES.

Wm. R. Pitt, New York .. (mon)

GRATES, ETC.

Wm. H. Jackson & Co., New York...

GREASE (Graphite).

Wisconsin Graphite Co., Pittsb'g, Pa.