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A FIRM of architects in Iowa is said to have incorporated in its regular form of specification a clause requiring that all cans, kegs, sacks, and so on, containing material to be used in the building shall be placed on the ground without being opened, and that they shall not be opened until they have been inspected by the architects, or some one with their authority, and shall not be removed without their orders. The local contractors object to this provision, and the Builders' Exchange has given notice that none of its members will tender for work in the office of these architects until it is modified. It is not surprising that contractors do not like to bind themselves to keep their work waiting until the architects have inspected their materials, and we are inclined to think that the architects are unnecessarily making martyrs of themselves in the interest of their clients. Of course, their reason for insisting on this clause in the specification is that inferior materials are frequently substituted by mechanics for those that they have contracted to furnish, and that an examination of the original package affords some security that it contains the article specified. Unfortunately, the security so gained is very shadowy, far too much so to make it worth while for architects to sacrifice themselves in the pursuit of it. Every contractor who loves dishonest gain knows how to place original packages where they will meet the eye of the architect, while he reserves in a suitable hiding-place material of a very different quality, to be produced as soon as the architect's back is turned; and there are plenty of dealers who, at the contractors' request, and even without his request, will take a can marked with some reputable name, pour out its contents into some private reserve, and refill it with cheap concoctions of their own. Against tricks of this sort no reasonable vigilance on the part of the architect can afford the owner protection, and it is the professional man that cannot, and should not, be expected to act as detective over all the workmen employed in his buildings, even if he could successfully do so. After all, it is the mechanic who agrees in writing to do certain work, and use certain materials. If he does not do so, he is liable to the owner for damages, and the measure of damages in such cases is, as a rule, the sum that it would cost to remove the improper materials and substitute those agreed upon. In the case of painters' materials, in which, perhaps, the grossest frauds are perpetrated, there is no doubt that the architect, or the owner, is entitled to compel the contractor to have the inferior paint or varnish cleaned off, and replaced with proper material, and if this would involve defacing the woodwork to which the paint has been applied, the contract ought to make it clear that the woodwork also must be replaced at the painter's expense. A few experiences of sandpapering rosin varnish off all the doors and finish of a house, to replace it with the material specified, would inspire in a painter a wholesome respect for specifica-

tions and contracts, and it is assuredly the province, and even the duty, of an architect to require this to be done if he has good reason to think that inferior materials have been employed. What architects need, therefore, is not a provision in their specifications for their inspection of original packages, which wastes their time, causes delay and expense to honest contractors, and affords no real protection, but a set of tests, which they can apply to work of which they have suspicions, and satisfy themselves whether it accords with the contract or not. In the case of lead-paints, a profound knowledge of chemistry is not required to inform the architect whether his client is being cheated with chalk, and it must be remembered that a contractor is not released from his agreement if he gets his work done without detection, but that, if it should appear at any subsequent time that he had not fulfilled his undertaking, the owner is entitled to redress. The testing of varnishes is not so easy as that of paints, since their quality varies almost to infinity; but something can be ascertained by the smell of a bit of the varnish, or of wood covered with it, when held in a flame. The makers of good varnishes, as, indeed, of good materials of other kinds, might prepare directions for simple tests of this sort, which would be extremely useful to architects and owners, and, incidentally, to themselves.

IT is rather curious that an American city of the size of New York should be decorated with so few pieces of bad statuary.

We do not mean few in comparison with the number of statues actually erected, but few when one considers how many more bad ones there might easily be. By great good luck, sculpture has hitherto escaped the admiration of the ruling class, who prefer to honor their great men in the flesh, and drink with them and feast with them, rather than to set up brazen images of them, before which they and their posterity might lout low. But the ruling class, who acquire their money so easily and so plentifully, by such mysterious and strange ways, have already seen the necessity of cultivating the Fine-Arts, and from decorating their bar-rooms with fine paintings, have advanced to building for themselves vast and florid mansions on fashionable uptown streets, and presently the advantages of sculpture may attract their attention. So, though the city lacks the embellishment that would be lent by statues of Tweed and Peter Sweeney, no one can guess how soon the present District-Attorney may not endow his admiring fellow-citizens with a perpetual reminder of his own preëminency. Perhaps it was a spirit of prevision that induced the Park Board recently to formulate certain rules to be observed in the acceptance and erection of sculpture in the city's parks; perhaps they had an advance hint that some body of Scotch-Americans, Franco-Americans, German-Americans, Hiberno-Italo-Russo-Scandinavian-Americans were about to demand that their rights as voters and good party-workers should be recognized and they should be allowed to add to the sculptured horrors of the Mall, where Moore, Schiller, Burns, Bethoven, Mazzini—those famous Americans—and others have inspired with awe succeeding generations of nurse-maids. It is one of the few advantages of the checker-board system of laying-out cities that it provides practically no site which cries aloud for the sculptor's adorning skill. The present generation is so self-conscious, so regardless of the rights of the generations to come, that it is occupying with its own records not only the best sites, but all, good, bad and indifferent, and if New York had a greater number of favorable sites we may feel sure that the statues of Dodge and Seward and Lafayette would have had a full companionship of equally execrable works of imported or domestic sculpture. The most amazingly un-American thing that has happened recently is the display of good sense on the part of the donor of the proposed Hall of Fame that will prevent the panels of the portico from being filled full to overflowing with the names of the famous as soon as the panels are in place.

THE rules adopted by the Park Board are in the main sensible and judicious. It would have been well, however, to expand the final rule, which gives to the Board the right to remove any statue or structure already placed in any park which may contravene the rules now adopted, if such removal is advised by the Art-Commission, by adding a clause reserving to the Board and its successors the right to remove from a site,

or even to seclude permanently, any work of art once accepted which, for one reason or another, may have lost favor with the educated public. We have a very strong feeling that in the matter of civic adornment no generation has a right to grant a site *in perpetuo* to any work of art and so preclude the artists of succeeding generations, men presumably of greater force and merit than those of to-day, from using the natural advantages of a site to the best advantage. A case in point is the Worth Monument, at the junction of Broadway and Fifth Avenue, one of the best sites in the city. It would give us pain to have this monument removed: it is excellent in itself, and Launitz's bas-relief is a gem, and, moreover, the ashes of a gallant soldier rest beneath it; yet, from the standpoint of the ultimate propriety of civic adornment, future generations may feel it a hardship that a more imposing, more artistic monument should not occupy that favored site. Where the Board's rules are general in terms, they are reasonable, but when they attempt to be particular they are not so discreet. Thus, the rule that ordains that "the pedestal of any statue or bust placed in any of the parks shall not exceed two-thirds of the height of the statue proper" is simply childish and unreasonable. A bust on a pedestal two-thirds of its own height would be simply absurd: even the huge busts in the Mall would become only more ludicrous on such pedestals. Moreover, it is more than likely that Barnard's "Pan" may revive the Roman fashion of recumbent effigies of river gods, water nymphs and so on, and to ordain that the pedestals of such figures or groups must be only "two-thirds of the height of the statue proper" may produce a result very unfortunate for the sculptor's fame. We doubt, too, the wisdom of the rule that declares that "statues shall be placed *only* as adjuncts to buildings, bridges, viaducts or other structural work, purely artificial in their nature, etc." Strictly enforced, this rule would do a great wrong in many cases by bringing a statue into undesirable juxtaposition with others with which it could not harmonize, or depriving it of the seclusion and isolation its theme and sentiment demanded.

THE columns of this and other architectural journals contain documentary evidence as to the frequency with which architects appeal to their editors for advice in the matter of procuring redress from those who have wronged them through the unauthorized reproduction of their buildings. Sometimes the complaint is brought against a fellow-professional or *soi-disant* architect, sometimes against a speculating builder, a private individual or a corporation, but oftener against the aggrieved architect's former client. We have always given such complainants all the aid and comfort we could; but, as such cases when they actually get into court are usually decided in favor of the defendant, our sympathetic assistance has, probably, been of little real value. Until now, however, we have never encountered the reverse of this familiar contention, a case, that is, where an aggrieved owner seeks redress against his architect because the latter has repeated a building for the original design—or drawings—of which the architect had been paid by his now offended former client. This unusual case has been referred to us lately by the owner, and, in the spirit of fair-play, we have given him, too, all the aid and comfort we could, and in forwarding our reply wrote: "We have no hesitation in saying that we feel that the architect you employed has not given proper attention to the matter of comity, ethics, and, in fact, common decency in duplicating essentially the building you had ordered from him by another erected at so short a distance from yours." In this lies the nub of the grievance; the structure, "an elaborate and altogether unusual country residence," is duplicated by one identically as elaborate and unusual only two miles away, a distance too short for the mutuality of identity to escape even the most careless observer. The outrage upon common decency is plain.

SECURE in our sympathy in this very interesting case—interesting because it involves at once the disputed question of the ownership of drawings, and by inference property in the design, and the much-discussed matter of artistic copyright, and the doubt as to where that right vests—our correspondent asked us if we would not publish the original structure and its duplicate and so "show up" the offender. Finding that suit had already been brought against the architect, and as we knew only one side of the story, and as there was an

obvious possibility that the owner had actually employed some dealer in "ready-made" architecture, and had himself innocently trespassed on the rights of some earlier user of the "unusual" and "elaborate" design, we, naturally, had to deny the request. Whereupon our correspondent declares that our course in "shielding his [the architect's] act from the public is false—false alike to moral principals and to the public. . . . It is just such false sentiment that is responsible for much of American rottenness, political and commercial. We are so afraid of making a fuss or condemning openly in round terms an offender against 'common decency' that we tacitly encourage all sorts of meanness, trickery, vice and fraud." Largely this is so. But it is a dangerous thing to meddle with a case already at bar, and there are many chestnuts in the fire that editors have to allow to burn, simply because they were not born salamanders. But, after all, *humanum est errare*, and the tendency of modern times is to adopt reformatory rather than punitive measures in transforming useless into useful citizens.

PERHAPS the world's history contains no more remarkable record of achievement than is afforded by the narrative of the domination and control of the vast multitudes of India by the British residents and administrators, backed by a relatively small military force, and in all probability this success is not so much due to firmness as to a certain liberal-mindedness, peculiar to the Anglo-Saxon, which allowed them to see that the native religions and the laws of caste might be left, in the main, undisturbed without affecting the commercial and material interests which most concerned Britons. In spite of this good intent, the necessary wars and the still more necessary physical improvements of an engineering nature have wrought an immense amount of damage to temples, tombs and architectural monuments of all kinds, and but little having been done to repair these damages the process of decay has been hastened by neglect. Just when the Archaeological Survey of India was established we do not know, and although its work, which has been mainly of a recording nature, did include the giving of some attention to the preservation of the architectural and archaeological remains of the country, it has not had large funds at its disposal and its efforts have been much hampered by secretarial influence and the entanglement of bureaucratic red-tape. Just now it seems likely that something of real magnitude and importance in the matter of preservation may be accomplished. Lord Curzon, the present Viceroy of India, recently attended the annual meeting of the Bengal Asiatic Society and made an address of singular interest and importance, for, in the first place, he declared that he was present not as an individual but as an official and for the purpose of confessing the great shortcomings of the Government in the matter of caring for the vast, numerous and precious archaeological remains of the wide-spreading territory of India, and to promise that proper reparation should be made. The catholicity of his intention and the degree of his comprehension of what the situation really is and what it calls for is capitally indicated in one passage of his address, where he says: "If there be any one who says to me that there is no duty devolving upon a Christian Government to preserve the monuments of a pagan art or the sanctuaries of an alien faith, I cannot pause to argue with such a man. Art and beauty and the reverence that is owing to all that has evoked human genius, or has inspired human faith, are independent of creeds, and, in so far as they touch the sphere of religion, are embraced by the common religion of all mankind. Viewed from this standpoint, the rock temple of the Brahmins stands on precisely the same footing as the Buddhist Vihara, and the Mahomedan Musjid as the Christian cathedral. There is no principle of artistic discrimination between the mausoleum of the despot and the sepulchre of the saint. What is beautiful, what is historic, what tears the mask off the face of the past, and helps us to read its riddles and to look it in the eyes—these and not the dogmas of a combative theology are the principal criteria to which we must look. . . . I hope to assert more definitely during my time the Imperial responsibility of Government in respect of Indian antiquities, to inaugurate or to persuade a more liberal attitude on the part of those with whom it rests to provide the means, and to be a faithful guardian of the priceless treasure-house of art and learning that has, for a few years at any rate, been committed to my charge." Adherence to and fulfilment of this pledge would do much to strengthen the regard of the natives for the Imperial Government.

ARCHITECTURAL ACOUSTICS.¹—I.

INTRODUCTION.

Monument to Th. de Banville. From *La Semaine des Constructeurs*.

THE following investigation was not undertaken at first by choice, but devolved on the writer in 1895 through instructions from the Corporation of Harvard University to propose changes for remedying the acoustical difficulties in the lecture-room of the Fogg Art Museum, a building that had just been completed. About two years were spent in experimenting on this room, and permanent changes were then made. Almost immediately afterward it became certain that a new Boston Music Hall would be erected, and the questions arising in the consideration of its plans forced a not unwelcome continuance of the general investigation.

No one can appreciate the condition of architectural acoustics—the science of sound as applied to buildings—that has not with a pressing case in hand sought through the scattered literature for some safe guidance. Responsibility in a large and irretrievable expenditure of money compels a careful consideration, and emphasizes the meagreness and inconsistency of the current suggestions. Thus the most definite and often repeated statements are such as the following: that the dimensions of a room should be in the ratio 2:3:5, or according to some writers, 1:1:2, and others, 2:3:4; it is probable that the basis of these suggestions is the ratios of the harmonic intervals in music, but the connection is untraced and remote. Moreover, such advice is rather difficult to apply; should one measure the length to the back or to the front of the galleries, to the back or the front of the stage recess? Few rooms have a flat roof, where should the height be measured? Another writer, who had seen the Mormon Temple, recommended that all auditoriums be elliptical. Sanders Theatre is by far the best auditorium in Cambridge and is semicircular in general shape, but with a recess that makes it almost anything; and, on the other hand, the lecture-room in the Fogg Art Museum is also semicircular, indeed was modelled after Sanders Theatre, and it was the worst. But Sanders Theatre is in wood and the Fogg lecture-room is plaster on tile; one seizes on this only to be immediately reminded that Sayles Hall in Providence is largely lined with wood and is bad. Curiously enough, each suggestion is advanced as if it alone were sufficient. As examples of remedies may be cited the placing of vases about the room for the sake of resonance, wrongly supposed to have been the object of the vases in Greek theatres; the stretching of wires, even now a frequent though useless device.

The problem is necessarily complex, and each room presents many conditions, each of which contributes to the result in a greater or less degree, according to circumstances. To take justly into account these varied conditions, the solution of the

problem should be quantitative, not merely qualitative; and to reach its highest usefulness it should be such that its application can precede, not follow, the construction of the building.

In order that hearing may be good in any auditorium, it is necessary that the sound should be sufficiently loud; that the simultaneous components of a complex sound should maintain their proper relative intensities; and that the successive sounds in rapidly moving articulation, either of speech or music, should be clear and distinct, free from each other and from extraneous noises. These three are the necessary, as they are the entirely sufficient, conditions for good hearing. The architectural problem is, correspondingly, threefold, and in this introductory paper an attempt will be made to sketch and define briefly the subject on this basis of classification. Within the three fields thus defined is comprised without exception the whole of architectural acoustics.

1. *Loudness*.—Starting with the simplest conceivable auditorium—a level and open plain, with the ground bare and hard, a single person for an audience—it is clear that the sound will spread in a hemispherical wave diminishing in intensity as it increases in size, proportionally. If, instead of being bare, the ground is occupied by a large audience, the sound diminishes in intensity even more rapidly, being now absorbed. The upper part of the sound-wave escapes unaffected, but the lower edge—the only part that is of service to an audience on a plain—is rapidly lost. The first and most obvious improvement is to raise the speaker above the level of the audience; the second is to raise the seats at the rear; and the third is to place a wall behind the speaker. The result is most attractively illustrated in the Greek theatre. These changes being made, still all the sound rising at any considerable angle is lost through the opening above, and only part of the speaker's efforts serve the audience. When to this auditorium a roof is added the average intensity of sound throughout the room is greatly increased, especially that of sustained tones; and the intensity of sound at the front and the rear is more nearly equalized. If, in addition, galleries be constructed in order to elevate the distant part of the audience and bring it nearer to the front, we have the general form of the modern auditorium. The problem of calculating the loudness at different parts of such an auditorium is, obviously, complex, but it is perfectly determinate, and as soon as the reflecting and absorbing power of the audience and that of the various wall-surfaces are known it can be solved approximately. Under this head will be considered the effect of sounding-boards, the relative merits of different materials used as reflectors, the refraction of sound and the influence of the variable temperature of the air through the heating and ventilating of the room, and similar subjects.

2. *Distortion of Complex Sounds: Interference and Resonance*.—In discussing the subject of loudness the direct and reflected sounds have been spoken of as if always reinforcing each other when they come together. A moment's consideration of the nature of sound will show that as a matter-of-fact it is entirely possible for them to oppose each other. The sounding body in its forward motion sends off a wave of condensation, which is immediately followed through the air by a wave of rarefaction produced by the vibrating body as it moves back. These two waves of opposite character taken together constitute a sound-wave. The source continuing to vibrate, these waves follow each other in a train. Bearing in mind this alternating character of sound, it is evident that should the sound travelling by different paths—by reflection from different walls—come together again, the paths being equal in length, condensation will arrive at the same time as condensation, and reinforce it, and rarefaction will, similarly, reinforce rarefaction. But should one path be a little shorter than the other, rarefaction by one and condensation by the other may arrive at the same time, and at this point there will be comparative silence. The whole room may be mapped out into regions in which the sound is loud and regions in which it is feeble. When there are many reflecting surfaces the interference is much more complex. When the note changes in pitch the interference system is entirely altered in character. A single incident will serve to illustrate this point. There is a room in the Jefferson Physical Laboratory, known as the Constant-temperature Room, that has been of the utmost service throughout these experiments. It is in the centre of one wing of the building, is entirely under ground, even below the level of the basement of the building, has separate foundations and double walls, each wall being very thick and of brick in cement. It was originally designed for investigations in heat requiring constant

¹ A series of papers by Wallace C. Sabine, Assistant-Professor of Physics at Harvard University.

temperature, and its peculiar location and construction were for this purpose. As it was not so in use, however, it was turned over to these experiments in sound, and a room more suitable could not be designed. From its location and construction, it is extremely quiet. Without windows, its walls, floor, and ceiling—all of solid masonry—are smooth and unbroken. The single door to the room is plain and flush with the wall. The dimensions of the room are, on the floor, 4.27 x 6.10 metres; its height at the walls is 2.54 metres, but the ceiling is slightly arched, giving a height at the centre of 3.17 metres. This room is here described at length because it will be frequently referred to, particularly in this matter of interference of sound. While working in this room with a treble *c* gemshorn organ-pipe blown by a steady wind-pressure, it was observed that the pitch of the pipe apparently changed an octave when the observer straightened up in his chair from a position in which he was leaning forward. The explanation is this: The organ-pipe did not give a single pure note, but gave a fundamental treble *c* accompanied by several overtones, of which the strongest was in this case the octave above. Each note in the whole complex sound had its own interference system, which, so long as the sound remained constant, remained fixed in position. It so happened that at these two points the region of silence for one note coincided with the region of reinforcement in the other, and *vice versa*. Thus the observer in one position heard the fundamental note, and in the other, the first overtone. The change was exceedingly striking, and as the notes remained constant, the experiment could be tried again and again. With a little search it was possible to find other points in the room at which the same phenomenon appeared, but generally in less perfection. The distortion of the relative intensities of the components of a chord that may thus be produced is evident. Practically almost every sound of the voice in speech and song, and of instrumental music, even single-part music so-called, is more or less complex, and, therefore, subject to this distortion. It will be necessary, later, to show under what circumstances this phenomenon is a formidable danger, and how it may be guarded against, and under what circumstances it is negligible. It is evident from the above occurrence that it may be a most serious matter, for in this room two persons side by side can talk together with but little comfort, most of the difficulty being caused by the interference of sound.

There is another phenomenon, in its occurrence allied to interference, but in nature distinct—the phenomenon of resonance. Both, however, occasion the same evil—the distortion of that nice adjustment of the relative intensities of the components of the complex sound that constitutes speech and music. The phenomenon of interference just discussed merely alters the distribution of sound in the room, causing the intensity of any one pure sustained note to be above or below the average intensity at near points. Resonance, on the other hand, alters the total amount of sound in the whole room and always increases it. This phenomenon is noticeable at times in using the voice in a small room, or even in particular locations in a large room. Perhaps its occurrence is most easily observed in setting up a large church-organ, where the pipes must be readjusted for the particular room in which the organ is to stand, no matter with how much care the organ may have been assembled and adjusted before leaving the factory. The general phenomenon of resonance is of very wide occurrence, not merely in acoustics but in more gross mechanics as well, as the vibration of a bridge to a properly timed tread, or the excessive rolling of a boat in certain seas. The principle is the same in all cases. The following conception is an easy one to grasp, and is closely analogous to acoustical resonance: If the palm of the hand be placed on the centre of the surface of water in a large basin or tank and quickly depressed and raised once it will cause a wave to spread, which, reflected at the edge of the water, will return, in part at least, to the hand. If, just as the wave reaches the hand, the hand repeats its motion with the same force, it will reinforce the wave travelling over the water. Thus reinforced, the wave goes out stronger than before and returns again. By continued repetition of the motion of the hand so timed as to reinforce the wave as it returns, the wave gets to be very strong. Instead of restraining the hand each time until the one wave travelling to and fro returns to it, one may so time the motion of the hand as to have several equal waves following each other over the water, and the hand each time reinforcing the wave that is passing. This, obviously, can be done by dividing the interval of time between the suc-

cessive motions of the hand by any whole number whatever, and moving the hand with the frequency thus defined. The result will be a strong reinforcement of the waves. If, however, the motions of the hand be not so timed, it is obvious that the reinforcement will not be so perfect, and, in fact, it is possible to so time it as exactly to oppose the returning waves. The application of this reasoning to the phenomenon of sound, where the air takes the place of the water and the sounding body that of the hand, needs little additional explanation. Some notes of a complex sound are reinforced, some are not, and thus the quality is altered. This phenomenon enters in two forms into the architectural problem: there may be either resonance of the air in the room or resonance of the walls, and the two cases must receive separate discussion; their effects are totally different.

The word "resonance" has been used loosely as synonymous with "reverberation," and even with "echo," and is so given in some of the more voluminous but less exact popular dictionaries. In scientific literature the term has received a very definite and precise application to the phenomenon, wherever it may occur, of the growth of a vibratory motion of an elastic body under periodic forces timed to its natural rates of vibration. A word having this significance is necessary; and it is very desirable that the term should not, even popularly, by meaning many things cease to mean anything exactly.

3. **CONFUSION: Reverberation, Echo and Extraneous Sounds.**—Sound, being energy, once produced in a confined space, will continue until it is either transmitted by the boundary walls, or is transformed into some other kind of energy, generally heat. This process of decay is called absorption. Thus, in the lecture-room of Harvard University, in which, and in behalf of which, this investigation was begun, the rate of absorption was so small that a word spoken in an ordinary tone of voice was audible for five-and-a-half seconds afterwards. During this time even a very deliberate speaker would have uttered the twelve or fifteen succeeding syllables. Thus, the successive enunciations blended into a loud sound, through which and above which it was necessary to hear and distinguish the orderly progression of the speech. Across the room this could not be done; even near the speaker it could be done only with an effort wearisome in the extreme if long maintained. With an audience filling the room the conditions were not so bad, but still not tolerable. This may be regarded, if one so chooses, as a process of multiple reflection, from walls, from ceiling and from floor, first from one and then another, losing a little at each reflection until ultimately inaudible. This phenomenon will be called reverberation, including as a special case the echo. It must be observed, however, that in general, reverberation results in a mass of sound filling the whole room, and incapable of analysis into its distinct reflections. It is thus more difficult to recognize and impossible to locate. The term echo will be reserved for that particular case in which a short, sharp sound is distinctly repeated by reflection, either once from a single surface, or several times from two or more surfaces. In the general case of reverberation, we are only concerned with the rate of decay of the sound. In the special case of the echo, we are concerned not merely with its intensity, but with the interval of time elapsing between the initial sound and the moment it reaches the observer. In the room mentioned as the occasion of this investigation, no discrete echo was distinctly perceptible, and the case will serve excellently as an illustration of the more general type of reverberation. After preliminary gropings, first in the literature and then with several optical devices for measuring the intensity of sound, both were abandoned, the latter for reasons that will be explained later. Instead, the rate of decay was measured by measuring what was inversely proportional to it—the duration of audibility of the reverberation, or, as it will be called here, the duration of audibility of the residual sound. These experiments may be explained to advantage even in this introductory paper, for they will give more clearly than would abstract discussion an idea of the nature of reverberation. Broadly considered, there are two, and only two, variables in a room—shape, including size, and materials, including furnishings. In designing an auditorium an architect can give consideration to both; in repair work for bad acoustical conditions it is generally impracticable to change the shape, and only variations in materials and furnishings are allowable. This was, therefore, the line of work in this case. It was evident that, other things being equal, the rate at which the reverberation would disappear was proportional to the rate at which the

sound was absorbed. The first work, therefore, was to determine the relative absorbing power of various substances. With an organ-pipe as a constant source of sound, and a suitable chronograph for recording, the duration of audibility of a sound after the source had ceased in this room when empty was found to be 5.62 seconds. All the cushions from the seats in Sanders Theatre were then brought over and stored in the lobby. On bringing into the lecture-room a number of cushions having a total length of 8.2 metres, the duration of audibility fell to 5.33 seconds. On bringing in 17 metres the sound in the room after the organ-pipe ceased was audible for but 4.94 seconds. Evidently, the cushions were strong absorbers and rapidly improving the room, at least to the extent of diminishing the reverberation. The result was interesting and the process was continued. Little by little the cushions were brought into the room, and each time the duration of audibility was measured. When all the seats (436 in number) were covered, the sound was audible for 2.03 seconds. Then the aisles were covered and then the platform. Still there were more cushions — almost half as many more. These were brought into the room, a few at a time, as before, and draped on a scaffolding that had been erected around the room, the duration of the sound being recorded each time. Finally, when all the cushions from a theatre seating nearly fifteen hundred persons were placed in the room — covering the seats, the aisles, the platform, the rear wall to the ceiling — the duration of audibility of the residual sound was 1.14 seconds. This experiment, requiring, of course, several nights' work, having been completed, all the cushions were removed and the room was in readiness for the test of other absorbers. It was evident that a standard of comparison had been established. Curtains of chenille, 1.1 metres wide and 17 metres in total length, were draped in the room. The duration of audibility was then 4.51 seconds.

Turning to the data that had just been collected it appeared that this amount of chenille was equivalent to 30 metres of Sanders Theatre cushions. Oriental rugs, Herez, Demirjik and Hindoostanee, were tested in a similar manner; as were also cretonne cloth, canvas and hair-felt. Similar experiments, but in a smaller room, determined the absorbing power of a man and of a woman, always by determining the number of running metres of Sanders Theatre cushions that would produce the same effect. This process of comparing two absorbers by actually substituting one for the other is laborious, and it is given here only to show the first steps in the development of a method that will be expanded in the following papers.

In this lecture-room felt was finally placed permanently on particular walls, and the room was rendered not excellent, but entirely serviceable, and it has been used for the past three years without serious complaint. It is not intended to discuss this particular case in the introductory paper, because such discussion would be premature and logically incomplete. It is mentioned here merely to illustrate concretely the subject of reverberation, and its dependence on absorption. It would be a mistake to suppose that an absorbent is always desirable, or even when desirable that its position is a matter of no consequence.

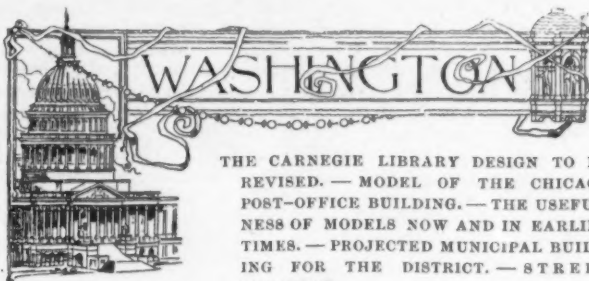
While the logical order of considering the conditions contributing to or interfering with distinct hearing would be that employed above, it so happens that exactly the reverse order is preferable from an experimental standpoint. By taking up the subject of reverberation first it is possible to determine the coefficients of absorption and reflection of various kinds of wall surface, of furniture and draperies, and of an audience. The investigation of reverberation is now, after five years of experimental work, completed, and an account will be rendered in the following papers. Some data have also been secured on the other topics and will be published as soon as rounded into definite form.

The above paper may be regarded as introductory to the general subject of architectural acoustics, and immediately to a series of articles dealing with the subject of reverberation.

WALLACE C. SABINE.

[To be continued.]

THE IRON AND STEEL TRUSTS. — The *Iron Age* has issued a complete directory of the existing consolidations in the iron and steel and allied trades which shows that 358 concerns have been absorbed into 28 combinations, having in the aggregate \$998,300,000 of authorized capital, more than half of which has been issued.



THE plans for the new library building, with which Mr. Andrew Carnegie's gift of \$350,000 is about to endow the City of Washington, are in the hands of Mr. Bernard R. Green, the engineer, who will superintend the construction. The drawings have been carried out to an admirable completeness and show an amount of study of the aesthetic possibilities of the problem highly creditable to the architects, Messrs. Ackermann & Ross, of New York. Mr. Green's estimates, however, based upon a detailed survey of the quantities of material and labor involved, show the necessity for a revision of the plans which must effect a reduction of cost amounting to as much as 40 per cent of the whole, and he has so reported.

So considerable a reduction calls for an overhauling which must strain the patience of the architects and tax their skill to save the vital elements of the design. It will involve a delay, probably of some months, in the final completion of the building. Let us hope that this regrettable necessity may bring compensation to the architects and to the building in a gain of simplicity, and may leave to the design that enduring groundwork of noble terseness which a seemingly cruel "swiping" of adjectives sometimes forces upon the written page. The experience of many architects might offer them the consolatory reflection that those features of the design which they must now ruefully sacrifice may seem of less moment to them when they view their finished work in after years.

The site for the new library in Mount Vernon Square is central and convenient, but it is gained at the expense of one of those public reservations which are the glory of Washington, and it partly destroys the only breathing-place in a crowded and somewhat unbecoming portion of the city. This choice was determined by a false economy on the part of Congress, and precipitated by the contest of sectional and personal interests among citizens. Again it is a pity that in a work of public character the principle of doing things in the best way should be set aside for a compromise.

There may be seen at the Treasury Department a lately completed model of Mr. Henry Ives Cobb's Chicago Post-office Building. The model is at a large scale and finished with great perfection of skill. It was done by M. Garet, who came to this city from Paris some years ago and has remained to execute some notable successes in the field of decorative sculpture. Incidentally, it is to be regretted that M. Garet finds himself very much out of pocket on this model, which he has, nevertheless, with the sentiment of a true artist, carried out most admirably, sparing no labor of brain and tool to bring out the grace of the carved capital, the swell of the shaft, and to give a sharp sure edge to the cancellation of the columns, which, as a worker in plaster remarked to me while looking at it, requires a degree of technical excellence not easily attained.

Models are costly to build; nevertheless, it would be well were they more often made. It would save us a lot of *ex-post-facto* criticism, and from some of those architectural aberrations which the riotous fancy of untamed professional genius imposes upon clients and the public.

Few persons really understand architectural drawings and diagrams to scale. To build up in one's mind from this cold abstraction of lines vertical and horizontal, of numbers and notes in technical shorthand, a brain-picture of the building they stand for, is not easy. To fully realize the effect of a design, the relation of members to themselves and to the whole, the emphasis of light and shade, the projections of cornices, and the function of the various details in giving character to the physiognomy of the building — as the features make up the human face — to get all this out of the merest suggestion by means of an assemblage of conventional symbols, is an intellectual task to which not all of us are equal. The architect himself is not always quite up to it. He has imagined the probable *ensemble*, has, perhaps, done a freehand sketch of the scheme with a few shadows blocked in. If a perspective drawing has been made, it is usually conceived from a point-of-view from which, without costly demolitions, the building can never be seen. The florid imagery of the facile water-colorist has been allowed to play at will upon his subject, impressionist indications of birds and trees and wierd human forms, in scale calculated to suggest superlative monumental dignity in the proportions of the building behind them, lend an air of realism to the view, while from a sky whose masterly handling may be relied upon to divert attention from certain slight necessary "fakings" of roofs and chimneys, a glorious flood of "the light that never shone" bathes the projected structure.

While this is all very pretty in its way, it is misleading, and lacks the hard directness of practical and prosaic fact.

A model is the only thing for the layman. There should be a

model of every important projected building, one built to fairly generous proportions and somewhat carefully detailed. One may then walk round and study it from all sides. With the eye at the right level and a slight mental allowance for reduction of scale, it is possible to evoke the real appearance, to approximate very nearly the actuality. The model is scarcely less necessary for the architect himself.

Leon Battista Alberti, illustrious disciple of the great Brunellesco, insisted strongly upon this in his fifteenth-century treatise on architecture.

Models in wood were made for all-important buildings by the architects of the Renaissance in Italy, and were frequently worked-out with great minuteness and liberal expenditure of time and labor. Many such are to be seen in Rome, Pavia and Bologna. Brunellesco's model for the dome of Sta. Maria del Fiore is in the Opera del Duomo at Florence. Tommaso Formentone's model for the Loggia at Brescia was brought there, in 1489, on a wagon drawn by four horses. In a word, the custom of that time was to undertake no monumental building without previous careful study of a model. They could better afford, perhaps, than we to dispense with that aid, for it was in the golden age of the "humanists," remember, when to be amateur of the arts was expected of persons of consequence, and when knowledge in matters architectural and in matters of cultivated taste was apparently more general among the educated classes, and certainly more so among the Italian people, than it is with us and in our day.

The Chairman of the Committee on Public Buildings and Grounds, Mr. Mercer, of Nebraska, has introduced a bill which will interest the architectural world. It provides \$2,500,000 for the purchase of a site and the erection of a Municipal Building for the District of Columbia. The site is to be one of the squares of ground on the south side of Pennsylvania Avenue. The selection will be made by a Commission constituted of the Secretary of the Treasury, the Attorney-General, and the Engineer Commissioner of the District. They are instructed to procure offers from the property-owners. When the owners of three-fourths of all the land in any three squares of those designated shall have submitted propositions of sale, the Commission may proceed to acceptance of such proposition, resorting to condemnation in procuring the unoffered balance. The price paid for the site is not to exceed the actual cash value of the property, and the average price per square foot is not to exceed that at which any other square, above named, is offered for sale to the Commission. The effect of the last clause may somewhat complicate the issue and hamper the selection of a perfectly central location for the building, which would, in the nature of the case, otherwise largely affect their decision.

The site procured, the Commissioners of the District are authorized to invite six architects or firms of architects, of conspicuous ability and experience, to submit competitive designs for the building upon a carefully drawn programme, the competition to be adjudged by the Commissioners acting with two other persons to be selected by the competing architects. The author of the selected design will be employed as architect of the building to act under direction of the office of construction, which will be in charge of an officer of the Government, specially qualified for the duty, who will make all contracts and employ all necessary services.

The architect will furnish all designs and drawings required for the construction of the building and needful for its artistic completion, with three per centum of the total cost of said building as full compensation for his services. Each other invited competing architect will receive not to exceed \$500.

The building is to be fireproof and designed to accommodate the municipal offices of the District of Columbia. Its total cost, including site, is not to exceed the amount of proposed appropriation, \$2,500,000, chargeable one-half to the revenues of the District and the residue to the Treasury of the United States.

The area and values of the squares named, recently reported by the Commissioners to Congress, vary from about thirty-one thousand square feet to one hundred and forty-eight thousand square feet, and from three hundred and eighteen thousand dollars to nine hundred and sixty-seven thousand dollars.

To the student of municipal affairs the peculiar form of government which the national capital enjoys would seem, at first glance, to offer the best possible conditions for the development of progressive ideas and the evolution of an ideal system of municipal administration. The governing power is in the hands of three Commissioners appointed by the President. One of these is an officer of the Corps of Engineers of the Army of the United States. The other two are from civil life, one, at least, being a citizen of the District. They are answerable to no constituencies. In conformity with Acts of Congress governing that matter, they expend the revenues of and appropriations for the District. Each House of Congress has a Standing Committee on District Affairs, some members of which are property-holders and practically residents here, men who fully understand local needs. Under these conditions we might reasonably expect to find a handling of city affairs which would stand as a great object-lesson to the country. The visitor from all parts of the nation and from foreign lands should be impressed by the perfect working of a perfect system. But, unfortunately, the observant stranger must take away with him quite different impressions.

In the first place, he will find the asphalt streets of a city without heavy traffic, presenting the easiest of street-cleaning problems, very

frequently in a state far from satisfactory, sometimes in one of deplorable neglect. Just now, for instance, the last snowfall, a moderate one, has been lying untouched for days. The crossings are practically impassable. Gutters and sewers have not been cleared, even upon the principal thoroughfares, and one must wade to the curb through ponds of slush. One alights from the street-car into drifts ankle-deep, thrown up along the tracks by the tram snow-sweeper. The best walking is found between the rails, where the sun has melted off what the brushes left.

The sun and rain are after all the main dependence of the Washington Street-cleaning Department in the removal of snow, and in the variable climate of the place they may be generally relied upon to arrange matters, but not always. For a fortnight after a light snowfall early in the present winter the snow lay and melted where it fell, accumulating unspeakable filth the while, and I think that no one in all that time saw a man or a brush at work upon the streets. The discomfort and inconvenience were aggravated by one's sense of the danger to the public health in such a condition of the streets.

When it rains the street-cleaning force is again not in evidence, although it is just the time, surely, when they should be out to a man, actively availing themselves of nature's aid. Water does not, in fact, play a due part in the cleaning operations. The streets are not washed. There is no flushing of gutters, a most necessary detail, one of the first importance. If the reader has, perhaps, watched the cleaning of the streets of Paris he will have realized what a prime factor water is in the operation. From the plugs set in the curb there is a full rush of water into the gutters; these are partially dammed at the street corners, until the water rises so as to lap the crown of the street, while a squad of men and women scrub down the whole pavement with their long brush-brooms. It is only the fairly early riser who will have witnessed this daily toilet of the street, which, as a rule, is over before the world is astir.

In Washington, work upon the streets goes on at inconvenient hours. On fair days — and, as I have said, they do little on others — the pedestrian, even in the visiting hours of the late afternoon, has now and then to dodge small dust-storms, raised by the belated broom-wielders of the Cleaning Department. These laborers are well paid at about a dollar and a quarter a day, and might reasonably be required to turn out earlier for the convenience of citizens. In this respect, and in the more liberal use of water on the streets, it would seem that the Department could do better even with the insufficient means at its disposal. For the means are utterly inadequate, and our streets are neglected because of niggardly appropriations. Congress granted for the year ending June 30, 1899, in all \$201,000 for this work, as follows: —

Experimental hand-cleaning without contract	\$15,000
All contract cleaning.....	130,000
Salaries.....	24,000
Snow-and-ice work.....	32,000
Total.....	\$201,000

The Commissioners had urged the superiority of hand-cleaning to machine-work, and claimed that it could be done at a saving under their own control.

In detail the experiment was carried out as follows: With 38 men and 4 horse-carts working 249½ days they removed 3,820 cubic yards of debris from an area of 75,356,385 of paved streets at a cost of \$13,564.87. This gave 18 cents per 1,000 square yards. The contract price was 32 cents per 1,000 square yards, and the same area cleaned under contract cost \$24,114.

If the total area of 184,815,755 square yards hand-cleaned during the year had been done without contract it would have cost the District \$25,874 less. Were the entire paved area of the city, which amounts to 3,600,000 square yards, cleaned daily by hand, which it should be, and done without contract, it would result on the basis of these figures, 18 to 32, in a saving of \$136,080 to the District, a strong point "in favor of the abolition of the contract system," as the Superintendent of Street Cleaning maintains.

It is from the report of the Superintendent that the above results are quoted. To the figures should be added, that the cleaning without contract gave also much better results. On this showing Congress was induced to insert in the pending bill for District appropriations that not over 22 cents per 1,000 square yards was to be paid for hand-cleaning, but declined to discontinue the contract system.

The Commissioners let the contract at 21½ cents and were thus enabled to extend the area cleaned daily by hand to 1,200,000 square yards, which is about one-third of the city's entire paved area. The cleaning done under this contract has been by no means so satisfactory as that done under direct control of the Department, and the continued efforts of the Commissioners to keep the contractors up to their obligations have had only partial success. The contractor's business, loosely managed, has now been brought before the courts for the appointment of a receiver.

The item of \$32,000 for snow-and-ice work has an interesting history. The winter of '98-'99 was, in the words of the report, "without precedent in the history of Washington for cold weather, violent storms and deep snows."

There were severe demands on the \$1,000 annually allowed by Congress for snow work. The amount was used up on the first snowfall. Congress was then asked for an additional \$5,000 for this purpose. \$1,000 was granted. This was used up by the end of January. A third storm and a third call for money, to relieve the

snowbound city, brought out an appropriation of \$10,000 several days too late. This sum barely served to open crossings and gutters and partially relieve some of the business streets from banks of melting snow. The great blizzard added 37 inches to this, and effectually blocked many streets. An appeal to Congress for \$20,000 in this emergency was promptly granted, and made available in time to open gutters and sewers and avert the threatened flooding of cellars.

In the face of this experience Congress has for the current year fallen back upon the regular appropriation of \$1,000, and the city waits in miserable discomfort and inconvenience, with that long-suffering patience which characterizes our people, for tardy special appropriations to meet each recurring emergency. The Superintendent of Street Cleaning asks for \$30,000 for snow-and-ice work, the unexpended balance, if any, to be turned into the treasury. It would need a deeper study of the Congressional mind than we have space for here to explain why he does not get it.

On the score of proved economy and increased efficiency, he asks for the abandonment of the contract system, whose working has been a signal failure. He wants more money in order to increase the area daily cleaned by hand, and to have more frequent machine-sweeping, if that method must be adhered to. One-third of the streets are cleaned by hand, the remainder by machine, one-third of them twice a week, the balance but once. The Superintendent wants more money for sprinkling. He should have it, with enough more to make daily washing-down of gutters feasible.

He "respectfully renews" his recommendations for \$40,000 for the removal of ashes and debris, and the manner of this renewal does him credit, for as yet that picturesque survival, the private ash-man, is still relied upon here for the performance of one of the most important functions in the detail of sanitary control of the city.

The result of his irregular attendance is that cellars and backyards are mostly filled with mounds of ashes and refuse. Much of this finds its way into the alleys, from the houses of the poor, and thence the winds distribute the lighter part of it impartially about the city. The report deprecates the practice of sweeping peelings, paper-bags, boxes, cans, broken crockery, old shoes, rags, bottles and general junk into the streets, "as many of them are swept but once a week." This indicates a truly Oriental richness of foreground in the city landscape in certain regions.

The municipality must remove and consume the waste. Practice elsewhere has firmly established this procedure. It is not possible to compel individuals to do it in the way necessary to safeguard the city's health. Police regulations are powerless to enforce unpopular and arbitrary laws. The attempt to drive citizens to the performance of duties which properly belong to the government is costly and ill-advised.

Based upon this same false principle is the so-called "snow-and-ice law," imposed by Congress upon this city, which requires the Commissioners on failure of owner, agent, or tenant, to have snow and ice, dirt, sand, etc., removed from all paved sidewalks and alleys, shovelled thence into the roadway only, and to assess the cost of removal as a tax against the property. The Court of Appeals has had to decide that this law as applied to agents is defective. Appeal from owners will, doubtless, have a like result.

The law in its working is arbitrary and unpopular, inflicting needless indignities upon the householder. It is, therefore, likely to remain practically inoperative, the more so, as no appropriation is made for its enforcement.

In a word, Washington's status among well-governed cities leaves something to be desired, and the nation should take shame that it is so, for it should not be forgotten that Washington and our friend "Lo" are the "wards of the nation."



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

CENTRAL PAVILION OF THE BOTANICAL MUSEUM, BRONX PARK, NEW YORK, N. Y. MR. R. W. GIBSON, ARCHITECT, NEW YORK, N. Y.

COTTAGE FOR W. A. GRANT, ESQ., NEWPORT, R. I. MR. CREIGHTON WITHERS, ARCHITECT, NEWPORT, R. I.

HOUSE OF D. R. FRANCIS, ESQ., JAMESTOWN, R. I. MR. CREIGHTON WITHERS, ARCHITECT, NEWPORT, R. I.

CHOIR-STALLS IN THE CATHEDRAL, BADAJOZ, SPAIN.

This plate is copied from "Monumentos arquitectonicos de España."

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

PLAN OF THE PAN-AMERICAN EXPOSITION, BUFFALO, N. Y.

THE Exposition Grounds include 350 acres, of which 133 acres are improved park lands, a part of Delaware Park. The grounds are about one mile from north to south and a half mile from east to west. Their situation is in the northern part of the city,

accessible from every direction, the park lands forming the southern part of the extensive grounds.

To the visitor who approaches the Exposition from the south entering the grounds on Lincoln Parkway, once inside the gates, the station of the intramural railway, which encircles the grounds, is at his left. On the right is the refectory. The Lake is dotted with boats. On the left is the Albright Art Gallery (Fig. 1) presented by a Buffalo citizen, who has taken this opportune time to make the city a magnificent gift. It is a permanent building, the home of Buffalo's best public art treasures, and will serve as the Art Building for the Exposition.

The sightseer now crosses a bridge that spans a narrow channel between the Lake (B) and the North Bay (C), and taking the objects of interest as they come—a winding path leads around the shore of the North Bay to the permanent building erected by the State of New York (9), in conjunction with the Exposition Directorate, as the home of the collection of the Buffalo Historical Society. Rather than cross the intramural railway tracks on the small bridge in the Music Gardens (F), it is best to retrace one's steps to the Approach (D).

As one comes to the Fore Court (E), the view still broadens. The buildings seem more lofty. Their rich coloring and elaborate decoration begin to touch the vision with their attractive lines.

Directly east of the Fore Court is the great Court of the State and Foreign Buildings (H), which is about one thousand feet long and contains many buildings representing the leading States and nations of the Three Americas. The Music Gardens are directly west of the Fore Court.

Crossing the Triumphal Bridge (G) to the Esplanade (K), in which there is room for 250,000 people, the visitor is now fairly within the Grand Court formed by the main group of Exposition buildings. The court is of the shape of an inverted T. The Approach, Fore Court and Bridge are about one thousand feet in length, three hundred feet wide. The Main Court is 2,000 feet long, 500 feet wide, and the transverse court, across the Esplanade, is 1,700 feet from east to west. On either side of the Triumphal Bridge are the Mirror Lakes (I-I), parts of the grand canal which completely encircles the great group of buildings. The canal is lined with young trees and banked with grass on its outer edge. Picturesque bridges cross it at many points.

Standing on the Esplanade and facing north the great group of buildings at the right, at the extreme east end of the transverse court, are those of the Federal Government (2-2-2). The main building is 600 feet long by 130 feet wide. A central dome rises to a height of 250 feet above the main floor, and is surmounted by a statue of "Victory," 20 feet high. The lesser buildings, each 150 feet square, are west of the main building 150 feet on the north and south lines of the main structure. Curved colonnades connect the smaller buildings with the greater, forming a spacious semicircular court opening to the west. The Government exhibits will include the aquariums and ichthyological collection of the United States Fish Commission and extensive collective exhibits from the Philippines, Porto Rico and Hawaii.

At the far western end of the broad transverse court is the Horticultural Building (7) 220 feet square, flanked on the north by the Graphic Arts Building (6) and on the south by the Forestry and Mines Building (5). They are connected by circular arcades, forming a broad court similar to that enclosed by the Government group. Behind the arcades are the conservatories. The Esplanade is to be made beautiful with fountains, sunken gardens, pergolas and colonnades.

Immediately north of the Esplanade is the Court of the Fountains (Q). At the right is the Ethnological Building (3) and at the left the Music Building (4), each 150 feet square. The Court of the Fountains is to be the great centrepiece of the Exposition. Here the principal electrical displays are to take place. The Court is to be illuminated at night with the diffused light of more than 100,000 incandescent electric-lamps, the distribution being so perfect that there will be no shadows. Colors will be extensively employed to produce fantastic effects. The huge steel tower (14) 350 feet high, which stands at the north end of the Court of the Fountains, will be used in the production of extraordinary electric features. One of these will be an electric water-fall 30 feet wide and of 70 feet descent, from a niche in the tower. The tower itself is of imposing design and intricate workmanship. The many fountains in the great basin of the court will be made beautiful at night by means of electric-lights of all colors.

Opposite the Court of the Fountains are the two big buildings of the Exposition, the Machinery and Transportation Building (11), on the west, and the Manufactures Building (10), on the east. These are each 500' x 350', and each has a beautiful tropical court with an aquatic pool in the centre.

To the right of the Mall is the Agricultural Building (12), 500' x 150', and to the left the Electricity Building (13), of the same general proportions. East of the Agricultural and Manufactures Buildings are the Live Stock Exhibits (18). About ten acres are devoted to these. West of the Machinery and Transportation Building is the Service Building (17).

The tower (14) already mentioned divides the Court of the Fountains from the Plaza. It stands in a large aquatic basin, and a picturesque bridge enables the visitor to reach it from the Plaza. In the tower, at the height of 70 feet, is a large restaurant. There

are promenade-floors at various heights, and a balcony near the summit, from which a bird's-eye view of the Exposition, the city, Lake Erie, Niagara River and the open country may be obtained. All the floors are reached by means of elevators.

The Plaza (Y) is 500' x 350'. Standing at the Tower Bridge, at the right is the Stadium Building (Z), 341 feet long by 52 feet wide, with towers 164 feet high. This ornate building forms the entrance to the Athletic Field or Stadium (O), where 25,000 people may be seated to witness the athletic contests to be provided. The Athletic Carnival of 1901 is intended to be the greatest ever given in America. The Stadium covers about ten acres, and resembles in a general way the one erected at Athens a few years ago. It contains a quarter-mile running-track and ample space within for exhibitions of skill and feats of strength. The entrances are made large, so as to admit floats, etc., as the Stadium is to be used for certain pageants, exhibits of automobiles in operation, the judging of live-stock, agricultural and road machinery.

On the west side of the Plaza is a large Restaurant Building (V), of the same dimensions as the Stadium entrance. This forms also the entrance to the Midway, to which twenty acres of space are devoted.

At the north side of the Plaza is the Propylæa (U), consisting of two monumental entrances connected by a curved colonnade forming a screen and separating the railway station from the Exposition. It is at this station that the steam-railway trains from all parts of the country will discharge such of their passengers as desire to go direct to the Exposition. Electric-cars will connect for all parts of the city.

The general style of the buildings is that of the Spanish Renaissance, modified to suit the character of an exposition. There is to be a generous use of color, the red roofs and tinted walls giving the completed work a festival aspect.

[Additional Illustrations in the International Edition.]

HOUSE OF R. GUGGENHEIMER, ESQ., NO. 923 FIFTH AVENUE, NEW YORK, N. Y. MR. ROBERT MAYNICK, ARCHITECT, NEW YORK, N. Y.

[Gelatin Print.]

SOUTHEAST PAVILION OF THE MUSEUM OF NATURAL HISTORY, NEW YORK, N. Y. MESSRS. CADY, BERG & SEE, ARCHITECTS, NEW YORK, N. Y.

[Gelatin Print.]

BOTANICAL MUSEUM, BRONX PARK, NEW YORK, N. Y. MR. R. W. GIBSON, ARCHITECT, NEW YORK, N. Y.

[Gelatin Print.]

WEST HAM TECHNICAL INSTITUTE, ENG. MESSRS. GIBSON & RUSSELL, ARCHITECTS.

MAIN ENTRANCE TO THE SAME.

SMOKING-ROOM: ALBION HOTEL, LINCOLN, ENG. MESSRS. W. WATKINS & SON, ARCHITECTS.



FOREST TREES AND LIGHTNING. — The overseers of nine forestry stations in the dukedom of Lippe have made an examination of trees struck by lightning throughout an area of 45,000 acres, in order to ascertain for the German government the susceptibility of various trees to lightning, and its effects and occurrence in general. As a result of their observations it was found the oak tree was by far the most liable to lightning, in spite of the fact that they were not as frequent as other trees in the forest. The percentages of the various species were given as follows: Beech, 70 per cent; oak, 11; pines, 13, and firs, 6. During the several years through which these observations were made, 275 trees were struck by lightning, and of these 159 or 58 per cent were oaks, 59 or 21 per cent firs, 21 or 8 per cent beeches, and 20 or 7 per cent pines, the other varieties damaged being still less in number. — *N. Y. Evening Post*.

DEATH OF PIAZZI SMYTH. — Charles Piazza Smyth, ex-Astronomer Royal of Scotland, died on February 21. He was born at Naples, and was called "Piazz" after the discoverer of Ceres, who was the official astronomer of the two Sicilies. He was interested in science at a very early age, and in 1845 was appointed Astronomer Royal of Scotland. He tried for many years to get a new observatory and at last he resigned after protesting vigorously against the ways of officialdom. He then retired to Clova, in Yorkshire, where he devoted himself to the photographic study of the solar spectrum and of cloud-forms. He is best known, however, by his eccentric views relative to the Great Pyramid. A controversy relating to this "paradox of a very high order," as De Morgan called it, led to his resignation, in 1874, of his Fellowship of

the Royal Society. Among his views were that the Great Pyramid was erected under the eye of Melchisedec, according to a divinely inspired plan. Its interpretation, moreover, heralded the beginning of the millenium in 1882. The Israelitish origin of the Anglo-Saxon race and the reprobation of the decimal system of weight and measures were among his ideas. — *Scientific American*.

THE BORGHESE MUSEUM. — "The Italian government," says the *London World*, "has purchased the Borghese Museum and Gallery of Pictures for £144,000, which is to be paid to the family in ten years by annual instalments. Every great collector in the world has been urging the Borghese trustees to sell these collections for many years past, and £24,000 was offered for a single picture. The law forbids the trustees to sell the collections outside of Italy, and if a foreigner had purchased any of the pictures they could not have been removed from the country. It is, therefore, a forced sale, and the Government has made a wonderful bargain, for if the collections had been disposed of at Paris or in London they would have realized at least £300,000."

THE MUSEUM FEATURES OF THE THEATRE FRANCAIS. — Few Parisians even were aware of the value of the museum that was contained in the Théâtre Français. The corridors and dressing-rooms were hung with pictures by Mignard, Van Loo, David, Gros, Ingres, Delacroix, Isabey, Dubufe, Gérôme and Tony Robert-Fleury. The history of the museum is as follows: In 1777, when the company owned only a picture or two, Caffieri proposed to found a gallery of dramatists and actors, to which he himself made the first contributions. In 1815 there were a dozen paintings and about two dozen marbles. In 1850 Arsène Houssaye became Administrator-General, and his artistic taste gave great impetus to the collection, which was fostered with rare discrimination by his successor, Emile Perrin, and well cared for by the present Administrator-General, Jules Claretie. The catalogue of M. Monval, the librarian, reckons more than four hundred numbers, including one hundred and eighty pictures and ninety marbles. Nearly all of these have been saved, and are placed temporarily in the Louvre Gallery. — *C. I. B. in the N. Y. Tribune*.

DISCOVERY OF A ROMAN CHARIOT. — Writing from Philippopolis under date of 4th inst., Reuter's correspondent says: "An interesting discovery has lately been made by M. Georges Seure, Associate of the University of France, and a member of the French Archaeological School at Athens, in the shape of a Thracian triumphal car of the later Roman period, or about the fourth century, A. D. It was excavated in the tumulus called Douhova (ghosts' mound), at the foot of the Rhodopes, near the village of Pastousha, situated to the southwest of Philippopolis. In this barrow must have been buried the servants and belongings of some great general, who evidently fell in some battle fought close by. All the metallic fittings of the chariot, with small bronze figures as decorations, and the harness for one horse, were found, together with five human skulls and several semi-decayed swords and lances. M. Seure has put the whole together in perfect order, and the complete chariot is now exhibited in the museum here, with several earthenware pots and lachrymatories, also found in the barrow. By the express desire of Prince Ferdinand, who came down to see these interesting relics of antiquity, the chariot will remain in this town. The discovery has so pleased his Royal Highness that he has offered to give from his private purse the sum of 10,000 francs, to which the Bulgarian Government will add 5,000 francs and the French another 5,000 francs, for the purpose of continuing these archaeological researches in the country. M. Seure states that this is the third Roman chariot discovered. One of the two others, in marble, is preserved in the Vatican Museum at Rome. — *London Daily News*.

THE ROMAN CATACOMBS. — Monsignor Crostarosa, secretary to the Commissione di Archaeologia Sacra, has issued from Rome an appeal to archaeologists and to all those who are interested in Christian antiquities to subscribe toward the further exploration of the catacombs. These monuments, which are of the greatest historic importance to Christianity, and so vast in extent that they form an underground city, were places of pilgrimage for Romans and strangers till the ninth century. But from the ninth century until the nineteenth the catacombs were neglected, the entrances were blocked and in time hardly a site was remembered. In the sixteenth century a pioneer was found in the person of Bosius, but it was not until the present century that a new world was laid bare to the student by the excavations of De Rossi, who rediscovered the great cemetery of Callistus, and opened, or partially opened, several of the principal historic catacombs, making discoveries which exceeded all expectations in their interest to the antiquary, the liturgist and the theologian. The chief catacombs on the Appia, Nomentana, Salaria and Ardeatina are open, but are not completely explored; of the forty-five cemeteries about five only are permanently accessible to the visitor to Rome. After the death of De Rossi the Commission of Sacred Archaeology continued the excavations with excellent results. The work of De Rossi had been encouraged and aided by Pius IX, who willingly entered into the former's plans for excavating, and provided the money. Leo XIII has continued this generous aid, but the means at the disposal of the Commission are inadequate to the great task still to be performed. "Notable discoveries of the greatest importance to history still await us," says Monsignor Crostarosa. "The Commission hopes that it may be enabled to carry out some of these in the course of the current year, and appeals to the generous of all nations to assist in work — arduous and costly as it is — the results of which cannot but prove in the future, as they have proved in the past, of the first value to the Christian historian and the archaeologist." Those interested are requested to apply for all further information to Monsignor P. Crostarosa, Via del Quirinale, 24, secretary of the Commission. A list of subscribers will be published in due course in the *Nuovo Bollettino di Archeologia Cristiana*. — *London Times*.

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WHAT IS MINERAL WOOL AND WHAT ARE ITS USES?

MINERAL Wool is the product of a mixture of silica, alumina, lime and magnesia made fibrous (after melting) by superheated steam, making a mineral fibre resembling cotton, and Mineral Wool properly is a mineral fibre.

Its uses are many and various, fire and vermin proofing, insulation of heat and cold, and deadening of sound; every one of these qualities is valuable in the modern dwelling, as also in buildings for business purposes.

There is an erroneous impression among architects and builders that the use of Mineral Wool is precluded by its cost. On the contrary the extra expense of its use is far from being commensurate with its value in the additional comfort and protection it affords. This error has grown out of the fact that many overestimate the quantity necessary by not making sufficient deductions for timbers and openings, etc., which, for example, should be as follows: To find the quantity of ordinary Mineral Wool required to fill the outside walls the full thickness of studding, take the entire distance around the building on a horizontal line and multiply by the height of the studding, which will give the square feet of outside surface. Deduct ordinarily one-half to one-third for space occupied by doors, windows, etc. Multiply the remainder by the thickness of the studding and the result will be the number of pounds of Mineral Wool required to fill the space.

Rule.—One pound per square foot for each inch in thickness.

Example.—House 30 x 50; studding 2 x 4; 20 feet high.

60	
100	
160 feet around.	
studs 20 feet high.	
33,200 square feet.	
1,066	" " out for openings (4)
2,134	" " net.
4	inches thick.

8,536 pounds Wool will fill outside wall full thickness of 4-inch studding and from sill to plate.

The area of the roof, or so much as is necessary to protect, is ascertained easily, but the thickness of the wool is less, generally 3 inches only, and this will make the upper rooms cool in summer as well as keep them warm in winter. This is what the *Scientific American*, Builders' Edition, October, 1892, has said on this subject:—

"It is quite as important to build a house so as to keep out the heat in summer as to

keep it in in the winter. Few architects seem to think of this point, and it is quite common to hear one say that a poorly built house is a cool house. This is not so, but the contrary is true. It is the rule that the attics of our houses are veritable ovens, and so long as nothing but a thin coat of mortar and occasionally a poor board floor separate the sleeping-room from the attic, the former will approach, in temperature, very nearly to the latter. This difficulty can be overcome very easily and quite inexpensively. Mineral Wool placed between the rafters is an absolute preventive of such a condition of affairs, but one who is building a house should not stop here with the use of this material, for its low cost and its many desirable qualities should commend it for use throughout the house wherever cold and dampness are to be kept out, and heat is to be kept in in cold weather and out in warm weather. The fire-resisting qualities of Mineral Wool have long commended it to architects for this specific purpose, but, in our opinion, this is the least of its qualities, although it is an absolute resistant of fire. . . ."

The house or building so lined is very much protected from fire. How? The hollow spaces between the studding afford no draught (like flues) for the spread of fire, being filled in, the draughts are shut off, and such fires as frequently now occur, to the total destruction of the dwellings, where the upper rooms and roof are afire almost as soon as the fire begins in the basement, will be prevented. For still further protection from fires and for deafening of sound, many owners of residences also apply 2 inches thickness of Mineral Wool between a rough and a finished floor.

The method of ascertaining the quantity necessary for this purpose is as follows: Find the area to be covered by multiplying length by breadth of floor or floors; thus, we will assume it to be 16 feet wide by 20 feet long; this gives the area 320 square feet. Then multiply by two (the thickness of wool to be applied), total, 640 feet. From this deduct 15 to 20 per cent, according to your beams or joists and distance apart; this will give you a net result of 544 or 512, which gives you the net weight of Mineral Wool necessary for deafening such a floor; this computation is on the assumption that a cubic foot of wool weighs 12 pounds.

Not one pound of this material need be wasted; should there be any left after thoroughly lining your house you can cover your water-pipes, and thus prevent them from freezing in the winter, and thereby prevent the nuisance and expense of bursted pipes—for

Mineral Wool is a perfect protection against frost as well as fire.

ROOF LINING WITH MINERAL WOOL.

If the roof is protected by 3 inches of wool, whereby the heat is excluded, the upper rooms are as cool in summer as the lower floors.

Filling side-walls.

2 ends: 16' x 10' = 160' x 2 = 320 feet.
2 sides: 20' x 10' = 200' x 2 = 400 feet.

720 feet.
144 = 20 per cent for joist

576 net feet surface.
4" fillings full depth of joist 4 lbs. to each ft. surface.

2304 lbs. Mineral Wool.

To find number of cubic feet material required, divide total pounds by 12; result, number cubic feet wanted.

Where Mineral Wool is used in *partitions behind wire lathing* it is hardly possible for a general fire to penetrate, for as long as the wool is held in place by the wire lathing, no flame can pass through, or sufficient heat to blister woodwork on other side.

Sound can be effectually deafened by using ordinary Mineral Wool two or three inches deep.

A BIT OF HISTORY.

UNTIL the introduction of Berger's Classified Designs, Metal Ceilings could not be had in complete and definite artistic styles.

The decorative possibilities of the material were not at first fully understood or appreciated; little or no attention was paid to the matter of artistic consistency. There was no attempt at correct classification of designs; nor, in fact, did any manufacturer produce complete sets of plates in any of the different artistic styles.

Thus, more or less mixture of styles was inevitable. Hence, the "old idea" in Metal Ceilings has simply been to make as pleasing combinations as possible with the material available, regardless of higher artistic or architectural considerations.

As a result, the field of usefulness of Metal Ceilings was, in a measure, limited. Moreover, to the educated eye there was something lacking.

Each of Berger's Classified Designs has a definite style of ornamentation; and every individual plate or piece in that class is in harmony therewith.

The designs are first modelled in clay, with æsthetic technic, giving mobility, elegance, character and style, and evolving a higher expression of detail.

The stippled background used in many of



SECTION OF FACADE AT ENTRANCE TO U. S. EXHIBIT
IN MINES AND METALLURGY BUILDING, PARIS EXPOSITION, 1900
This Facade is 162 feet long, 15 feet high, and was Designed and Executed by
THE WINSLOW BROS. COMPANY

The Winslow Bros. Company Chicago Ornamental Iron and Bronze

the pieces enhances the rich plastic effect of the ornamentation.

The deep stamping brings out the detail in bold relief, and the fresco artist is enabled to give artistic expression and refinement by simple blending of colors.

Matters are simplified from a mechanical standpoint by stamping mouldings in connection with the borders and coves; and, wherever practicable, the pieces are stamped in long lengths, making them easier to apply and reducing the number of joints.

Thus, Metal Ceilings are elevated to a higher plane of architectural development; artistic and mechanical excellence are secured, at the same time, the advantages of Metal Ceilings in general are fully retained.

Each Classified Design conforms throughout to a definite artistic style; at the same time, a variety of patterns in each class is provided, permitting a wide range of variety in effect from the different combinations that can be made.

The purchaser is not forced to select from a conglomeration of pieces of different styles, but has only to pick, from the Classified Design of his choice, the particular combination that for his purpose is most suitable.

Thus, mixture of styles is avoided and yet full opportunity is afforded for the exercise of individual taste and judgment in making a selection.

Styles. — The series of Berger's Classified Designs embraces a variety of styles, such as Greek, Roman, Romanesque, Gothic, Moorish, Italian and German Renaissance, Rococo, Empire and Colonial; some of these styles being particularly suited for special work, as in churches, synagogues, hospitals, libraries, schools and dwellings; others for hotels, cafés, auditoriums, etc., as well as for a wide range of miscellaneous work.

Interested parties are urged to advise us of their requirements, and we will gladly furnish full details and estimates, and, if desired,

assist in the selection of styles suitable for the work in hand.

For further information address,
THE BERGER MANUFACTURING CO.,
CANTON, OHIO.

TAKE HEED LEST YE FALL.

A new catalogue has just been issued by the American Mason Safety Tread Co., which may be had by addressing the company in this city, or any of its agents who are located in large cities throughout the United States. The business of the company has vastly increased during the past year, this development being based on the growing appreciation of the fact that a safeguard is needed against the ever-present danger of slipping on stairways. Without the Safety Tread this danger increases as the stairs become worn by use. When wood, marble or slate is used for stair treads, the material becomes hollowed and shelving, necessitating frequent renewal or repairs. Iron soon becomes polished, especially at the edge, and is extremely unsafe.

The Mason Safety Tread is durable by reason of its steel base and steel ribs, which hold in place strands of lead running lengthwise of the stair. Alternating with these ribs are V grooves, which collect all dirt, and this is readily swept out. These grooves also have a holding power for the foot independent of the lead.

The Safety Tread is used in nearly every large city in this country, as well as in England, France and Germany. It is used wherever there is large traffic, as in school-houses, railroad-stations, public buildings, factories, busy stores, vessels of the United States Navy, on steps of street-cars, etc. It is endorsed and specified by architects and engineers of the highest reputation, and liberally used by real-estate owners and trustees in the repair of their property.

Send for the new catalogue and any desired information to the

AMERICAN MASON SAFETY TREAD CO.,
BOSTON, MASS.

ART IN METAL CEILINGS.

In the past, because metal ceilings were not artistic, a great many architects did not specify them.

That objection no longer holds good, — Berger's Classic Metal Ceilings have completely done away with it.

One can have metal ceilings that are thoroughly artistic and strictly in harmony — from top to bottom — all over, throughout, if one specifies Berger's Classic and sees that he gets them.

Berger's Classic Metal Ceilings are made in eleven complete and distinct artistic styles — Greek, Roman and Romanesque; Gothic and Moorish; German, French and Italian Renaissance; Rococo, Empire and Colonial — each provided with a variety of patterns to meet the requirements of different rooms.

If you have not seen our classic designs, it is more than likely you do not realize how effective they are.

Write for Catalogue No. 5; also kindly say if you would like our unabridged catalogue (in preparation), both of which are free to architects.

THE BERGER MANUFACTURING COMPANY,
CANTON, OHIO.

NOTES.

THE Berlin Iron Bridge Co., of East Berlin, Conn., have received through a large Philadelphia exporting house a contract for eleven Plate Girder Bridges to be sent to foreign parts.

I. P. FRINK reports a number of installations of Frink's Patent Store-window Reflector, the most important being in the new Gross & Strauss store, at the corner of Bedford and Washington Streets, the addition of R. H. White & Co., and the store of B. Sommers & Co., on Winter Street, all of Boston, Mass.

Atlas PORTLAND CEMENT

Guaranteed to be Superior to any Imported or Domestic Cement.

Used Exclusively in the Following New York Buildings:

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NEW YORK

PROBABLY a gallery of paintings is the hardest thing there is to light satisfactorily, and the fact that all the curators of all the leading American galleries unite in pronouncing the Frink system to be unqualifiedly the best is the strongest proof of its superiority, for curators as a class are exceedingly exacting in everything that relates to the proper exhibition of the art treasures in their charge. As the up-to-date store-window presents an exactly identical problem of lighting, it naturally follows that the Frink Window Reflector, which is the Picture Reflector adapted to show-windows, is the best fixture for window lighting. We see many makeshifts that are an attempt to force other kinds of fixtures into conformity with the true principles of window and picture lighting, but if any other arrangement of lighting devices were as good as the Frink Special Reflector, would not some of the leading galleries have adopted it? No merchant who has once used it can be persuaded to make experiments with other fixtures, while those who first try the "just-as-good" arrangements frequently install the Frink reflector when enlarging or remodelling their stores.

I. P. FRINK reports four important contracts for the installation of his patent reflecting fixtures for electric lighting, in Paris, two of them being in connection with the Exposition. This is another instance of the success of American-made goods in foreign countries.

At the annual meeting of the Stockholders of the Berlin Iron Bridge Co. held at the office of the company in East Berlin, Conn., on Monday, the 29th, the capital stock was increased to \$750,000. The following Board of Directors was elected: Chas. M. Jarvis, Frank L. Wilcox, S. H. Wilcox, H. H. Peck, Geo. H. Sage, D. E. Bradley and Seymour N. Robinson.

Mr. A. A. LOWE, of Brooklyn, N. Y., is erecting at Horseshoe, N. Y., a very elaborate plant for the manufacture of maple sugar. The construction will be fireproof and the buildings entirely of steel, covered with the Berlin Iron Bridge Company's Patent Anti-condensation Corrugated Iron Roof-covering. It will be furnished by the Berlin Iron Bridge Company, of East Berlin, Conn.

BUILDING INTELLIGENCE.

Reported for the American Architect & Building News

ALTERATIONS AND ADDITIONS.

Brooklyn, N. Y.—Seventeenth St., nr. 9th Ave., addition to three-st'y bk. factory, 66' x 75'; \$16,000; o., A. A. Bishop; a., Lawton & Fields, 95 Lenox Road.

Cambridge, Mass.—Five-st'y bk. building, 41' x 98'; \$20,000; o., Reversible Collar Co.; a., A. F. Gray, Boston.



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"COHESIVE CONSTRUCTION."

An Essay on the Theory and History of Cohesive Construction.

By RAFAEL GUASTAVINO, Architect.

Price, \$1.25.

BUILDING INTELLIGENCE.

(Alterations and Additions Continued.)

Greenwich, Conn.—Two-st'y addition to golf club; \$5,000; o., Fairfield County Golf Club; a., N. C. Mellen, 27 W. 30th St.

New York, N. Y.—Columbus Ave., 59th St. to 60th St., increase tower 40'; \$6,000; o., Paulist Fathers, 415 W. 59th St.; a., Henry Palmer, 1 Union Sq.
W. Twelfth St., Nos. 31-33, general alterations; \$7,500; o., Geo. A. Hern, 46 E. 69th St.; a., Jno. B. Snook & Son, 261 Broadway.

Third Ave., No. 1378, repair fire damage; \$11,000; o., Samuel Howe, 1462 Second Ave.; a., S. B. Ogden & Co., 954 Lexington Ave.

Philadelphia, Pa.—Thirteenth and Spruce Sts., four-st'y bk. & iron apartment-house addition, 25' x 84'; \$25,000; o., Diana F. Levy; b., Appleton & Burritt; a., A. B. Lacey.

Arch St., No. 819, two-st'y addition to store, 15' x 28', 10' x 20'; \$29,000; o., Mark Bros.; b., Geo. F. Payne & Co.

APARTMENT-HOUSES.

Brooklyn, N. Y.—President St., nr. 3d Ave., 2 four-st'y bk. & st. flats, 27' x 60'; \$10,000; o., Maria Theresa Imperiale, 502 President St.; a., F. S. Lowe, 186 Remsen St.

Degraw St. and Bedford Ave., 5 four-st'y bk. & st. flats, 29' x 90' & 27' x 78'; \$80,000, o. & b., Thos. Brown; a., F. S. Lowe, 186 Remsen St.

Pacific St., nr. Franklin Ave., four-st'y bk. apart., 28' x 75', gravel roof, hot water; \$14,000; o., M. Meyer, 1258 Broadway.

Columbus, O.—East End, four-st'y fr. & bk. apart., 36' x 56', comp. roof, steam heat; \$12,000; a., E. W. Hart & Co.

BUILDING INTELLIGENCE.

(Apartment-Houses Continued.)

New York, N. Y.—Broadway, cor. 71st St., twelve-st'y bk. flat, 101' 5" x 109' 9"; \$750,000; o., H. M. Weed, 2585 Broadway; a., Janes & Leo, 2585 Broadway.

W. One Hundred and Twenty-eighth St., No. 24, five-st'y & base, bk. flat, 25' x 86' 6"; \$28,000; o., Brady & Hauptman, 78 E. 104th St.; a., G. F. Pelham, 503 Fifth Ave.

One Hundred and Eighteenth St., n. s. 310' e Lenox Ave., 2 five-st'y bk. flats, 25' x 86'; \$50,000; o., C. M. Silberman, 1210 Fifth Ave.; a., Neville & Bagge, 217 W. 125th St.

One Hundred and Fifty-sixth St., s. s. 300' e Broadway, 3 four-st'y bk. flats, 16' 17' x 64'; \$36,000; o., G. D. Brouwer Ancher, 524 W. 149th St.; a., Geo. J. Ebert, 82 Laurence St.

Jackson Ave., cor. Home St., five-st'y bk. flat, 35' x 82' 6"; \$36,000; o., Wm. Crockett, Hunts Point Road; a., W. C. Dickerson, 149th St. & 3d Ave.

E. Eleventh St., No. 322, six-st'y & base, bk. flat, 25' x 79' 8"; \$25,000; o., Nielberg Bros., 322 E. 11th St.

W. Central Park, cor. 105th St., 2 seven-st'y bk. flats, 45' 55' 11" x 95' 89' 3"; \$190,000; o., Turner & Kiernan, 113 W. 96th St.; a., Neville & Bagge.

Amsterdam Ave., nr. 161st St., five-st'y bk. flat, 25' x 88' 6"; \$18,000; o., Jared Lockwood, 304 W. 91st St.

Ninety-third St., s. s. 125' w W. Central Park, seven-st'y bk. flat, 50' x 88' 8"; \$95,000; o., James Livingston, 108 W. 84th St.; a., Neville & Bagge.

Philadelphia, Pa.—Thirteenth and Walnut Sts., seven-st'y bk. & terra-cotta apart., 38' 6" x 107' 6"; \$125,000; o., C. F. Rumpf; b., John K. Wiggins; a., Carl P. Berger

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Highest Quality, Most Reliable, Best Color, Most Enduring Surface, Greatest Bulk to the Barrel.

NOTABLE INSTANCES WHERE ALSEN'S CEMENT HAS BEEN USED BECAUSE OF ITS SUPERIOR QUALITY.

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AGENTS AT BOSTON: WALDO BROS., 102 Milk Street.

BUILDING INTELLIGENCE.

CHURCHES.

Cellina, O. — One-st'y bk. & st. church, 80' x 145', slate roof, steam; \$40,000; o., Catholic Society; a., De Curtins Bros., Lima.

St. Louis, Mo. — Lafayette Ave., cor. Missouri Ave., one-st'y st. & bk. church, 70' x 70', slate roof, steam; \$40,000; o., Lafayette Pk. M. E. Society; a., W. A. Cann.

Trenton, N. J. — Bk. church, 46' x 76', slate roof, steam; \$16,000; o., Brothers of the Israelites; a., Geo. W. Keeler.

CLUB-HOUSES.

Shamokin, Pa. — Independent St., four-st'y bk. Y. M. C. A. building, 50' x 120', tin roof, steam; \$35,000; o., Y. M. C. A.; a., W. U. Jusy.

EDUCATIONAL.

Millan, Mich. — Two-st'y bk. school, 65' x 85', slate roof, mechanical hot air; \$16,000; o., City; a., E. C. Van Leyen, Detroit.

New York, N. Y. — University Heights, one-st'y granite Hall of Fame, 300' long, tile roof, steam; \$100,000; o., University of New York; a., McKim, Mead & White.

O'Neil, Neb. — Two-st'y & base bk. convent & school, 75' x 130', slate roof, hot water; \$30,000; o., Catholic Society; a., J. E. Dietrich, Omaha.

FACTORIES.

Cincinnati, O. — Colerain Ave., eight-st'y bk. malt-house, 48' x 120', gravel roof; \$18,000; o., Peter Renner & Co.; a., Philip Pfeiffer.

Columbus, O. — E. Fulton St., three-st'y bk. shoe-factory, 64' x 128', comp. roof; \$12,000; o., C. B. Wolfe; a., H. C. Lindthwaite.

Curtis Ave., one & two-st'y bk. factory buildings, 100' x 175', comp. roof, steam; \$10,000; o., Columbus Malleable & Gray Casting Co.

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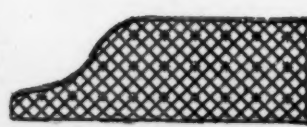
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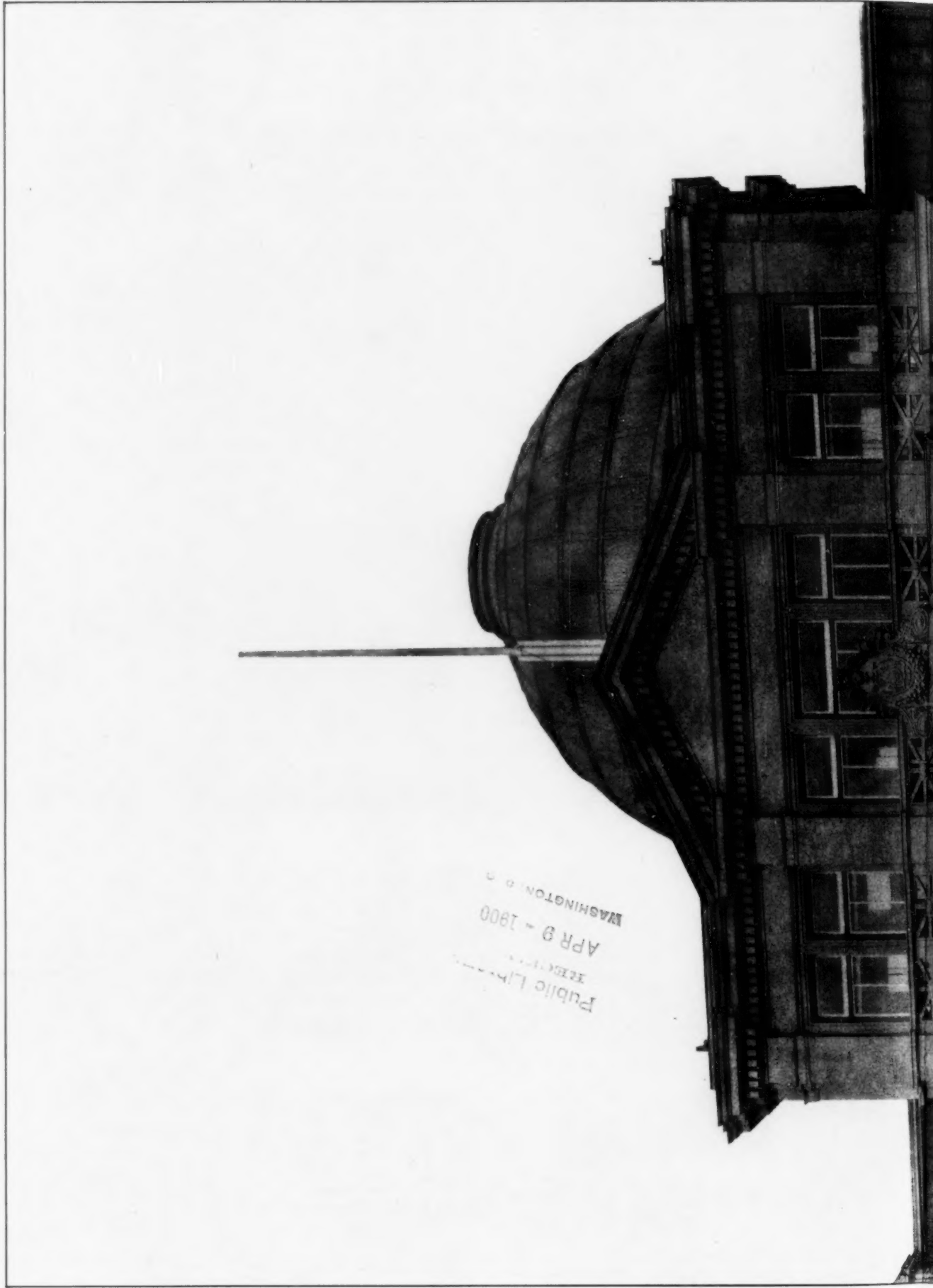


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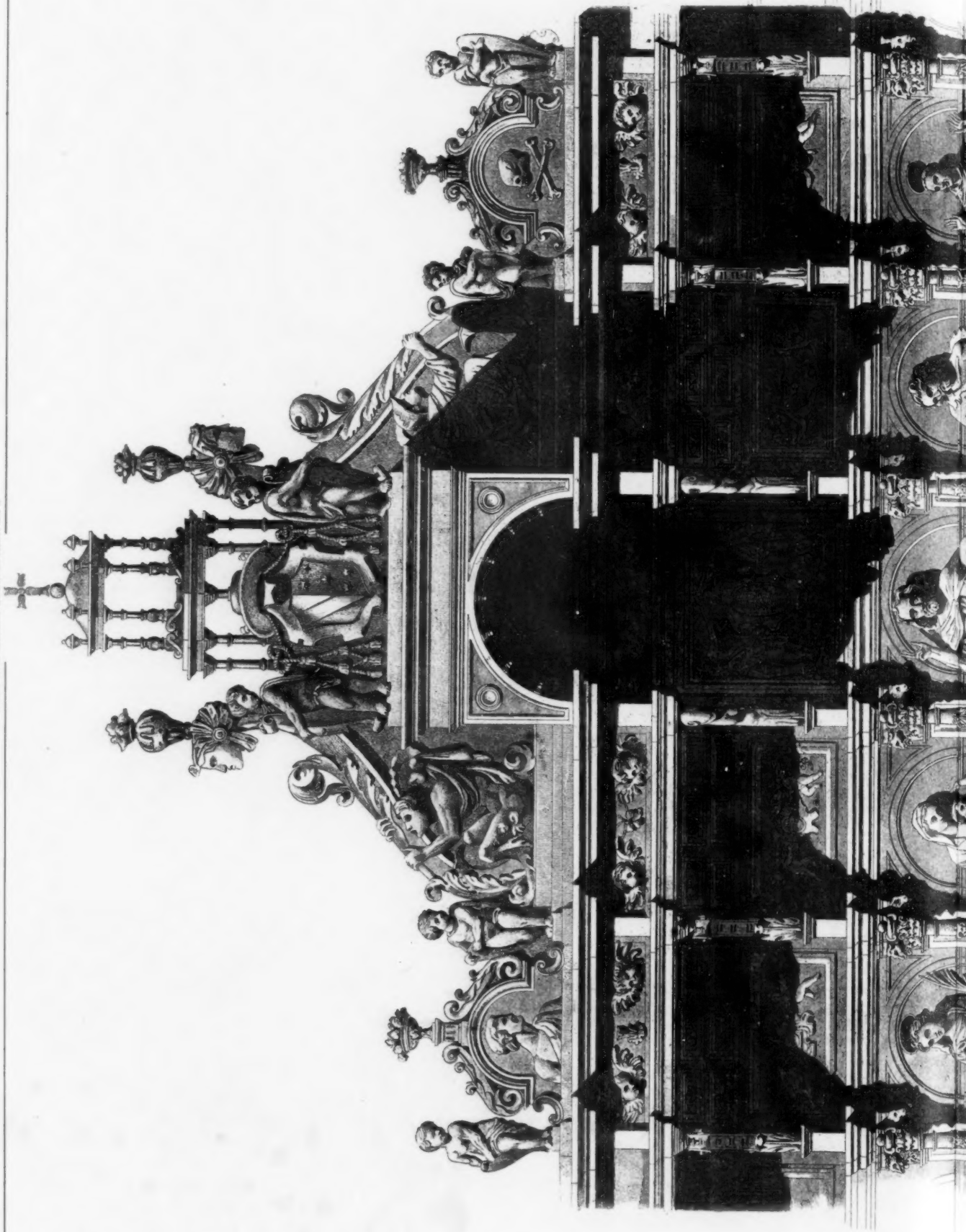
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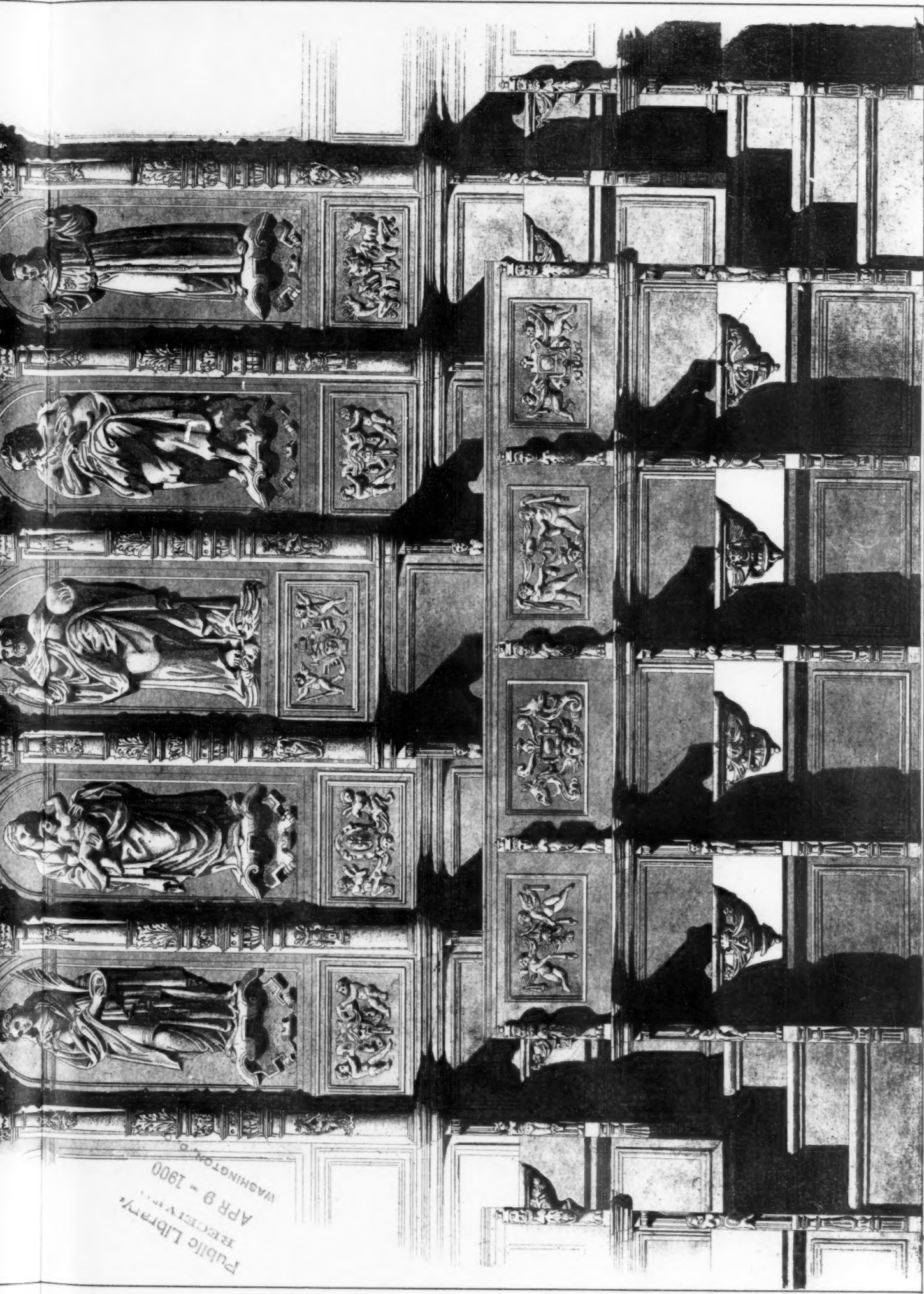


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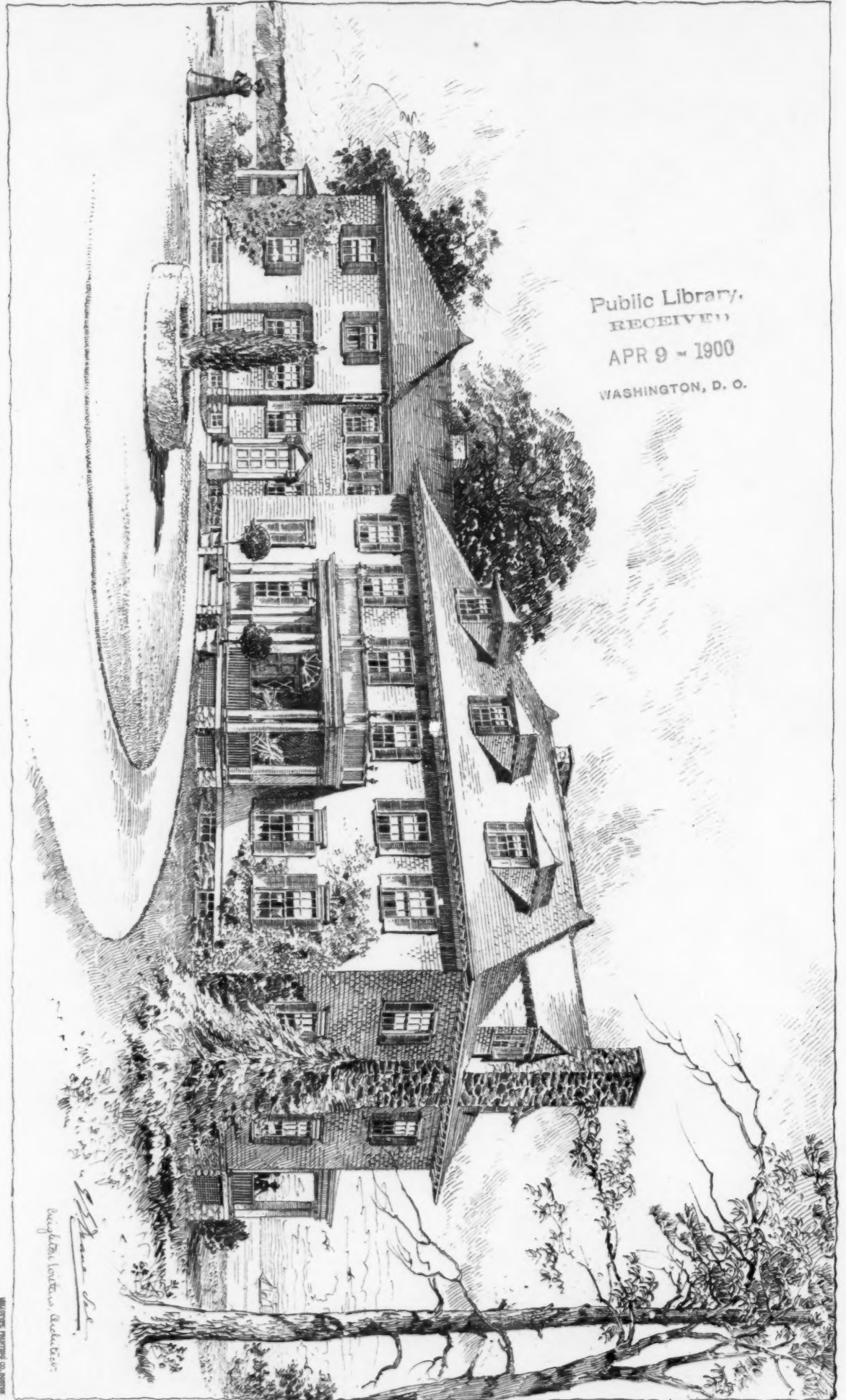


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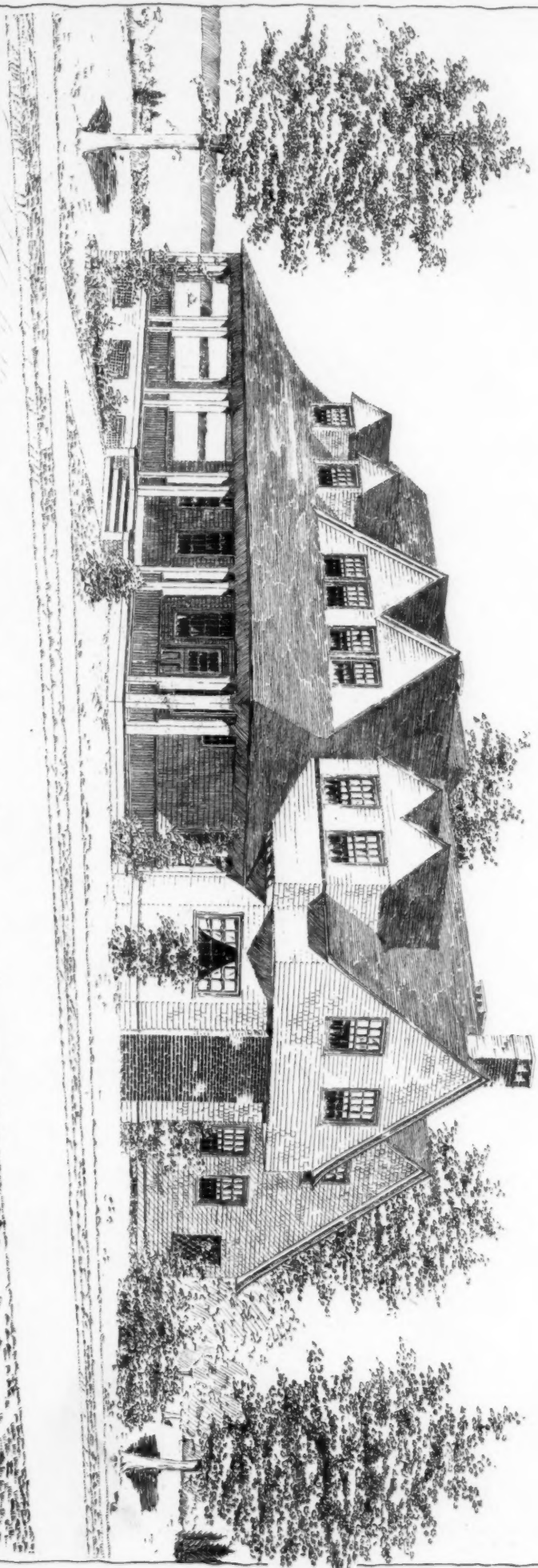
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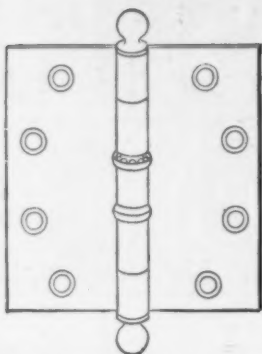
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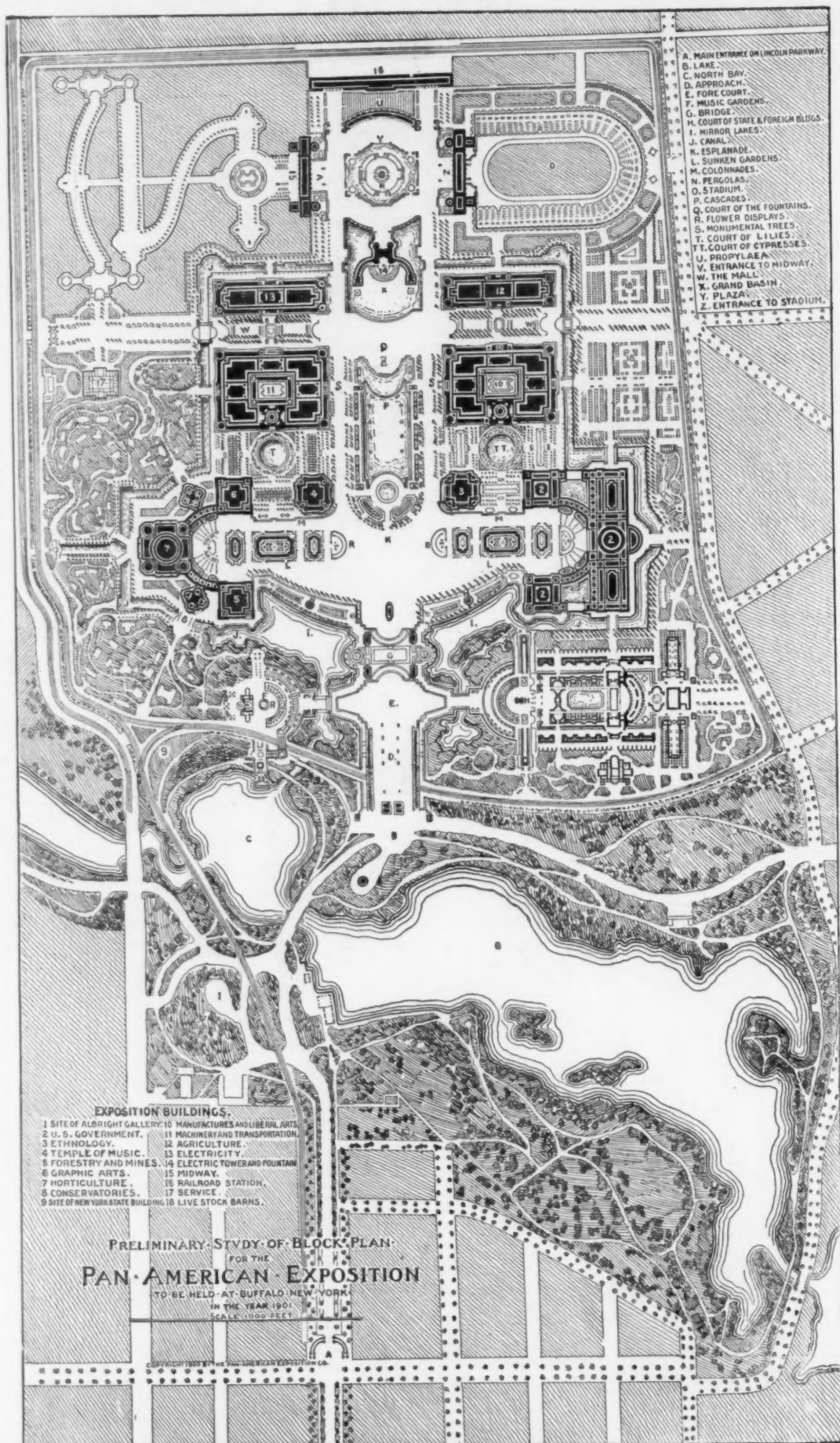
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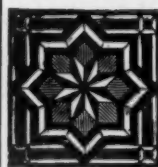
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BUILDING INTELLIGENCE.

(Advance Rumors Continued.)

Solomon Goldberg will erect a four-story brick and stone building on Meridian St. It will have stores, offices and a hall, and will be 72' x 90', costing about \$35,000.

Buffalo, N. Y. — Witcomb, Wead & Co. will build a hotel at the corner of Washington and Clinton Sts., to be known as the Lafayette. It will occupy an area of 122' x 147', and will cost when complete, about \$1,000,000.

Crookston, Minn. — H. L. Melgaard has had plans prepared by E. Strassburger, architect, for a two-story frame residence, 36' x 46'; cost, \$5,500.

Dedham, Mass. — The matter of erecting a new school-building for the Oakdale District is being considered by the town authorities.

Des Moines, Ia. — The Modern Woodmen of America plan to erect a large building, investing from \$50,000 to \$100,000 in a building if proper arrangements can be made.

Detroit, Mich. — E. C. Van Leyen is preparing plans for a three-story brick apartment for J. R. Pearson to be built on the north side of Alexander Ave., near Cass; estimated cost, \$12,000.

Donaldson & Meier have prepared plans for a five-story market and refrigerating building for the Falls Market Co., Woodward Ave., near Columbia St.; cost, about \$18,000.

W. D. Butterfield & Co. have prepared plans for a new M. E. Church to be built on Trumbull Ave.; cost, \$15,000.

Gordon W. Lloyd has prepared plans for a residence for the Little Sisters of the Poor; cost, \$6,000.

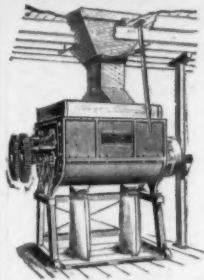
N. Wardrop has prepared plans for a new front and remodelling store 232 Randolph St., for Robert McMillen; also plans for improvements to residence 25 Peterboro St., for Le Roy Spencer.

Newcomb & Endicott will add two stories to their five-story east-iron front on Woodward's Ave. N. Wardrop has prepared plans for improving 2-8 Monroe Ave.; stores in first floor and hotel in the four stories over.

The R. C. Church on Adelaide St. will be improved internally.

Duluth, Minn. — Johnson Bros. have the contract to erect a building for S. Levine between 5th and 6th Ave., W., from Superior to Michigan St. It will be two-story on Superior St. and three-story on Michigan; cost, \$20,000.

Easton, Pa. — Architect Chas. W. Bolton, of Philadelphia, has prepared plans providing for elaborate



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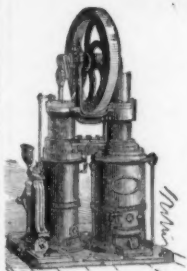
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(Advance Rumors Continued.)

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Grafton, Mass. — An \$18,000 high-school building will be erected here.

Indianapolis, Ind. — Architect S. A. Hastings has prepared plans for 5 two-story frame dwellings, building, 43' x 120', to cost \$40,000, and another to cost \$20,000 for himself.

Jefferson, Wis. — J. J. Zimmerman will erect a store and office building to cost \$8,000. John Hunzicker, of Lake Mills, architect.

Kansas City, Mo. — The McCormick Harvester Co. are having plans prepared for a six-story warehouse, to be built at 14th and Liberty Sts.; cost, \$100,000.

Lenox, Mass. — At the annual town meeting it was voted to buy the Stanley property for \$12,000 for a town-hall site. It is intimated that a town-hall structure will be provided within a year or two from private funds.

Lewiston, Me. — A donor whose name is not given has subscribed \$20,000 toward a library building for Bates College. Work on the building will probably be begun during the coming season.

Middletown, Conn. — Dwight Seabury, architect, Providence, R. I., has prepared plans for a building for the Portland Silk Co., to cost about \$15,000.

Milford, Mass. — Darling Bros., of Worcester, have been awarded the contract to build the brick power house, 62' x 125', two stories high, at the Magd-Hope Silk Mfg. Co.'s plant on N. Bow St. The

BUILDING INTELLIGENCE.

(Advance Rumors Continued.)

price is about \$25,000. Arthur F. Gray, architect, 53 State St., Boston.

Milwaukee, Wis. — Reports state that a new church will be built by the St. Augustine Catholic Society at Graham and Homer Sts., to cost about \$26,000. Rev. P. A. Schumacher, pastor.

Architect Anton Dohnmen has prepared plans for a church for St. Augustine's congregation, Howell Ave.; cost, \$26,000.

Architects Leenhouts & Guthrie are preparing plans for a brick residence to be erected on Racine St.; cost, \$45,000.

Mineral Point, Wis. — F. H. Kemp, architect, of Beloit, has prepared plans for John W. Cheney for a three-story brick hotel building, 60' x 67'; cost, \$12,000.

Minneapolis, Minn. — E. S. Stebbins, architects, has plans for a school-building to be erected in the Pierce District, Fillmore, near Summer St., N. E. It will be 50' x 87', two stories and basement, of brick and cut stone; containing six rooms, with classrooms and hall; cost, \$14,000.

Mitchell, S. D. — W. L. Dow, architect, of Sioux Falls, is preparing plans for Dakota University for a four-story brick or stone dormitory, 50' x 125'; cost, \$25,000.

New York, N. Y. — A woman member of the congregation of St. Bartholomew's congregation has given \$250,000 which is to be used in building a clinic for the parish house of that church, where diseases of the eye, ear, nose and mouth may be treated free at all hours of the day and night. A site has already been purchased and ground for the building will be broken soon.

Mrs. Elizabeth M. Anderson, of Greenwich, Conn., will erect an eight-story studio building covering a plot fronting 59' 7" on 6th Ave. and 100' on 40th St.

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BUILDING INTELLIGENCE.

(Advance Rumors Continued.)

The façade will be of Holland brick, Indiana limestone and terra-cotta, with bluestone trimmings. The structure will be called the "Bryant Park Studios." Estimated cost is \$300,000.

Omaha, Neb.—George A. Joslyn has had plans prepared for a large stone residence and also a stone stable, to cost about \$100,000.

Architect H. F. Henninger has prepared plans for a two-story frame residence and barn for T. C. Shelley, 32d and Woolworth Ave.; cost, \$10,000.

Osage, Ia.—The Congregational Society is making preliminary arrangements for the erection of a \$25,000 church.

Oshkosh, Wis.—An addition to cost \$21,750 will be built to the Normal School during the summer.

Pacolet, S. C.—The Pacolet Manufacturing Co. are having plans prepared by Lockwood, Green & Co., Boston, Mass., for a new \$1,000,000 cotton-mill. The main building will be five stories high, 130' x 525'. Mr. V. M. Montgomery, Spartanburg, manager.

Philadelphia, Pa.—Reports state that B. F. Keith, the continuous performance manager, has secured an option on a piece of property here and will erect a theatre in the style of his Boston house.

Architect Frank R. Watson is drawing plans for a proposed four-story apartment-house, to be built at the southeast corner of 17th and Chestnut Sts., for J. W. Hallahan. The design will be in the English style of architecture. The first story will be of Indiana limestone, the elevation above being of brick and terra-cotta. Ultimately it is proposed to make the structure eight stories high.

Architect Jas. M. Windrim has completed plans for the proposed new store and office building to be erected on Chestnut and S. 3d Sts. for the Girard estate. It will be eight stories high, with a frontage of 121.4 feet on Chestnut St. and extending 122½ feet on S. 3d St. The first story will be divided into stores. The exterior is to be of mottled brick trimmed with Indiana limestone and terra-cotta. The base will be of Milford pink granite. The building is to be of fireproof construction, with steel and iron skeleton framework.

Macey, Henderson & Co. have plans for erecting an equipment building, including storehouses, at the League Island Navy Yard. The building will be two stories, brick, terra-cotta and steel, with a frontage along Broad St. of 52' 2" x 276'; cost, about \$26,500.

BUILDING INTELLIGENCE.

(Advance Rumors Continued.)

Providence, R. I.—The Board of Aldermen has passed a resolution appropriating \$38,000 for carrying out the plan for a new 3d Ward school building as recommended by the special committee.

Richmond, Va.—The Baptist Society will erect a new church on the corner of Fairmount Ave. and 21st St. The edifice is not to cost less than \$5,000 and will seat about 400 persons.

Rochester, N. Y.—Plans are being prepared for a new school-building to cost \$40,000. J. C. Oliver, secretary.

Salamanca, N. Y.—J. W. Morrison, 50 Gokey Block, Jamestown, has prepared plans for a \$50,000 high-school building to be built here.

Shrewsbury, Mass.—The contract for a frame hotel building, 40' x 65', to be erected on the main road, has been awarded to Dorais & Dupuis, of Worcester. Architect J. W. Patston drew the plans. The owner is Napoleon H. Haven.

Stevens Point, Wis.—Improvements to cost \$22,500 will be made this spring to the State Normal School.

St. Paul, Minn.—A. H. Stem, architect, is preparing plans for remodeling the building on the northwest corner of 6th and Jackson Sts., for the Hale estate. The building is a three-story brick with four stores on the ground floor; cost, \$15,000.

Uxbridge, Mass.—Architect Geo. H. Clemence, of Worcester, has completed plans for a private residence for W. E. Burns. The cost will be about \$5,000.

Waverly, Ia.—Buechner & Jacobsen, architects, of St. Paul, are preparing plans for a German Lutheran Church to be erected here. It will be of pressed brick, cut stone trimmings, costing \$15,000.

West Baden, Ind.—Lee W. Sinclair will soon begin the erection of a 500-room hotel. The building will be of brick and stone and modern in design.

Wilkinsonville, Mass.—Architects Chapin & Parker, State Mutual Building, Worcester, have prepared plans for a two-story power-house and machine shop for D. T. Dudley & Son.

Winona, Minn.—Maybury & Son, architects, have drawn plans for the German Methodist Society for a new church to be erected at the corner of Main and Sanborn Sts.; cost, \$12,000.

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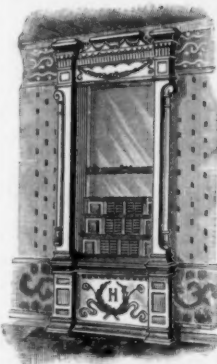
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BUILDING INTELLIGENCE.

(Advance Rumors Continued.)

Worcester, Mass.—Geo. M. Hubbard is the builder for a 3 apartment-house, 30' x 45', on Grafton St., for which Barker & Nourse drew plans. The owner is C. M. Crockett, Grafton St.; estimated cost, \$5,000.

Architects Earle & Fisher have awarded the contract for a one-story iron addition to the Boston Store, 27' x 35', to J. W. Bishop & Co.

Architect W. H. Harvey is preparing plans for the proposed power plant addition of the Worcester Traction Co. The addition will be 80' x 100'.

Architect E. T. Chapin is making plans for a two-story private residence for Thos. Brown on German St. It will be two and one-half stories, 42' x 64'; cost, \$8,000.

A. P. Robbins is to erect a private residence for G. C. & N. H. Moss on Richmond Ave., from plans by Architect Louis Plack, Jr.; cost, \$5,000.

E. T. Chapin, architect, has prepared plans for a car-barn addition for the Consolidated St. Ry. Co. The building will be 113' x 190', have a steel frame, galvanized iron cornices and skylights.

E. T. Chapin, architect, has prepared plans for a private residence to be erected on Pleasant St. for Justin A. Ware. It will be of wood, 31' x 51', with an ell, 24' x 40'.

It is reported that Arthur E. Estabrook will erect a large addition to his factory building at the corner of Beacon and Jackson Sts., to be occupied by the Vocalion Organ Co. It will be three stories in height, with a finished basement, and will be 35' x 170'.

Architects Cutting, Carleton & Cutting are making drawings for a summer hotel to be erected for H. H. Bigelow this season at Quinsigamond Park. The hotel will be of frame, three stories in height, 32' x 64'. There will be a pavilion, 30' x 80'.

Architects Cutting, Carleton & Cutting are preparing drawings for remodeling the Gilman Block on Main St., recently damaged by fire. This block was originally drawn from their plans.

HOUSES.

Milwaukee, Wis.—Newberry Boulevard, two-st'y fr. & bk. dwell., 33' x 53', shingle roof, furnace; \$6,500; o., G. Wiggernhorn; a., Van Ryn & De Gelleke.

Newton, Mass.—Hammond St., two-st'y bk. dwell., 37' x 72', pitch roof, steam; \$26,000; o., William Blodgett; b., William Pettigrew; a., Chapman & Fraser.

Elmhurst Road, two-st'y dwell., 36' x 42', pitch

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BUILDING INTELLIGENCE.

(Houses Continued.)

roof, furnace; \$10,000; o., Carrie S. Evans; b., Geo. H. Kentry; a., Gay & Proctor.

Pontiac, Mich. — Two-st'y fr. dwell., 46' x 55', shingle roof, hot water; \$15,000; a., Edward C. Van Leyen.

MERCANTILE BUILDINGS.

Boston, Mass. — Summer St., Nos. 161-165, eight-st'y bk. mercantile building, 34' x 39' x 98', flat roof, steam; \$100,000; o., Joseph Gahm; b., Geo. A. Fuller; a., Hartwell, Richardson & Driver.

PUBLIC BUILDINGS.

Spencer, Ia. — Two-st'y bk. & terra-cotta court-house, 70' x 104', slate & tin roof, steam; \$50,000; o., Clay County; a., Kinney & Detweiler.

STORES.

Columbus, O. — Spring and High Sts., six-st'y bk. & brownst. store, 60' x 100', comp. roof, steam; \$50,000; o., Merchants & Manufacturers' National Bank; a., C. A. Stribling & Co.

Fort Wayne, Ind. — Six-st'y bk. store-building, 40' x 110', asphalt roof, fan system heat; \$18,000; o., M. J. Stack.

(Continued in Supplement.)

COMPETITIONS.

Boston Society of Architects.

ROTCH TRAVELLING-SCHOLARSHIP.

Seventeenth Annual Competition.

The examination for the Rotch Travelling-Scholarship will be held at the Boston Architectural Club, 5 Tremont Place, Boston, on Monday and Tuesday, April 16th and 17th, at nine o'clock A. M.

Candidates must be under thirty years of age, must have worked during two years in the employ of an architect resident in Massachusetts, and will be required to pass preliminary examinations upon the following subjects:—

I. Construction, Theory and Practice. (Written examination.)

II. An Elementary Knowledge of the French Language. (Written examination.)

III. History of Architecture. (Written examination.)

IV. Freehand Drawing from the Cast.

Candidates who pass in these preliminary examinations will be asked to present themselves on the third Saturday following, for the competition in Design.

Candidates who have passed in the preliminary examinations since 1897 are eligible for admission to the competition in Design without re-examination.

The successful candidate in each yearly examination receives from the Trustees of the Scholarship annually, for two years, \$1,000, to be expended in foreign travel and study; provided always that the beneficiary shows such fitness and diligence as may be required of him.

The Boston Society of Architects has offered the sum of \$75 as a second prize.

Candidates are required to register their names with the Secretary of the Committee three days before the opening of the examinations.

Any further information concerning the Scholarship can be obtained upon application to

C. H. BLACKALL, Secretary,
1 Somerset St., Boston, Mass.

STATE-HOUSE.

[At Columbia, S. C.]

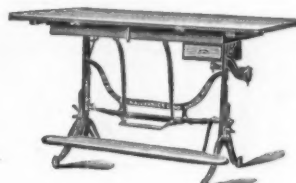
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COMPETITIONS.

April 12, for the completion of the State-house; probable cost, \$200,000. D. H. MEANS, Clk. of Commission. 1267

HIGH SCHOOL.

[At Savannah, Ga.]

Designs will be received by the Trustees of Chatham Academy until April 25, for a high school. HENRY C. CUNNINGHAM, Chmn. Bldg. Com. 1269

PROPOSALS.

COURT-HOUSE.

[At Crookston, Minn.]

Sealed proposals will be received until May 10th, for the erection and construction of a court-house for Polk County. JOHN GLEASON, Auditor of Polk County, Minn. 1268

NORMAL SCHOOL.

[At Oshkosh, Wis.]

Sealed proposals will be received until 12 M. April 12, for the erection of an addition to the State Normal School. A. E. THOMPSON, regent. 1267

CHURCH.

[At Janesville, Wis.]

Sealed proposals will be received until April 10, for the erection of a church for the Catholic Society. REV. W. A. GOEBEL. 1267

GAS AND ELECTRIC LIGHT FIXTURES.

[At McKeesport, Pa.]

Bids will be received by the Secretary of the Board of Education April 12, 1900, for furnishing and fitting up of gas and electric light fixtures in the new high-school building, McKeesport, Pa. D. P. SMITH, secretary. 1267

JAIL.

[At New Orleans, La.]

Sealed proposals will be received until April 9, for the erection of a new police jail. W. S. DOUGLASS, comptroller. 1267

PROPOSALS.

COURT-HOUSE ADDITION.

[At Mantorville, Minn.]

Bids will be received by the County Commissioners until April 16, for an addition to and remodelling the court-house. GEO. A. NORTON, Co. Aud. 1268

SCHOOL-HOUSE.

[At Elmwood Place, O.]

Bids are wanted April 18, for erecting a school and for modifications in the present school. B. C. DE CAMP, architect, Neave Building, Cincinnati. 1268

CHURCH.

[At Mantador, N. D.]

Bids will be received until April 10, for the erection of a Catholic Church here. REV. J. F. STUDNICKA, Wahpeton, N. D. 1267

HOTEL.

[At New Ulm, Minn.]

Sealed proposals will be received until April 10th, for the erection and construction of a brick hotel. GUST DREWS. 1267

JAIL.

[At New Orleans, La.]

Sealed proposals will be received until April 9, for the erection of a new police jail on the site of the present police jail in the square bounded by S. Robertson, Ferrilat, Cypress and S. Liberty Sts. W. S. DOUGLASS, comptroller. 1267

SCHOOL-HOUSE.

[At Niagara, N. D.]

Sealed proposals will be received by the Board of Education until April 14th, for the erection and construction of a school-building. GEO. L. TRIEHLER, pres. 1267

HOSPITAL.

[At Tomah, Wis.]

The Commissioner of Indian Affairs, Washington, D. C., will receive sealed proposals until April 9th, for the erection of a hospital at the Tomah School. W. A. JONES, com. 1267

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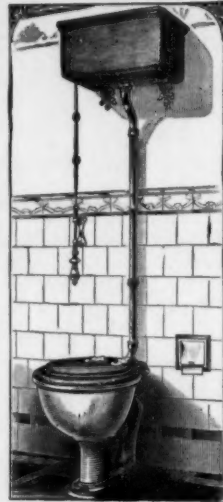
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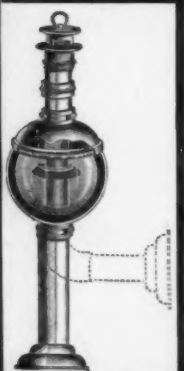
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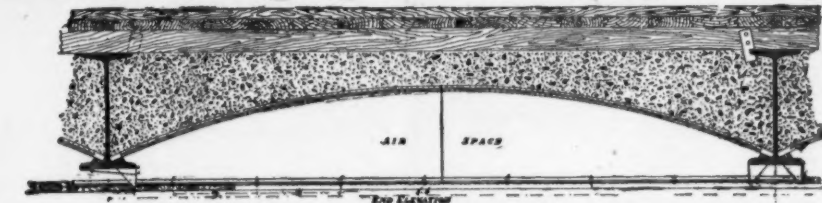
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SECTION 1. No Member should enter into
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SECTION 2. A Member having any ownership
in any building material, device or invention,
proposed to be used on work for which he is
architect, should inform his employer of the
fact of such ownership.

SECTION 3. No Member should be a party to
a building contract except as "owner."

SECTION 4. No Member should guarantee an
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SECTION 5. It is unprofessional to offer draw-
ings or other services "on approval" and
without adequate pecuniary compensation

SECTION 6. It is unprofessional to advertise in
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address, profession, and office hours, and
special branch (if such) of practice.

SECTION 7. It is unprofessional to make altera-
tions of a building designed by another archi-
tect, within ten years of its completion,
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out due notice to the said designer.

SECTION 8. It is unprofessional to attempt
to supplant an architect after definite steps
have been taken toward his employment.

SECTION 9. It is unprofessional for a Member
to criticise in the public prints the professional
conduct or work of another architect except
over his own name or under the authority of
a professional journal.

SECTION 10. It is unprofessional to furnish de-
signs in competition for private work or for
public work, unless for proper compensation,
and unless a competent professional adviser
is employed to draw up the "conditions" and
assist in the award.

SECTION 11. No Member should submit draw-
ings except as an original contributor in any
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remains undecided.

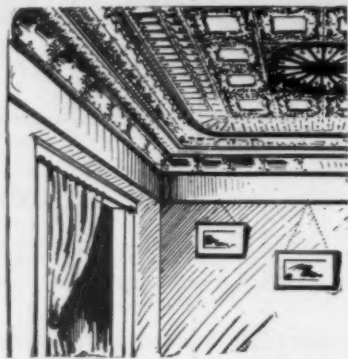
SECTION 12. The American Institute of Archi-
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mum rates for full, faithful and competent
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SECTION 13. No Member shall compete in
amount of commission, or offer to work for
less than another, in order to secure the work.

SECTION 14. It is unprofessional to enter into
competition with or to consult with an archi-
tect who has been dishonorably expelled from
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SECTION 15. The assumption of the title of
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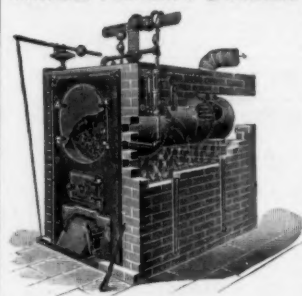
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