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CONTENTS.

WE invite the attention of our subscribers and readers in general to the important notice concerning the temporary reduction in the subscription-price of the *American Architect* for the ensuing year, which will be found on page xi. We trust that a large number of draughtsmen who have hitherto enjoyed the privilege of reading their employers' copies will take advantage of this fleeting opportunity to become subscribers in their own names.

ONE of the distressing occurrences which come every few weeks to remind us, generally in vain, of the duty which those who construct and occupy buildings owe to their fellow-creatures whose lives may depend upon their foresight, was reported last week from Providence, where a building containing two manufactories of jewelry, both of them full of operatives, was set on fire by the ignition of the naphtha with which a man who occupied one of the rooms was cleaning clothes beside a stove, and burned quickly to the ground. As usual in such cases, the only staircase was immediately seized upon by the flames, cutting off all means of escape except by jumping from the windows to the ground, a distance of about fifty feet. This many of the operators ventured to do, with greater or less success, three being instantly killed, three more fatally injured, and sixteen bruised and maimed, many of them for life. One man, more fortunate than the rest, clung to the telephone-wire, although his hands were scorching, until the firemen arrived with ladders; and two poor girls were saved by the courage and address of a sailor, who, climbing a ladder which was too short for its purpose, balanced himself on the top round, and in that position caught them and handed them safely to the ground.

A GREAT deal of complaint is made in New York about the operations of the various steam-heating and power companies, which tear up the pavements and obstruct the streets, to the annoyance of business men and the detriment of traffic. Generally the first excavation, made for the purpose of laying main pipes, is only the beginning of a series of "assaults upon the streets," as the *Tribune* calls them; for no sooner is the main laid than private connections have to be made to supply customers, each necessitating the digging of a trench half-way across the street; while the turning of the steam into the pipes is very likely to disclose a leak or defect in some valve or pipe, which not only allows clouds of offensive vapor to ascend into the street, or penetrate neighboring basements, but makes it necessary to break up the pavement and interrupt traffic a third time. A *Tribune* reporter counted the other day ten obstructed streets in the small territory bounded by Broadway, Wall, Gold, and Fulton Streets, and as the pipe-laying has now been carried on for seven months without intermission, it is not surprising that those who derive no benefit from the new system should have lost patience.

A VERY ingenious electric clock for use in railway stations has been recently exhibited in Boston, which will give the signals for starting trains automatically at any time and with perfect precision, the apparatus being automatically regulated at noon each day by electric impulse from some astronomical station. Although the details of the clock are rather complicated, the principle is simple. The mechanism for giving the signals shows two discs, each pierced with fourteen hundred and forty holes, arranged in spirals of twenty-four turns, with sixty holes in each turn. Small metallic pegs are inserted in the holes, corresponding to any given minute and hour, and the contact of these with an electrical conductor transmits the current for the signal. Any change in the time of starting trains is made by shifting the pegs, and one, two, three or more successive and different signals can be given for each train. It is proposed, we believe, to connect all the stations of a railroad with the main office, so that signals for starting trains will be given from a single apparatus, instead of depending upon the uncertainties of a conductor's watch.

MUCH alarm has been caused in Paris during the present season by the unusual prevalence of typhoid fever, and as a natural consequence the discussion of methods for draining the city has become more earnest than ever. It has been observed that the epidemic has been most violent in the northeastern portions of the town, and to account for this the theory has been advanced that the prevailing winds of summer and autumn being from the southwest, the air brought to the houses in the opposite quarter is more charged with the exhalations from the innumerable ventilation-pipes which discharge the vapor from the house-vaults into the upper atmosphere, and is therefore more likely to convey the germs of the disease. This explanation seems not unreasonable, and as in sewered towns this malady has been observed to affect the more elevated portions, as if the contagium floated in the lighter gases evolved from the drains, it is quite probable that in Paris, which has no sewers, as we understand them, the external air might serve as the carrier of the light organisms which are supposed to constitute the poison. Perhaps the epidemic is the natural consequence of the foul odors which have for the last two summers caused so much complaint; and even if not, the two will always be associated hereafter.

IN August last a series of experiments was made at the United States Arsenal at Watertown, Mass., at the request of the Commissioners for the erection of the Public Buildings at Philadelphia, to determine the resistance of various materials, particularly of those used in the building now in process of construction under the direction of the Commissioners. The results of the tests have been published in a small pamphlet, giving a clear and concise record of great interest. Fourteen of the determinations were of specimens of marble; twelve were of sandstone, six of limestone, and fourteen of brick. Some of the marble showed extraordinary strength, particularly that from Lee, Mass., a variety much used in Philadelphia, some pieces of which, with a sectional area of about thirty-five square inches, bore without yielding the maximum load of the great Emery testing-machine — eight hundred thousand pounds, or about twenty-three thousand pounds to the square inch. The weakest specimen of this marble tried showed an ultimate resistance of more than twenty thousand pounds to the square inch. Some limestones from Conshohocken, Pa., gave excellent results, supporting a pressure of from fourteen to more than sixteen thousand pounds to the square inch before failure; and two specimens of sandstone from Hummelstown, Pa., resisted from thirteen to nearly fourteen thousand pounds. Marble from Montgomery County, Pa., failed at ten thousand pounds, and various specimens of buff Ohio sandstone yielded to a pressure of four to seven thousand. The blue Ohio sandstone gave better results, sustaining eight, ten, eleven, twelve, and even sixteen thousand pounds to the square inch. The tests of brick developed a very great variation in strength, together with an irregularity of resistance, some specimens beginning to crack under a pressure less than half as great as that which finally crushed them. One specimen of hand-made hard brick from Philadelphia, although it showed signs of yielding at ninety-five hundred pounds, bore eighteen thousand six hundred and ninety before final failure; and another sample of the same make resisted nearly twenty-one thousand pounds, or almost as much as the strongest of the marbles. This, however, was exceptional, few of the bricks examined showing more than half this strength, and several began to yield at three or four thousand pounds.

BESIDES these, three specimens of cast, and three of wrought iron were tested, the result showing less difference in the strength of the two materials than we have been accustomed to suppose. The samples of cast-iron contained equal quantities of metal, but in different forms, the first being a solid cylinder, three and one-quarter inches in diameter and six inches long; while the second was a hollow cylinder six inches long and four and one-half inches in diameter, with shell about three-quarters of an inch thick; and the third was a cylinder of the same length, eight and three-quarters inches in diameter, with shell three-tenths of an inch thick. Of these three, the first bore sixty thousand, three hundred and sixty pounds to the square inch failing with an oblique fracture, and shortening by compression and swelling in the middle to five and six-tenths inches before its final destruction. The second sample was diminished in length only two-tenths of an inch by the crushing load, yielding at something over sixty-eight thousand pounds to the square inch. The third, which had the greatest diameter and the least thickness of metal, bore seventy-nine thousand two hundred and thirty pounds, and was compressed only seven one-hundredths of an inch under this load, bursting finally with a loud report. The samples of wrought-iron tested were all pieces of rolled I-beams, varying from seven to fifteen inch, and six inches long, and obviously less suitable in form to resist compression than a transverse strain. All of them, as might be expected, failed by the buckling or splitting of the web, but the ultimate resistance per square inch of sectional area was nearly the same in all, varying from fifty-three thousand three hundred and thirty in the fifteen-inch beam to fifty-four thousand three hundred and ten in the nine-inch beam. The seven-inch beam showed a strength of fifty-four thousand two hundred and thirty pounds, varying from the nine-inch by less than one-sixtieth of one per cent, and the larger specimen would probably have reached the same limit if the power of the machine had been sufficient to apply a strain equal to that placed upon the others. The buckling of the web and flanges caused a shortening before total failure of one-sixth to six-tenths of an inch in the three specimens. Previous to the commencement of the buckling, a compression set of about six one-hundredths of an inch was observed in all.

THE last week in October was signalized by the completion of the new Rathhaus of Vienna, which has been ten years in building under the direction of the Chevalier von Schmidt, one of the most distinguished architects of Austria. The inaugural banquet was given on the fifty-seventh birthday of the architect, who was entertained in the new building, by the Municipality of Vienna. The building contains five hundred rooms, and has cost twelve million florins,—about six million dollars. It is in the Gothic style, and stands very near the new Austrian Parliament Houses in the Ring-Strasse.

THE contract for the projected tunnel under the St. Lawrence River at Montreal has been awarded to Mr. Rouillard, at three million, nine hundred and five thousand dollars. The tunnel is to be sixteen thousand feet long, or almost exactly three times the length of the Hudson River tunnel, and thirteen and one-third times as long as the renowned tunnel under the Thames. The greatest depth of the Montreal tunnel will be one hundred and seventy-six feet below the entrances. The Hudson tunnel is one hundred and nine feet below mean low tide at the point of greatest depression, so that the grades in it will be steeper than in its Canadian rival. The contract calls for the completion of the work in three years, a period which seems quite inadequate, unless Mr. Rouillard enjoys some unusual facilities.

PROFESSOR PUTNAM, of Cambridge, Mass., who spent last summer in exploring the remains of prehistoric races in America, has succeeded in collecting and transmitting to the Peabody Museum of Ethnology the contents of eighty stone tombs, of a race which once occupied the territory between the Ohio River and the Gulf of Mexico, but is now known only from its distinguishing habit as the stone-grave race. The graves from which the name is derived consist of slabs of stone, several of which are set upon edge to form the sides of the enclosure, while the top is covered with others, often in several superposed courses. The interior seems to have been carefully lined with small stones and pieces of bark, or even with skins, and small utensils were deposited with the bodies. Generally one body only is found in each grave, but some contain two or more. The pottery, of which several articles, probably containing food and water, were placed beside the bodies, is of various interesting shapes, some specimens being formed to represent animals, and others human beings. Objects believed to be dolls were found in some of the graves, besides children's playthings of other kinds.

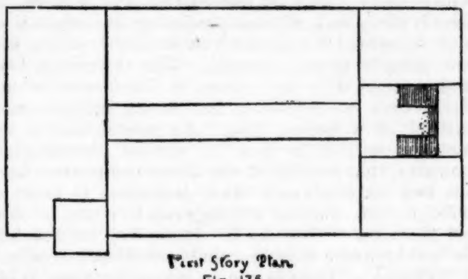
M. LISCH, a distinguished French antiquarian and official inspector of historic monuments, announces the discovery near Poitiers, in the central part of France, of the remains of an important Gallo-Roman city. According to his letter, a temple two hundred and sixteen feet wide by three hundred and fifty feet long has been excavated, with a bath of the first class, still containing its swimming-basins, its heating-apparatus, pipes, pavements, and so on; and a theatre with a stage two hundred and seventy-seven feet across, still showing its rows of seats and passageways; and finally, several streets, with houses and shops; the whole forming, as he says, a little Pompeii in the middle of France. The sculptures found are said to be in the best style, dating probably from the second century, and many objects of iron, bronze and terra-cotta have been recovered. Poitiers has from the earliest ages been a considerable trading point, and the Roman city of Limonum, at the junction of four important roads, is undoubtedly the one which has just been brought to light.

IT is always interesting to the many Americans who have enjoyed the benefit of instruction in the Ecole des Beaux-Arts at Paris to follow the fortunes of their former companions in the atelier, and this year a special interest attaches to some of the nominations. As our readers know, the first grand prize of Rome is carried off by Pierre-Joseph Esquié of Toulouse, a pupil of M. Daumet; the second prize by Joseph Abbut Tournaire of Nice, a pupil of M. André, and the third by M. Courtois-Suffit, pupil of MM. Suffit and Pascal. The Prix Deschaumes, of fifteen hundred francs in money, founded for the encouragement of young architects distinguished by their aptitude for their art is awarded to M. Julien, a pupil of the school. The prix Jary, given to the winner of the prize of Rome who, during his residence there as a protegé of the Government, shall have fulfilled all the duties imposed by the regulations, is this year assigned to M. Henri Nénot, who, as every one will remember, was also the winner of the first premium in the great competition for the monument to King Victor Emmanuel. The Prix Achille Leclère of one thousand francs, intended for the author of the best design in accordance with a special programme, is this year awarded to M. François Roux, with an honorable mention to M. Delemer, a pupil of M. André. The Prix Duc, intended to encourage the higher technical studies, is divided equally between MM. Louis Bernier and Wable. The Prix Jean Leclaire, of five hundred francs each, is awarded to M. Quatesous, pupil of M. Pascal and M. Yoon, pupil of M. André. The Prix Delauroy, of one thousand francs, which is added every year to the honors of the winner of the prize of Rome, is given to M. Esquié, and the Fondation Lusson, of five hundred francs, is similarly awarded to M. Tournaire, as winner of the second grand prize. The Prix Jean Reynaud, of ten thousand francs, which is awarded in each of the five Academies of Fine Art in succession is this year given in the department of Architecture to M. Daumet, as architect of the new Château de Chantilly. Besides the Prix Jean Leclaire, M. Quatesous has carried off the grand medal of emulation given among the pupils in each department of the Ecole des Beaux-Arts, and is also awarded the Prix Abel Blouet, given to the member of the first class who has received the most honors since his entrance into the school. Two new instructors have also been appointed in the school, one being M. Falguière, the most distinguished of modern French sculptors, and himself a winner of the prize of Rome, who is made professor of sculpture and "chef d'atelier;" and the other M. Brisse, who is made professor of mathematics.

BUILDING SUPERINTENDENCE.—XXIV.

PART III.

WE will make our provisional plan without windows or partitions, since the latter will depend somewhat upon the distribution of the former, and these again upon the spacing of the roof-trusses, which is yet to be decided. Figure 175 shows therefore the outline of the main walls of the first story, and Figure 176 those of the second story; the tower and the other cross-wall which serves as abutment to the great arch being indicated, as well as the outline of the roof.

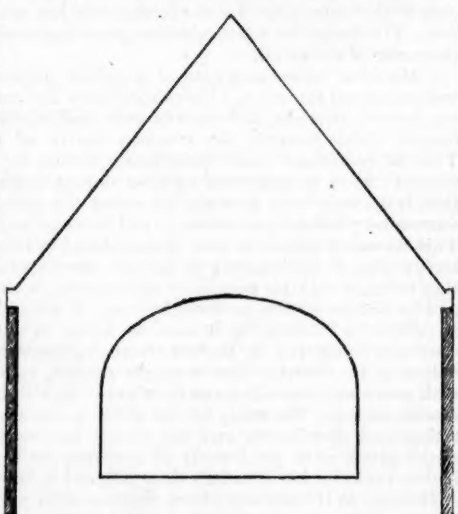


First Story Plan.
Fig. 175.

As we wish, for the sake of greater security against fire, to cut off the upper portion of the stage entirely from the auditorium, by carrying the proscenium-wall through the roof, the profile of the roof will determine that of the wall, which will, however, project a foot or more beyond the slates. This being fixed, together with the heights of the various stories, we must design the proscenium opening, taking into consideration the proportions of height and width which we desire it to have, and the consequent pressure which must be resisted. This will give us the length of the cross-walls which form its abutment on each side.

Second Story Plan.
Fig. 176.

We may next study the main walls, first determining the thickness required for stability under the given conditions of height and length, and then adding to this whatever additional mass may be necessary, either in the form of extra thickness or of internal or external buttresses, to resist such horizontal thrust as may be exerted by any portion of the roofing. This will involve the consideration of the trusses for various portions of the roof, and the fixing of such forms and spacing as best meet the conditions to be fulfilled. The choice among the different modes of buttressing may depend here on the effect which we wish to secure in elevation, since so far as interior convenience or acoustic effect is concerned it makes little or no difference whether the pressure of the roof is resisted by the mass of a plain wall, by internal pilasters, external buttresses, or the weight of pinnacles.



Elevation of Proscenium Arch.
Fig. 177.

As the form of the wall above, and the distribution of the weights upon it, whatever may be its plan, must substantially determine those of the wall below it, we shall now have the main features of the exterior masonry, and can go on confidently with the study of the elevations. The thickness and position of the interior walls and piers will, however, depend somewhat on the mode of supporting the floors, and this point should be generally fixed upon at the outset, more accurate determinations being made subsequently. There is not much danger in such a building of imposing too great a crushing strain upon any of the materials, but it is best to keep the strength of brickwork and stone in mind, and to guard against diminishing unduly the size of piers between openings, either external or internal.*

In order, however, that our conception of the problem to be solved may include all the essential conditions, we must, before proceeding beyond the most general outline of our design, know something of the foundation which is to support our building, and this will be all the more necessary in the present case, since the bearing stratum to which the piles are to be driven is not of very firm consistency.

If we proposed to put an unusual weight on any part of the foundation, by carrying the tower to a considerable height, or in any other way, it would be necessary, besides driving trial piles at different points within the site of the intended structure, to show the hardness of the bearing stratum, to ascertain also its thickness, and the character of the material below it, by boring through it with an auger which will bring up in its hollow a portion of the formations which it traverses, but our building being considerably lighter than others in its neighborhood, which have stood for years safely on foundations about which no special precautions were taken, we need hardly fear the disruption of the bearing stratum itself under the weight of the building, provided the load is so distributed over the piles that none of these will settle after the structure is completed. Just how much weight can safely be placed on each pile under our building cannot be known until they are actually driven, since the consistency of a bearing stratum such as we have to deal with varies greatly in different parts of a given area, but we can form an approximate opinion by observing the driving of those for works in the neighborhood. * We will therefore inspect for a few minutes the operations taking place in the cellar of a new block of stores near by. The piling for one of the party-walls is just started, and we observe that the length necessary to reach the bearing stratum is about thirty-five feet. The piles are of spruce, most of them perfectly straight, although we notice some crooked ones being hastily rolled to an inconspicuous position as we approach. We see one swung under the hammer of the machine, and the driving begun. The pile sinks rapidly, and at a nearly uniform rate, through the gravel filling, until its head is within two feet of the surface of the ground, when the blows are seen to meet with greater resistance; the hammer rebounds, and the ground is felt to quiver, while the sinking of the pile under each stroke is but five or six inches, instead of a foot or so. The shaking of the ground indicates that the bearing stratum in that place is thin, and there is danger that it may be broken through, so the foreman orders a man to climb half-way up the machine and detach the hammer by hand, so as to lessen the distance through which it falls, and with it the force of its impact upon the head of the pile. Stepping up to the machine, we now ascertain the rate at which the pile sinks under the blows, by marking on one of the standards with an old nail the position of the top of the hammer after two successive blows, and measuring the distance between them. For two blows the sinking is five inches, then it falls to four, and then to three inches. The next stroke drives it three inches more, and the foreman gives the signal to stop. As the machine is being shifted to a new place we inquire the weight of the hammer, and learn that it is 1650 pounds, and we ascertain, also, that the height from the ground to the point at which it was detached for the last few blows is 15 feet. We have now the data for determining the weight which can be placed upon the head without fear of its sinking under it, by Sanders's formula,

$$\frac{F\,H}{8\,s} = W,$$

in which F = Fall of the hammer in inches.
S = Sinking at last blow in inches.
H = Weight of hammer in pounds.
W = Safe weight in pounds.

In our case $F = 180$; $H = 1650$; $S = 3$; and the formula gives $\frac{180 \times 1650}{8 \times 3} = 12375$ pounds, which is the safe weight required. The next pile, with the same fall and the same hammer, sinks only two inches at the last blow, which, if substituted in the formula, would give $\frac{180 \times 1650}{8 \times 2} = 18562.5$ pounds as the safe weight. Most of the piles, however, give a minimum sinking of three inches, further driving increasing rather than diminishing the rate, by the penetration, as the foreman informs us, of the bearing stratum; and the corresponding safe load of 12,375 pounds must be accepted for the present as the standard upon which our calculations should be based.

We notice that the piles for the party-wall are being driven in a double row, spaced two feet apart from centres in the direction transverse to the line of the wall and three feet from centres in the same direction as the wall; and, curious to learn what load the unknown builder proposes to place on them, we ask to see the plans, which are in a tool-chest on another part of the ground. These show a row of three-story stores with finished basements, each 23 feet wide from party-line to party-line. The walls scale 45 feet high from the curb-level, and we know that the depth from this level to the top of the piles must be 15 feet. As the party-walls have no pressure of earth to support, they have but two courses of stone footings; one, immediately above the piles, being 3 feet wide and 18 inches high, while the second is 2 feet wide and also 18 inches high. This is equivalent, in a rough estimation of weights, to an addition of 4 feet 6 inches to the height of the wall, which, above the footings, is of brick, 12 inches thick, making the virtual height of the wall 64 feet 6 inches. At 112 pounds to the cubic foot, which is a fair estimate for brickwork, but low for stone-work, the weight of each foot in length of the wall will be 7,224 pounds. To this must be added the weight of the floors and roof and the probable loads upon them, which in a retail country store may safely be taken at 100 pounds to the square foot. The roof, which in this case is covered with tar and gravel, will require about the same allowance. The clear span of the floors is 22 feet, and the party-wall supports half the floor on each side of it, or 22 feet in all. Counting that of the basement, which is framed just like the others, there are four floors besides the roof, and the total floor and roof load supported by each foot in length of the party-wall will therefore be $5 \times 22 \times 100 = 11000$ pounds. The weight of each foot of the wall itself, as we just ascertained, is 7224 pounds, so that the total pressure at the bottom of the wall is 18224 pounds to each foot in length. The piles being spaced 2 feet apart transversely, and 3 feet longitudinally, there are but two piles under every 3 feet in length of the wall; so that each pair of piles has to support $3 \times 18224 = 54672$ pounds of wall and floor load, making 27336 pounds to each pile.

But we have ascertained by Sanders's formula that the safe weight upon the piles under the conditions which we find to exist is but 12,375 pounds; so that if the plans are carried out they will be loaded to more than double their safe capacity. After satisfying ourselves that our calculations are correct, we call the attention of the foreman of the pile-drivers to them. He shrugs his shoulders at first, and mutters something about "book-larnin," and "practical men," but is finally brought to admit that if the building had been his, he would, considering the softness of the ground, have put a triple instead of a double row of piles under the wall, and made the spacing in each direction 2 feet, which is as near together as long piles can be driven without danger that they may force each other up from their solid bed on the bearing stratum. This would give 3 piles for the support of every 2 feet of wall, and would bring the load on each within the safe limit. "However," the foreman adds, in a burst of confidence, "I aint got nothin' to do with that. They give me the piling plans, and I go by 'em; and anyhow, I guess these are only speculation buildin's." That they are likely in this case to fulfil the condition required of them — to hold themselves up until they are sold — we cannot deny, and we forbear to meddle further with what is clearly not our business.

Nevertheless, we should be sorry to run the risk of seeing in our own building after a few years the evidences of incipient settlement, the joints of the brickwork opening, and the lintels and interior plastering cracking; and we resolve to keep the weights on the piles within the safe limits.

AMERICAN ARCHITECT COMPETITION. — IRON-WORK.

"*CROSS KEYS*" stands brilliantly first in this competition with a gate in which he has developed with ingenuity and graceful fancy the characteristic qualities of wrougnt-iron. His use of this metal is as logical as it is elegant in design, and both in mass and detail shows a fine artistic sense. This quality is conspicuous in his promptly taking advantage of a rare opportunity for a pendant ornament; no device could be more appropriate than the ingenious net-work of rings which he has hung in the arch. Manifestly, this is more logical than any design requiring support from beneath, besides avoiding a rigid division of the arch from the gateway, which such a band of support would have caused. Very admirable, too, is the way in which the rich frieze of scroll ornament across the gate is contrasted with the firm rectangular lines above and below it. Of this rectangular work the lower portion, where strength is required, is closely studded with rivets, and treated with great vigor, while the upper part blossoms into rosettes, and forms, with the spear-heads, a light and graceful cresting to the gate. Not so successful is the knocker, for its design suggests in its scrolls of foliage, wrought, instead of cast iron, as it has been labelled. "*Cross Keys*" draws with a sparkling precision, which, supplemented by an orderly and intelligent disposition of his lettering and details, makes his a model sheet.

"*Art Lover*" gives a gate in which wrought-iron is used with great simplicity. His free use of plain bars of iron to frame his double row of scroll ornament gives the latter peculiar richness, and yet possesses a thoroughly constructional character. The twisted spiral of the double bars is a legitimate and effective device. The same may be said of the riveted lattice barring the lower part of the gate, and below that the introduction of sheet-iron brings in an element of which "*Cross Keys*," in common with several other competitors, did not avail themselves. The composition of the foliated work is unnecessarily confused, and its stability not materially increased by the segmental bars riveted across it. The chief blemish in this design, however, is the unfortunate introduction of the iron spindles in the upper part of the gate. Iron lathes may be turned, no doubt, by powerful machinery, but this sort of work is so easily and naturally done in wood, that turned spindles necessarily recall that material and their introduction here is a surprising error in so good a design. The design for a sewing-machine stand is more logical than graceful.

The merit of "*Two A.M.'s*" gateway lies in the happy device by which he spans it with clustered bars richly bound together, and developing midway into an ingenious support for a lantern. The development of the bars and scrolls is simple and natural, and the result effective. The intention shown in trying to give the iron-work a firm attachment to the stone posts is more commendable than the means actually employed, which are too stiff and formal to harmonize with the florid work elsewhere. The same system of twining rope-like bands is used in the gate itself, the design of which lacks somewhat concentration of interest, and its real richness is dissipated, without producing the effect it might. The design submitted for a cast-iron window-frame is neither decorative nor suitable to the material. The distinction between cast iron and wrought does not consist in the former being poorer and less florid than wrought-iron, but in its being a moulded substance instead of a beaten one. An ornamentation appropriate to a moulded surface is then its natural characteristic. We notice, however, that several of the ablest competitors have made between the two materials an evident distinction in favor of florid work in wrought-iron, whereas castings can be easily treated with the greatest richness. "*Two A.M.*" draws with ragged, heavy lines, which do not do justice to his carefully-considered details.

"*Ferrum's*" sheet is a most interesting one. While not altogether fortunate in his details, which are not very decorative, the designer's individuality is so marked, and his intention so positive, and carried out with such directness, that he at once secures a high position among the competitors. He presents us with a design for a gallery, whose railing suggests the balconies common in Spain. Cast, wrought, and sheet iron are thoughtfully combined with a view rather to economy and practical considerations, than to an artistic design; but the general result is successful, and certainly it is far removed from being commonplace. There is a decided lack of brace or tie to hold together the gallery-bars near their bases, and the use of wrought-iron in such broad brackets as those indicated is not to be commended. These brackets should have been, while keeping the same profile, divided into several narrow ones, which would have been more easily hammered out, and would have produced a lighter and more decorative effect. The wrought *grille* is thoroughly constructive, and produces a good effect with the simplest means. The drawings are coarsely and heavily executed; and the design for the knocker suffers especially from this.

"*Vulcano*" introduces wrought, cast, and sheet iron in his gate. All the bars being wrought, the cresting and foliation are of cast-iron, and the perforated panels of sheet-metal. The latter in panels gives value to the rich crestings. Here we finally come to a design where something is shown of the real capabilities of cast-iron for rich effects. It was, however, a mistake to make so heavy a cresting, and the general design suffers from the lack of some dominant feature. It would, for instance, have greatly improved the design to have given greater height to the twisted bars, which with the foliated work above should be the dominant feature. The result of such a change is evident in the wall-railing, whose judicious proportions produce a rich and agreeable effect. It would have been more satisfactory to have emphasized more decidedly the staple securing the gate to the stone post; for the former now has no recognized position. The design for a wrought-iron grate is graceful and well in the character of the metal.

"*Maréchal*" gives us a gate of excellent proportions, and with a well-expressed intention. He concentrates his ornamentation upon the lateral divisions, and crowns each half of the gate with a rich feature rising towards the common centre of the double gates. This latter feature is an unfortunate device, for by reversing the natural line of a supporting member sloping down from the pivoted side, it not only loses leverage to swing the gate, but it brings an unnecessary weight just where it will increase any tendency to sag. This crowning motive is also ill-considered in its treatment of cast-iron, which, if the lettering is correct, provides for that metal a design which would be peculiarly appropriate, both in its movement and its slender scrolls, to wrought-iron. It would be difficult to cast so delicate a pattern, for it must be borne in mind that this metal does not easily run in narrow channels, where a mere air-bubble will stop its course. The wrought portion, however, is designed with grace and ingenuity, and the sheet-iron, with its *repoussé* bosses, is well placed. The study for the *grille* is admirable, the ornamentation well distributed, and the details interesting. Had "*Maréchal*" given us a good study of cast-iron he would have taken a higher rank, for his drawings show unusual delicacy and refinement.

It seems as if the competitors were strongly partisan each of one of the metals, and either did not understand or would not give their attention to the other metal. Thus: "*W. J.*" develops with success cast-iron, but except in bars does not give wrought-iron its characteristic forms. His design for a wrought-iron gate could be easily cast; much of it, indeed, could be reproduced most easily in that way. On the other hand, his gate in cast-iron is an excellent example of its legitimate possibilities, though in the mere matter of proportions the other example is the most successful. The cast-iron staircase is intelligently considered, and the alternative in wrought work promises well. The drawings are skilfully presented, and as he is a facile designer and well up in cast-iron, we have only to recommend to "*W. J.*" careful study of mediæval wrought-iron.

"*Vienne*" treats a railing of wrought-iron with forms which are characteristic enough, but which lack elegance, the lower compartment being particularly clumsy. His cast knocker is, however, elegant in mass and detail, and shows its material to advantage. The great disparity between the two examples may perhaps have come from the designer having inspired himself with some ancient wrought-iron designs which were poor examples, for undoubtedly many such exist, and, when we recommend the study of mediæval work, we refer only to good examples of it. A village blacksmith might well understand the capabilities of his materials without having any knowledge of the principles of design.

This caution applies also to "*By George*" — and there is greater need for it — who gives us a staircase which he intends shall be original, cost what it may, and if he had anything to lose, it would certainly cost him that. His very positive knowledge of the properties of iron ingeniously applied is vitiated by a hopeless want of taste. A "Staircase to a Family Hotel" is not the place to exhibit a procession of ill-drawn snakes, beasts and birds, nor is a "Fence in front of a City-House" a fit opportunity for grotesque vegetables. We suggest to "*By George*," that since he thoroughly understands the proper practical use of iron, he now apply himself to the acquisition of the elements of design, and to the improvement of his taste. "*Oriental*" comes before us with a careful study for a cast-iron lamp-post, and a wrought-iron railing. The former is well designed for its function and for the material, and shows unusually refined details. The wrought lantern is simple and graceful. The railing though less artistic is not without ingenuity, especially in the device by which the railing is attached to the posts. The drawing is neat and attractive.

What "*Tyro*" sends is so good in its way that we regret the modesty of his small sheet. His wrought gates are thoughtfully considered and produce a dignified result. He uses sheet-iron effectively in the panels of the lower half of the gate. His lamp-post of cast and wrought iron is not so pleasing, but has some good points. The drawing is done with care.

"*Shanks*" tells us his lantern is of cast-iron and his railing wrought, but he makes no intelligible difference in their treatment. There is nothing about the lantern which would not more naturally be executed in wrought-iron, and it would never occur to any one to try to cast it. As wrought work, both designs are commendable.

"*Serio*" is industrious and ingenious. He offers us seven designs of iron *grilles*, some of which he condemns himself by labelling them "wrought or cast iron." If they are suitable for one metal, they lose their merit for the other. In truth, they are all adapted only for wrought work; he gives us, however, a hot-air register suitable for casting. His drawing is careful rather than brilliant.

"*All Right*" also gives us a cast-iron register, but it is of a most primitive pattern. On the other hand his wrought-iron door is of unusual interest from its novelty, yet it escapes the reproach of eccentricity. The sheet and wrought work are admirably combined, and we regret that the author did not send us a more elaborate and ambitious attempt.

"*Thor's*" wrought-iron hinge would cast well. He should have given it more delicate detail to bring out the resources of the hammer. The cast-iron railing could be cast, but we should advise "*Thor*" not to do so until he has given more attention to design, and then we are sure he will substitute something better in proportion and detail.

HENRY VAN BRUNT,
EUGENE LETANG,
ARTHUR ROTCH.

BUILDERS' SCAFFOLDING.—VII.

BRACKET-scaffolds, used by carpenters and joiners, and for outside plastering, stuccoing, and for such other light work, are usually of two kinds, represented in Figures 18 and 19. The bracket is of triangular form; the horizontal and vertical parts are usually of 2″ x 4″, or 2″ x 6″ stuff; the oblique pieces or struts are of fencing or are 2″ x 4″; all the pieces are securely nailed or screwed together; and gusset-pieces of board are nailed across the right angle. Figure 18 is supported at the required height against a wall by means of a raking shore, the head of which presses up at the right angle, and is confined by the gusset-pieces. The foot of the shore is shod with iron, and is sunk in the ground to prevent slipping. Sometimes an adjustable shore is employed, consisting of two pieces of long scantling, of size to resist the transverse action of the oblique strains which may come upon it when extended to its full length. At one end of one of the pieces is a rod-iron jointed clasp which fits obliquely over the other piece and fits into corresponding notches in it, and at the corresponding end of the other piece is a fixed band-iron clasp which holds both pieces together, and permits them to slide upon each other, the oblique clasp catching fast hold of the notches, so that the pieces can be secured together at any required length. A wall board is usually nailed horizontally across the back or vertical piece to prevent swinging sideways. As the prop frequently has to be of considerable length to reach the height at which the bracket may be required, care must be taken that the prop has enough sectional area rightly disposed to prevent its bending in the least degree under the heaviest loading to be imposed upon the scaffold.

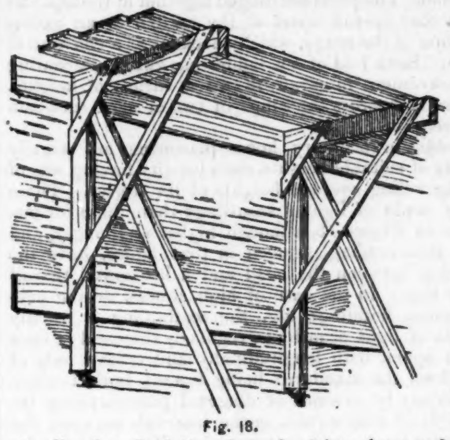


Fig. 18.

The bracket in Figure 19 can only be used through an opening; it is held by an upright scantling, to which it is spiked; the scantling is spiked directly to the joists above and below when they lie transversely of the wall, or indirectly, to scantlings or cleats which are nailed to the joists, when they lie longitudinally of the wall. The cleats are sometimes spiked to the joists above and below on the corresponding opposite sides of the upright scantling, so as to resist the alternate strains of *pull* above and *push* below. Brackets of this kind usually consist simply of waste boards nailed to the upright scantling.

Bracket-scaffolds are sometimes hung on iron pins with heads driven in brick or stone walls, for purposes of outside plastering, stuccoing, etc. In Scotland a hard-wood needle, as it is called, with notched head about three inches square, is let into the wall, a corresponding square hole is cut in the upper part of the back-board of bracket, which is usually a piece of 8-inch plank laid flat against the wall, so that it can slip over the notch.

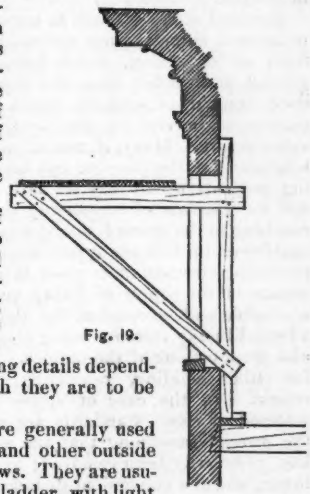


Fig. 19.

There are various forms of brackets for scaffolds adapted to special purposes, but all depend for their utility upon one or another of the methods of securing in position to the building here described, or others which are analagous in principle, but of varying details depending on the circumstances in which they are to be used.

Hung or suspended scaffolds are generally used by painters in painting cornices and other outside work not accessible through windows. They are usually made in the form of a runged ladder, with light boards laid across the rungs. Bridle suspending-ropes are attached at both ends and on each side; to the bridle-ropes purchase-blocks are hooked. The upper block is made fast to a large bar-iron hook, which is fitted with a jointed bearing-plate, by which it is suspended. It is made large enough to reach back over the tops of ordinary house cornices. This arrangement of scaffold is shown in Figure 20. In the absence of these hooks, cantilevers made of strong planks or spars are laid upon the roof, with the ends projecting over the cornice, and weighted at the inner ends, the hoisting-tackle being fastened to the projecting end, the fall of the hoisting-rope reaching down to the painters using the scaffold. The cantilever is a straight lever of the first order, with the fulcrum between the power (which in this instance we will consider to be the projecting end which suspends the scaffold with the painters, etc., upon it) and the weight, which is the inner end which is weighted down upon the roof.

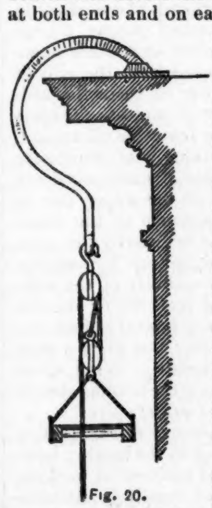


Fig. 20.

Paris painters sometimes use for painting the outside work of windows, etc., an arrangement of somewhat similar construction to what is called the "boatswain's chair," which is used on board of ships for facilitating the scraping or varnishing of masts. The ordinary boatswain's chair consists of three pieces of light scantling, about two feet long and having holes in both ends, fastened together in a triangular (equilateral) form, and suspended by a bridle-rope fastened to the three corners by passing through the holes and knotted underneath. A seat is formed by canvas or netting stretched across the triangular frame, but often it is used without any such seat. For house painting it is slung from a cantilever to which a block is fastened, the fall of the rope being fastened by the operator in the chair to the suspending-rope.

Paper-hangers' scaffolds consist of a double ladder, each part widening towards the bottom. The parts are hinged together at the top, and when set up for use they spread apart at the bottom to an extent limited by the position of the hinge, which checks it at a convenient angle of inclination. Each fold of the ladder has rungs alternating with the other at convenient intervals, to suit a variety of heights. Boards or planks are laid across the rungs of two or more such ladders at any height required.

Plasterers' scaffolds in ordinary house plastering are usually erected upon trestles of suitable heights, each locality having sets of trestles suited to the ruling average heights of its stories. These trestles are usually made of lighter scantlings than those for masonry purposes seen in Figure 13, although higher and longer, and instead of having strut-bracing, as seen in that figure, have the cross or panel bracing between the head and a horizontal tie-rail near the foot of the legs. In the case of high stories, or the ceilings and walls of public buildings, etc., the scaffolding is usually erected on standards of light scantlings, regularly disposed in tiers at proper intervals apart, both longitudinally and transversely of the hall or auditorium, the standards being braced both longitudinally and transversely by systems of diagonal panel-bracing between successive tiers of ledger-rails, in the intervals between the standards, both longitudinally and transversely. The rails are introduced at such intervals in the longitudinal and transverse directions as the height of scaffold and the distance apart of the standards require. When a considerable length of high ceiling has to be done, it is sometimes advisable to construct a movable scaffold which allows of work on a convenient extent of the length, and usually all the width at a time. It is made to roll along on wheels working on light railways. Such a structure is simply a limited arrangement of braced standards, etc., corresponding to the preceding description, with the addition of wheels under the standards in suitable positions.

Elevated scaffolds, such as are required for spires, turrets, finials, prominent chimneys not accessible from a roof, and such like portions of structures, which have considerable altitude from the ground, only differ from the types already described, perhaps, in their manner of support, which for economical reasons in many cases is not carried up directly from the ground, but rests upon the substructure. Many, if not all of the types of ledger-scaffolds are available for the purpose and are adopted according to the prevailing methods which may be, as it were, indigenous to the locality, and the methods of supporting them, when not by direct standards reaching to the ground, floor-joists, roof-timbers, etc., partake of the cantilever or bracket types, according as magnitude and other determining circumstances seem to demand, regard being had to the nature of the supply of fitting materials and appliances which are accessible and economical for the purpose, the particular method adopted in any instance being also regulated by the local prejudices and predilections of the builder. Such scaffolding may be required for either building, rebuilding, or for subsequent additions or repair. In the case of spires of lofty dimensions, when constructed of stone, standards are generally carried up directly from the ground (assuming that the scaffold of the tower substructure had previously been removed) to any convenient height above the tower, and at a convenient distance out from the tower wall. These standards may be of timbers or of several scantlings bolted together with continuous ledgers and panel-bracing all around, as described in the fifth paper. To the standards are attached strong timber needles, which run horizontally through the louvre or window openings, and are propped up vertically, and strutted from the sills of the openings. These needles carry an inner tier of vertical standards, which are placed close in to the tower wall and have ledgers at suitable intervals, and panel-bracing in these intervals all around, between the consecutive tiers of ledgers. Raking wind-braces are carried from convenient heights up the upper tier of standards down to the main or lower standards at the level of the upper tier of ledger ties, so as to impart the necessary resistance to the wind-strains acting upon the upper scaffolding. As ordinarily the spire contracts as it ascends, more space is left higher up for interior bracing and reinforcing devices, to add to the stability of the scaffold when not interfered with by architectural features or details, which in ordinary cases may afford the necessary lateral stiffness to the scaffold when not in a very exposed situation; but when a high spire is contemplated, and is in an exposed locality, flying wind-braces must be resorted to, as the wind-strains on the scaffold should not cause any lateral strain to be communicated to the spire.

Scaffolding for the erection of factory or chimney stacks (called *stalks* in Scotland) is most generally constructed on the inside; however, for small chimneys which would not afford convenient working room inside, it must necessarily be outside, and usually is a double-faced ledger scaffold, although occasionally it is single-faced, as described in the November number; but in either case the scaffolding should be rendered independent of the chimney, by means of a rigid system of longitudinal and transverse cross-bracing in panels or bays, as well as shoring for the single-faced scaffold, all around; the working-platform being supported in the latter kind on triangular brackets nailed to the standards, in order that whichever kind is employed, putlog-holes in the chimney shall be avoided, with a view to the scaffolding in no way interfering with the independent equal settlement of the chimney all around. For the inside scaffold the number of putlogs or needles of, say, 8-inch plank, depends on the internal diameter and whether the hoist is placed inside or outside. If outside, there is usually one placed in the centre, and one on each side of it; they have a bearing of 3 or 4 inches on the walls, a brick is left out at the back of each end, so that they can be moved backwards or forwards lengthwise in this vacancy, in order to be readily withdrawn endwise and gradually slipped out. When the hoist is placed outside, the putlogs below the working-platform are often left in until the top is reached, when all are taken down at the same time; in the meantime, they afford convenient holdings for temporary ladders, by which the bricklayers ascend to their work. Planks are laid close together across the putlogs, and form the working-platform; it covers the entire opening, except when the internal diameter is large enough to admit of the hoist-hole being placed in the centre of the working-platform, through which the materials are raised to the bricklayers. Scotch builders in the majority of chimneys prefer to put the hoist or gin-pole on the outside, except when the diameter is very large, and affords a roomy platform around the central hoist-opening. This hoist usually consists of a vertical pole 5 or 6 inches in diameter, and about 12 feet long, having an iron ring or collar on each end, and another about 3 feet from the lower end; but it should correspond with a certain number of courses of the brick being used so that it may work conveniently with the successive scaffolds; the lower end has a groove across the centre to admit of the collar fitting down into a ratchet or notched iron anchor. This anchor is of $\frac{1}{2}'' \times 2''$ bar-iron about 4 feet long; about 18 inches of one end is twisted round one-quarter turn, the extreme 7 or 8 inches of the twisted part is notched closely about half-an-inch deep, along one edge, the other end of the anchor has nail-holes punched in it. This anchor is laid in the wall dry as it is being built, in the direction of the diameter of the chimney, with the notched end projecting about 5 or 6 inches from the outside face of the wall, with the notches placed edgewise upwards. The inner end of the anchor is nailed through the holes to the central needle, which is placed above and in contact with it. A second similar anchor is laid in the same manner, about three feet above the lower one as just described, as the wall is being built, the height corresponding with the middle ring or collar on the pole, which has attached to it a notched bar, fixed crosswise of the pole to fit into the notches in the upper anchor, so that should the anchors not be exactly plumb over each other, the pole by means of the two notched bars square to each other can be *trued* plumb, and so held there. A spindle of $\frac{3}{4}$-inch round iron is driven into the upper end of the pole; fitting on this is a cross-arm of about 2 feet 6 inches long, which swivels around, and having a sheave working in a slot in each end; the hoisting-rope passes over these sheaves, and as the materials are hoisted to the top, the arm swivels round to enable the box to be dumped on the scaffold inside. When the wall has reached about 3 feet higher, another iron anchor is inserted to serve its turn when the wall again reaches the proper height for still another. When the lower anchor is relieved of the pole as it is raised each stage, it is withdrawn, to be reset further up; thus, three anchors are constantly required to relieve each other in turn as the wall advances. A pulley is secured at the foot of the chimney, through which the fall of the hoist-rope passes horizontally to the winch. In England it is usually preferred to use an inside hoist. A good form of it consists of a tripod set over the centre of the chimney. It is composed of three iron rods, having an eye at the top through which a bolt passes securing them together; from this bolt is suspended the hoisting sheave or pulley. The building materials are hoisted in a box of about 20 to 24 inches cubic dimensions. A square opening is made in the centre of the working-platforms to pass the box through. The lower ends of the tripod legs are bent and flattened, and a pin-hole made in them by which they can be fastened to the working-platform. When the inside hoist is used, either two or four putlogs are necessary, one on each side of the centre space being set to mark the size of the hoist-opening. The lower putlogs must be removed at once, in order to leave the entire height clear of obstructions, so as to admit of the hoisting being done without any interruption.

FILLING THE PORES OF WOOD.

STAINED or painted wood-work is finally submitted to the various treatments known as polishing, rubbing (with wax), or lacquering or japanning. Those processes are intended, on the one hand, to beautify the work or to give lustre to it, and, on the other, to protect its surface against exterior injurious influences, consequently to impart to it greater durability. By closing the pores of the wood it becomes smoother, and is capable of greater resistance. Very much depends upon an efficient closure of the pores, also upon the operation being effected with the proper substances. The latter should harden within a few hours, and should not undergo any changes from exterior influences during their transformation which might have injurious effects upon the layer of polish, lacquer or wax. Although

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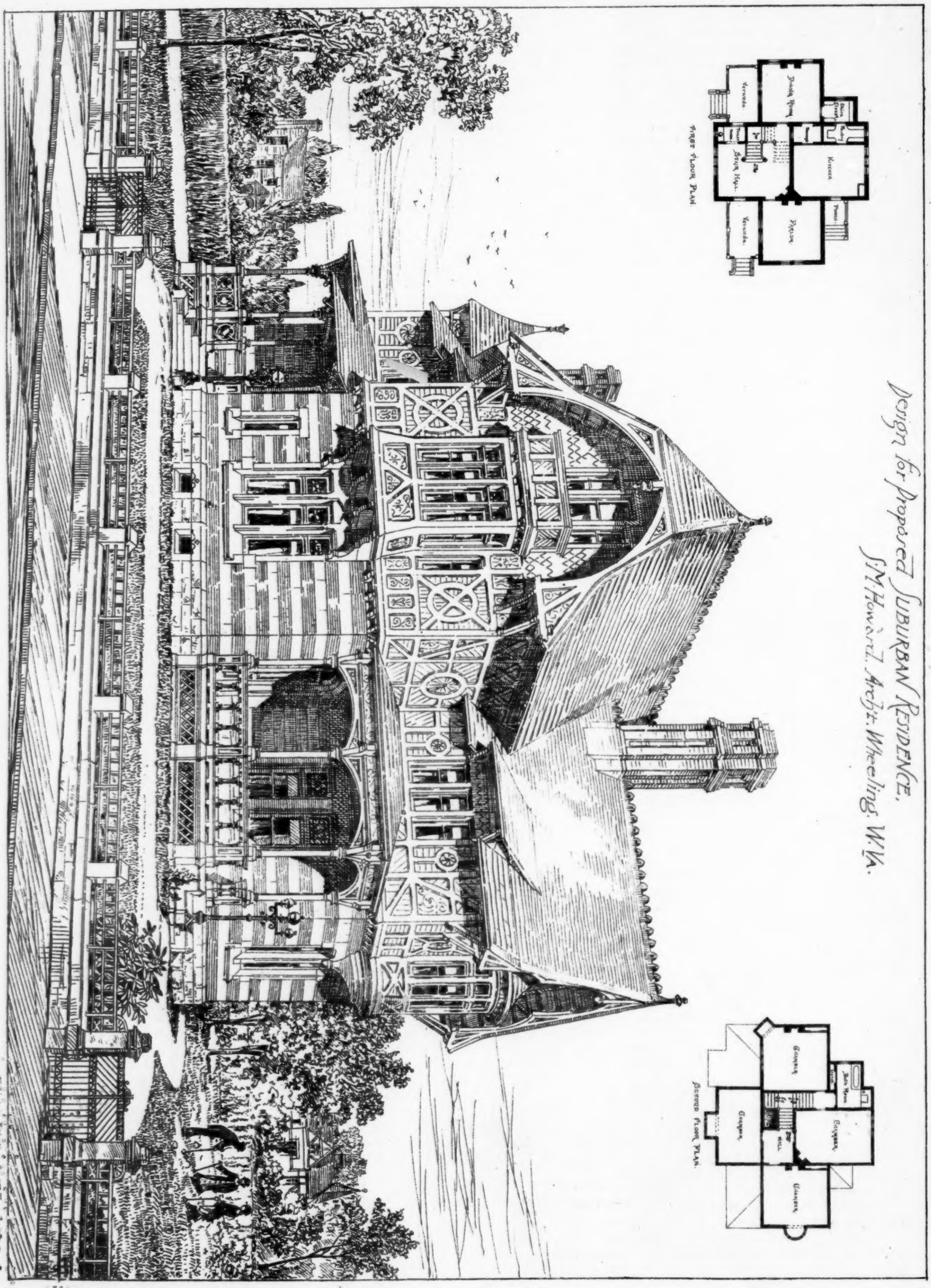
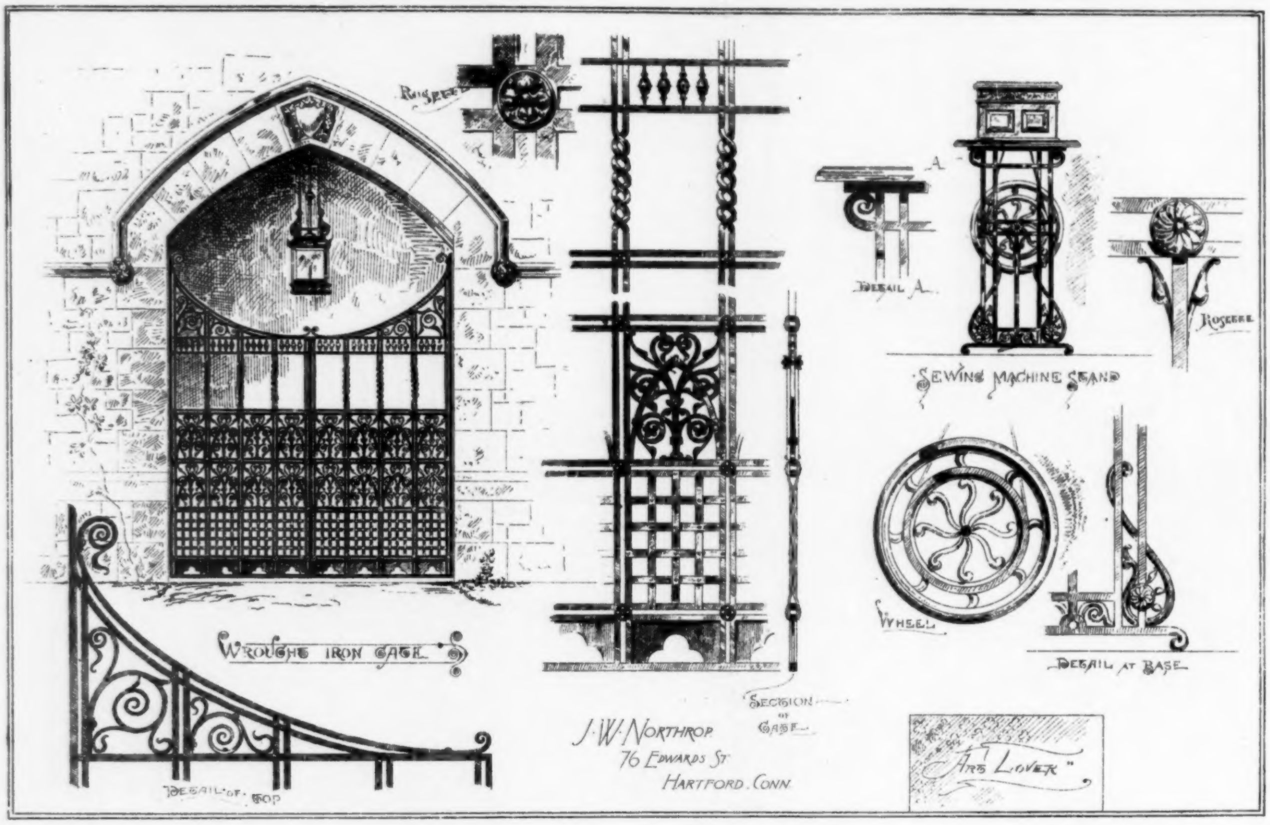
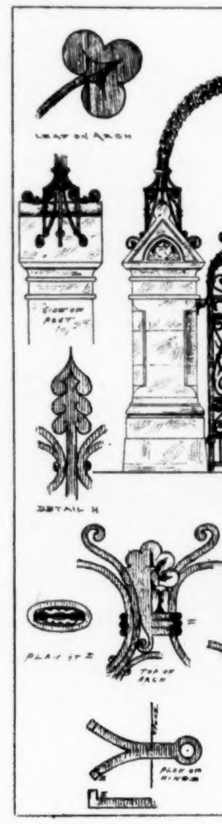
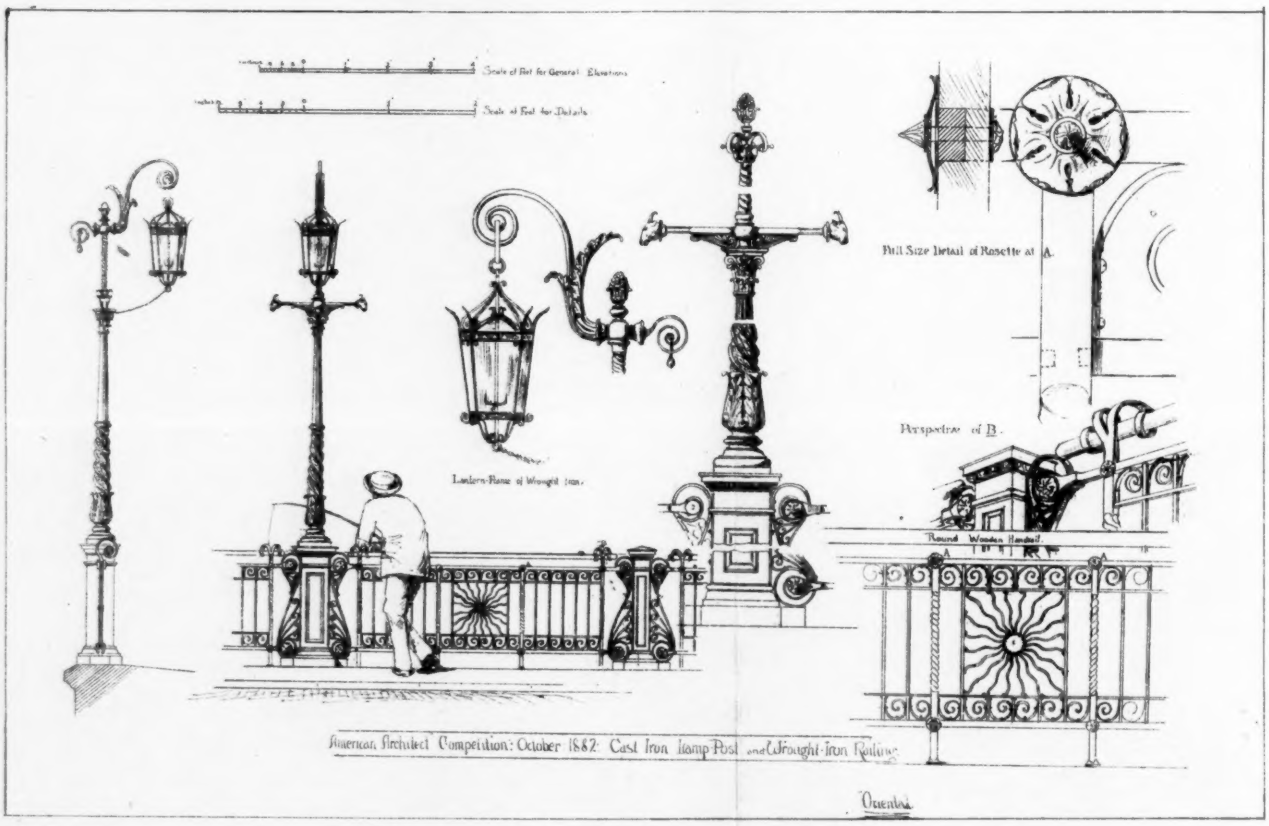
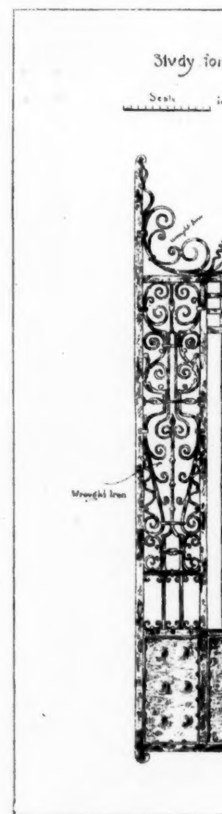


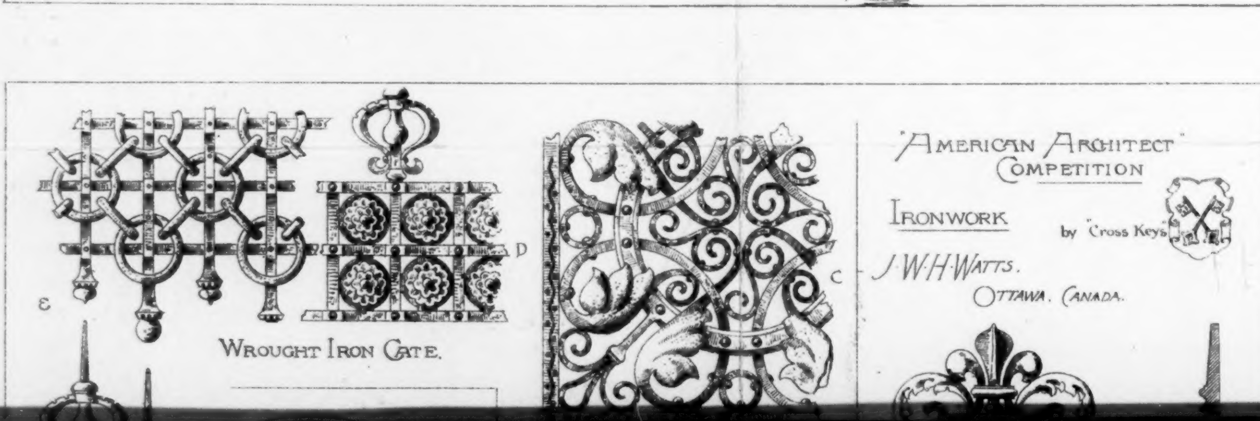
Heliotype Printing Co. 211 Tremont St. Boston


Rosette
Detail A.
Sewing Machine Stand
Rosette
Wheel
Detail at Base
Wrought Iron Gate
Section of Gate
Detail of Top
J. W. Northrop
76 Edwards St
Hartford, Conn.
"Art Lover"


Leaf on Arch
Detail H


Scale of Feet for General Elevations
Scale of Feet for Details
Full Size Detail of Rosette at A
Lantern-Frame of Wrought Iron
Perspective of B
Round Wooden Handrail
American Architect Competition: October 1882: Cast Iron Lamp-Post and Wrought-Iron Railing
Oriental


Study for
Scale
Wrought Iron


D
E
C
Wrought Iron Gate
"American Architect" Competition
Ironwork
by "Cross Keys"
J. W. H. Watts.
Ottawa, Canada.

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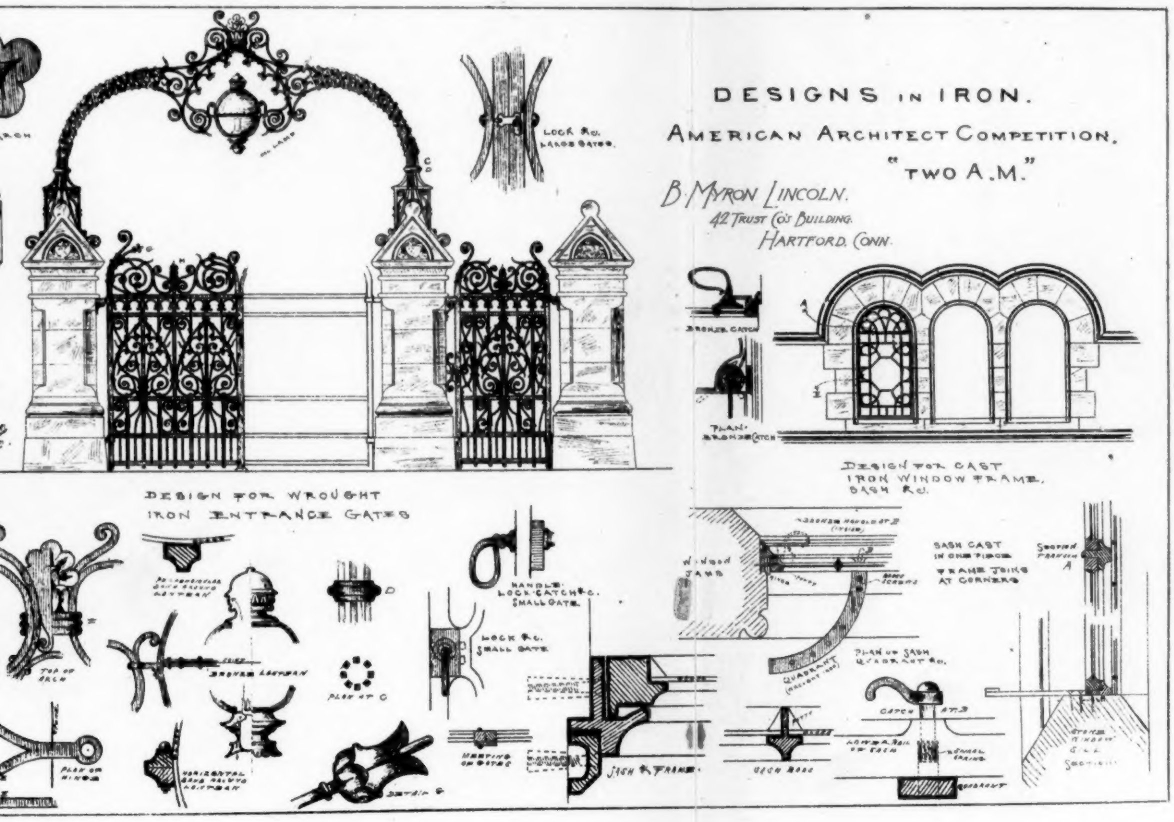

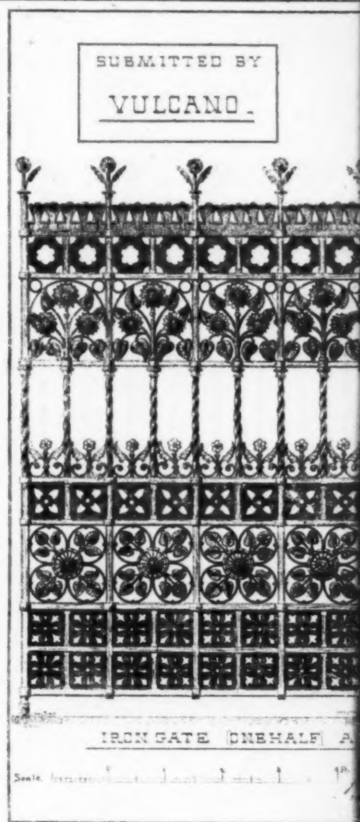

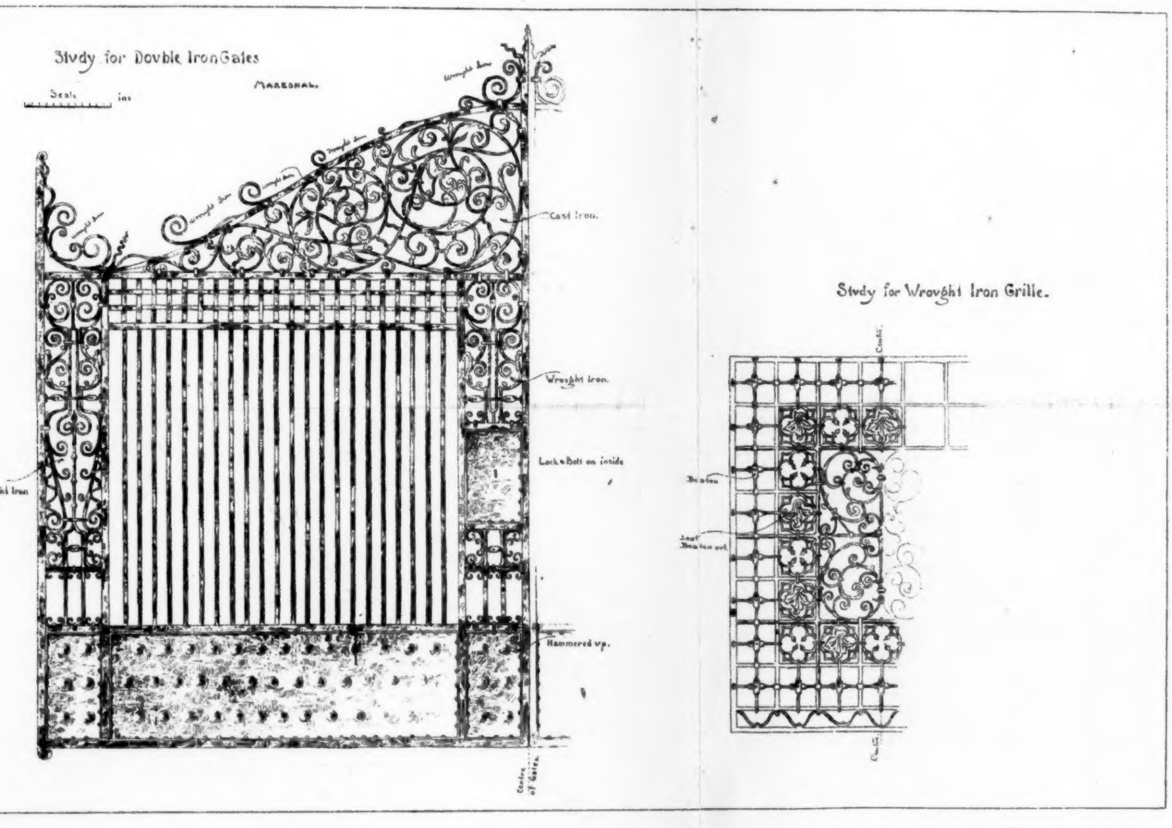

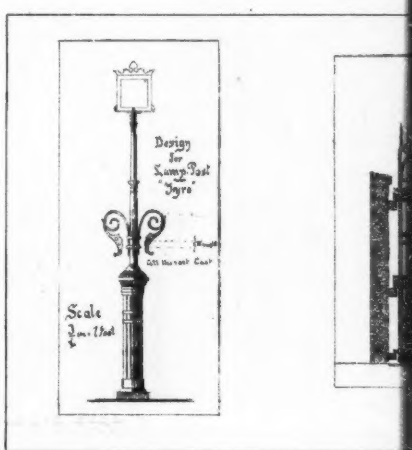

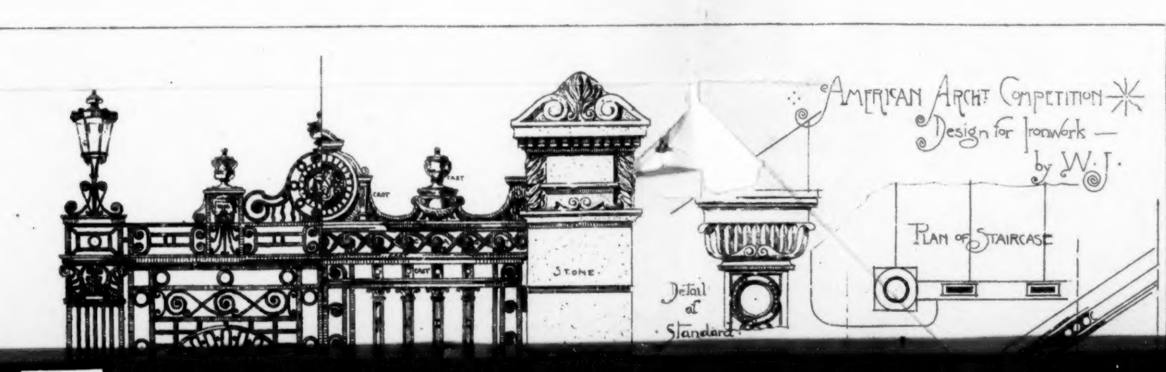

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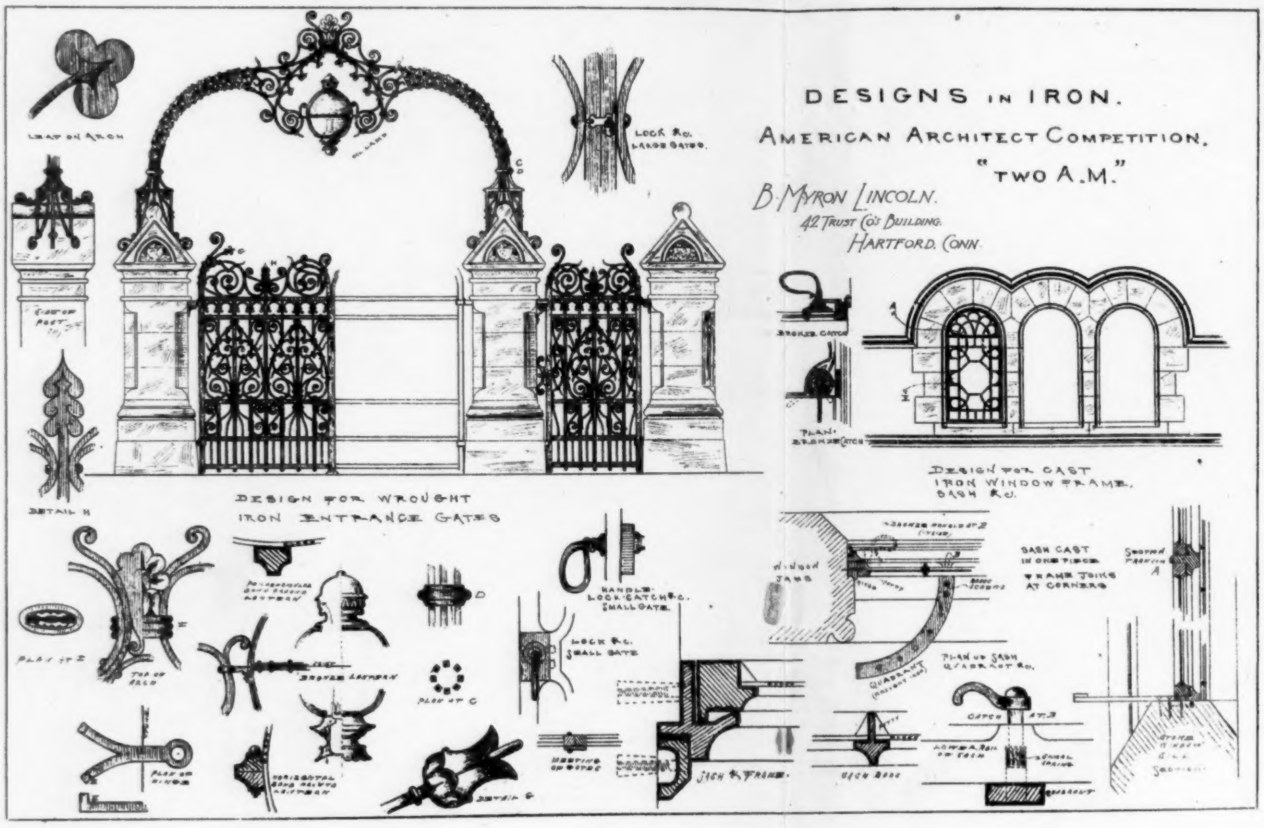

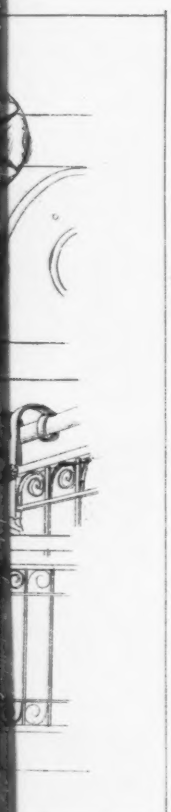

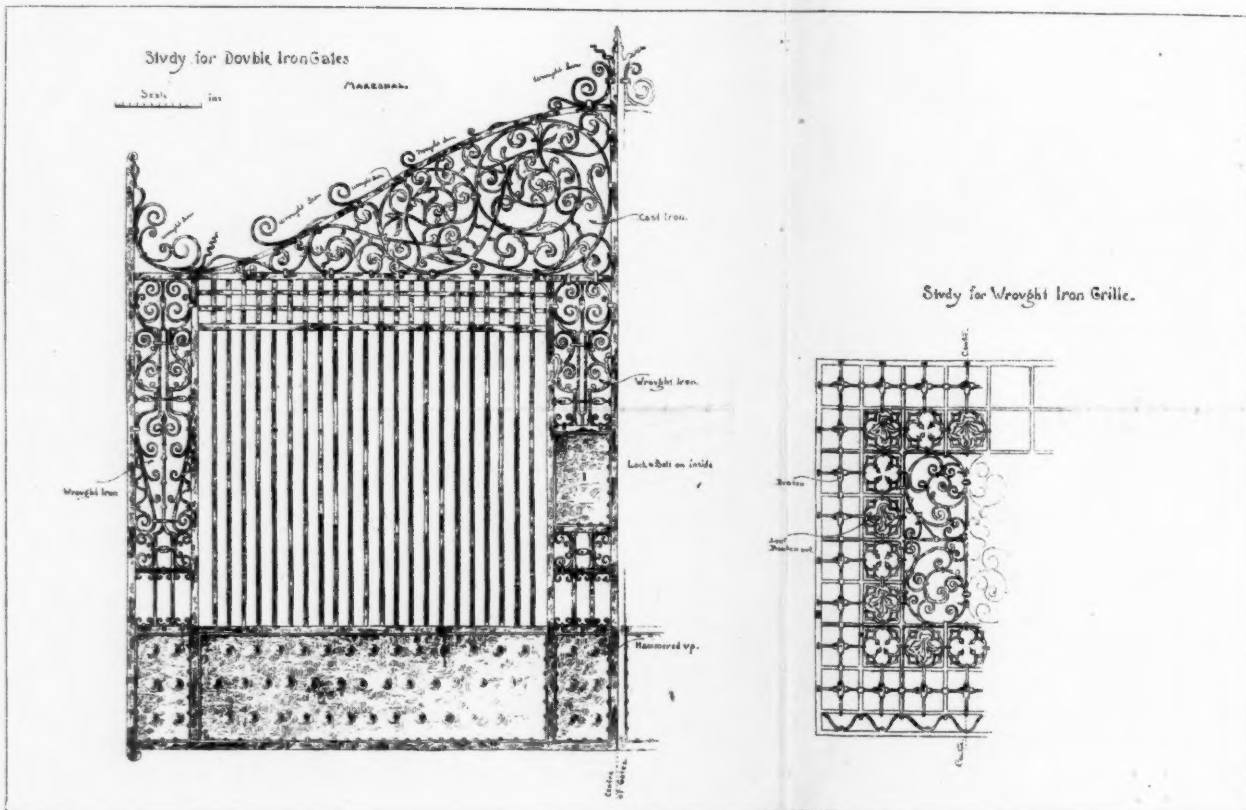

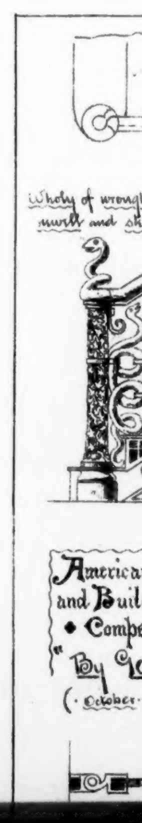

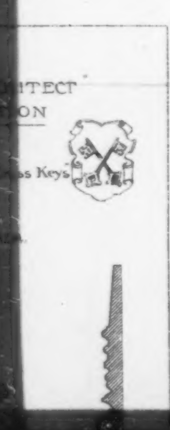

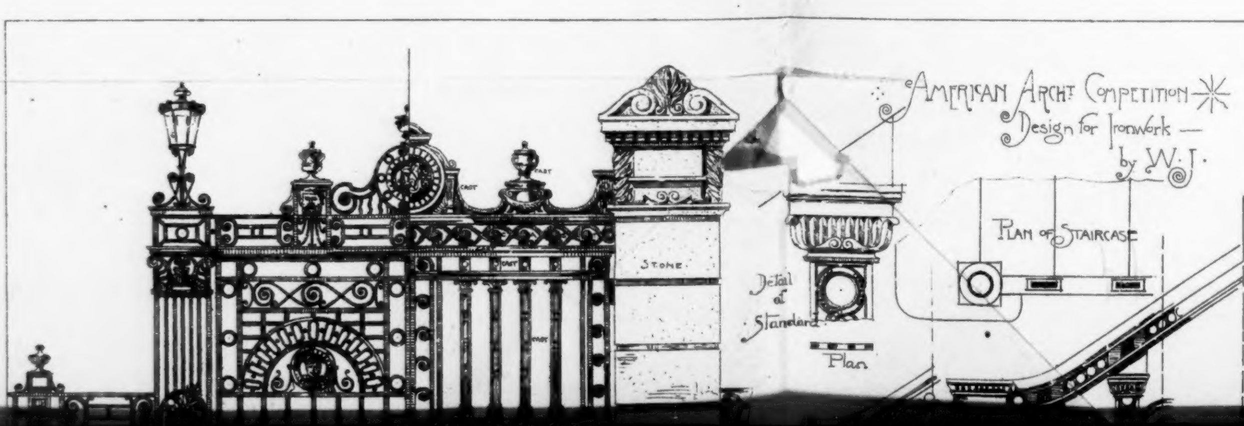

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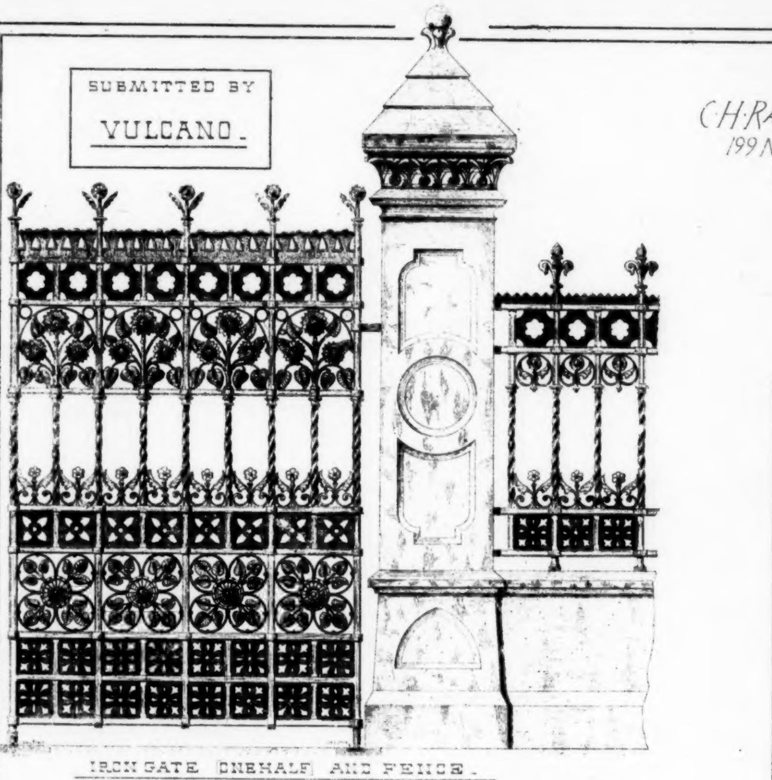
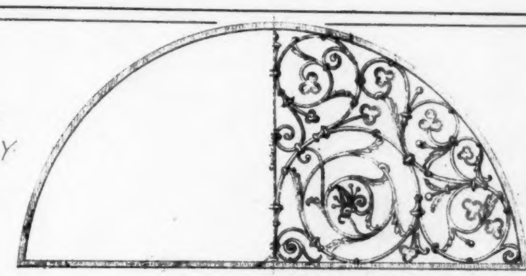


IRON GATE (ONE HALF) AND FENCE.

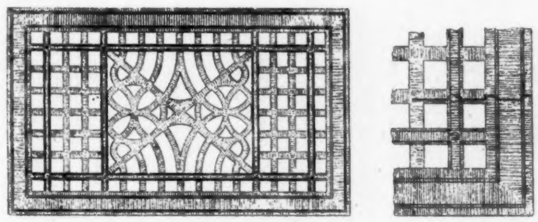
Scale

Note: All bars to be of wrought iron, the cresting and flowers to be of cast iron and the panels to be made of sheet iron.

C. H. Rau.
199 North Clinton St.
Rochester. N. Y.



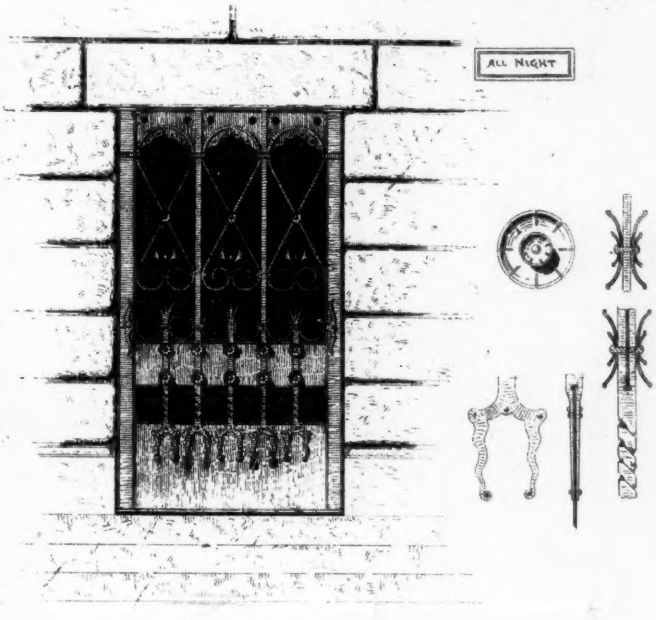
WROUGHT IRON GRATE.



CAST IRON WALL REGISTER

Scale for Elevation

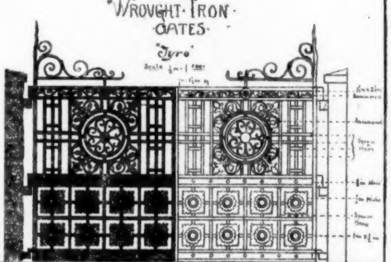
AMERICAN ARCHITECT COMPETITION.

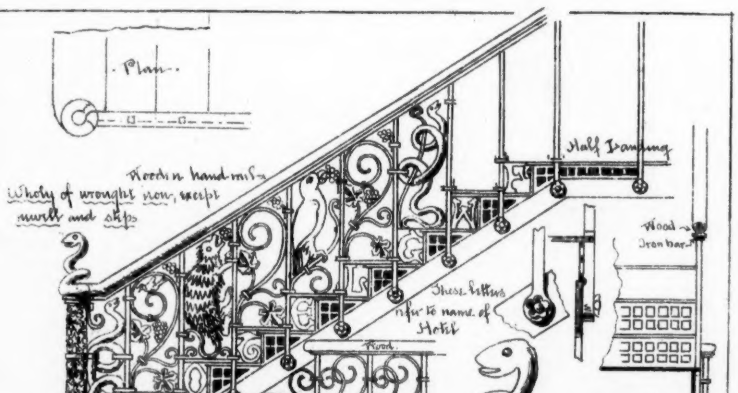


WROUGHT IRON DOOR

A Design for Wrought Iron Gates.

"Tyro"





American Archt and Building News Competition

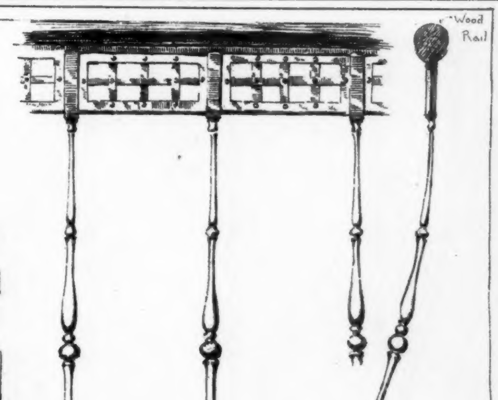
"By George!"

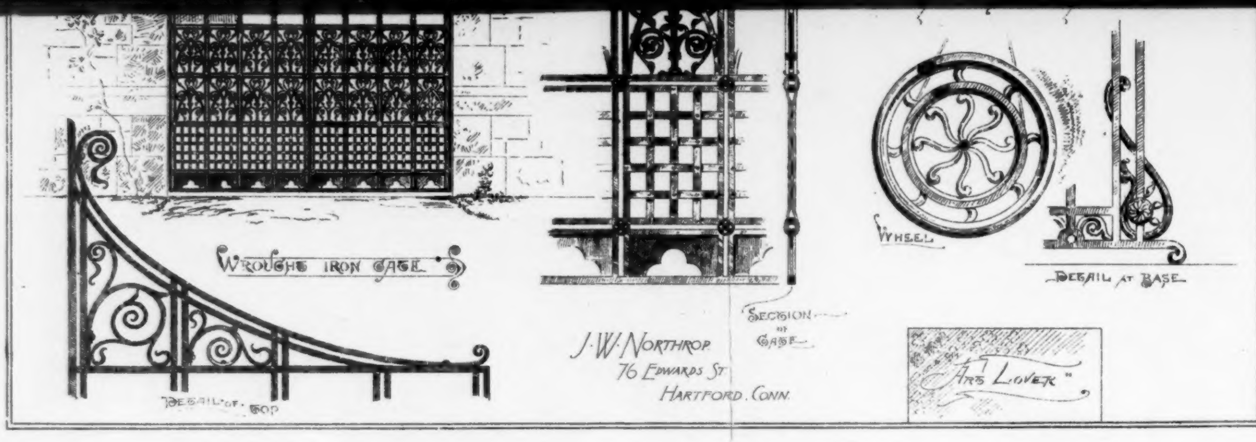
(October 1882.)

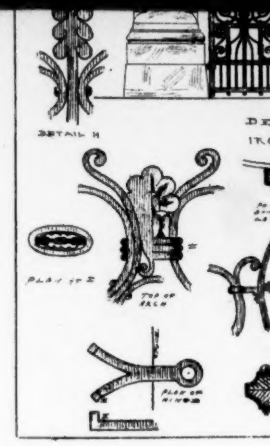
Staircase to a Family Hotel

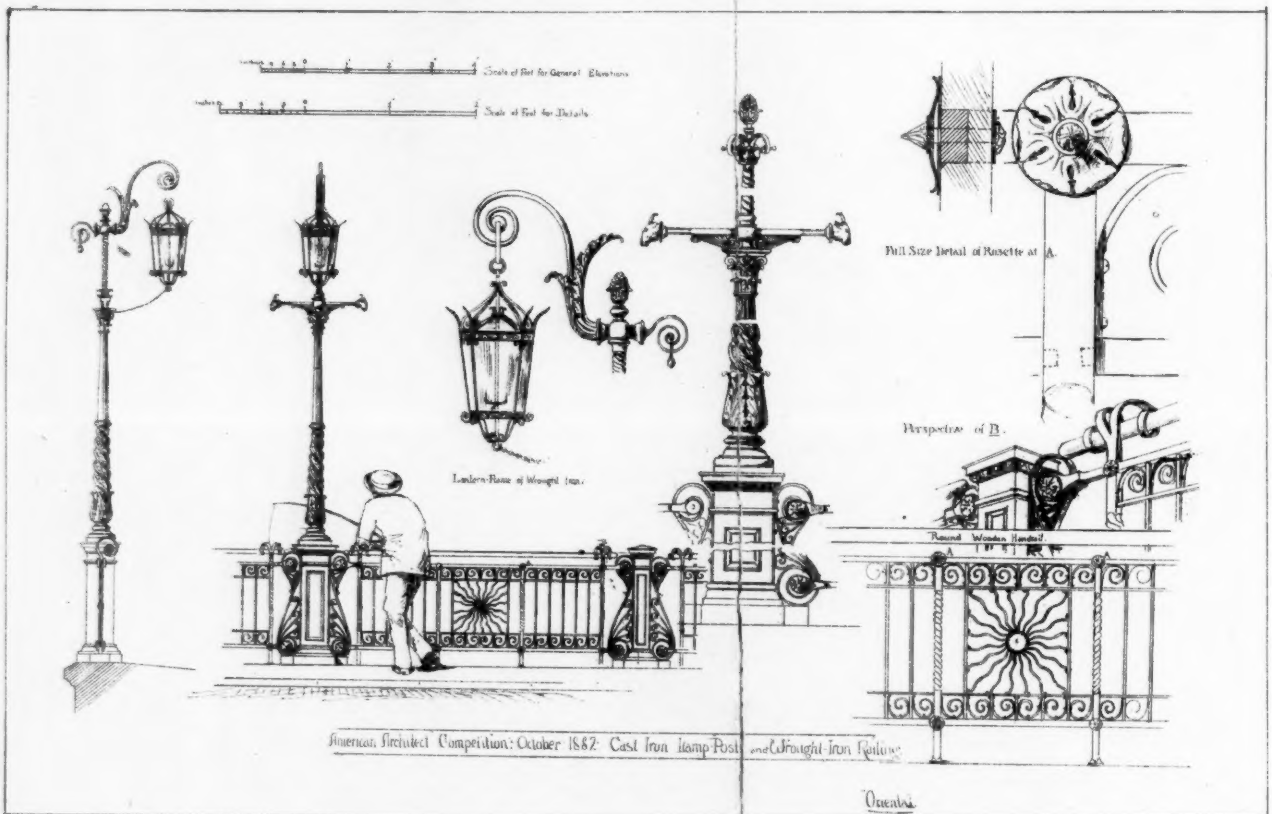
Scales

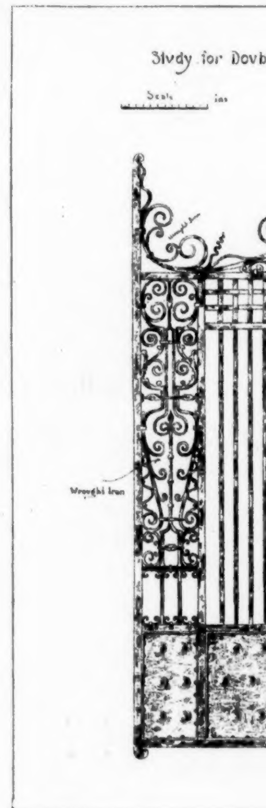
Knocker.

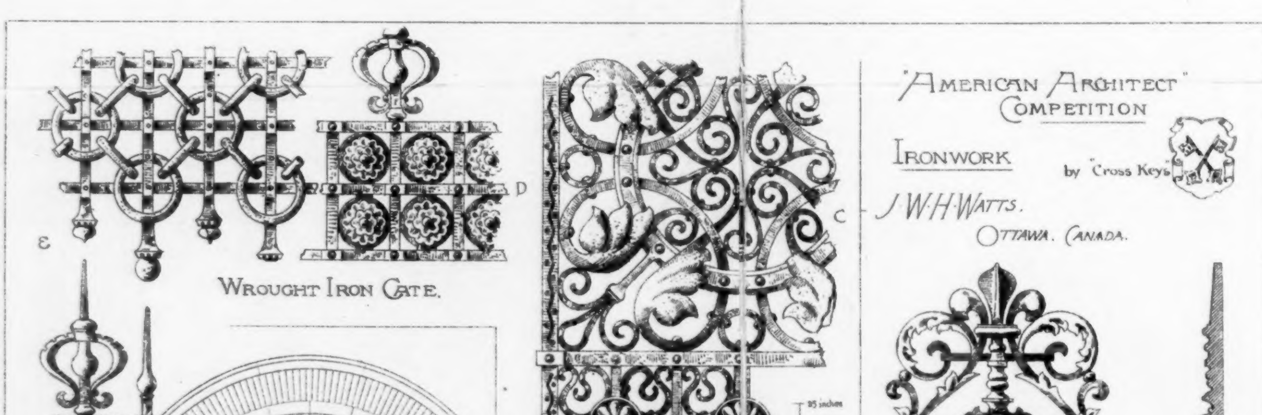


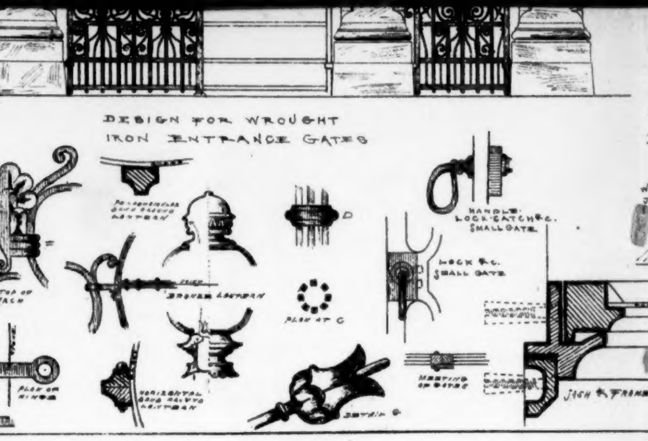

Wrought Iron Gate
Detail of Top
Section of Gate
J.W. Northrop
76 Edwards St
Hartford, Conn.
Wheel
Detail at Base
"Ars Lover"

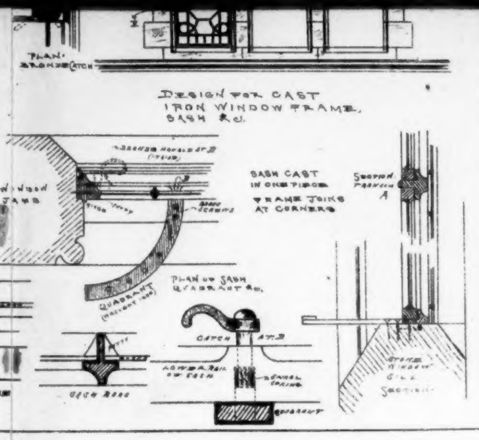

Detail H

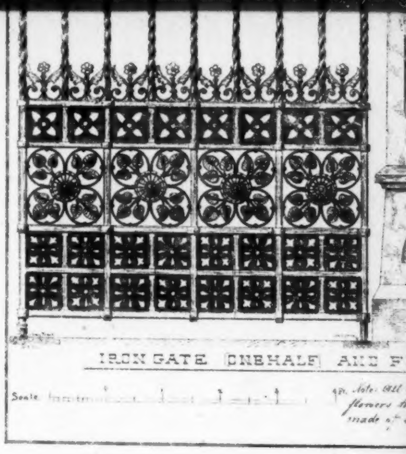

Scale of Feet for General Elevations
Scale of Feet for Details
Full Size Detail of Rosette at A.
Perspective of B.
Lantern-Frame of Wrought Iron
Round Wooden Handrail
American Architect Competition: October 1882. Cast Iron Lamp-Posts and Wrought-Iron Railing
Oriental

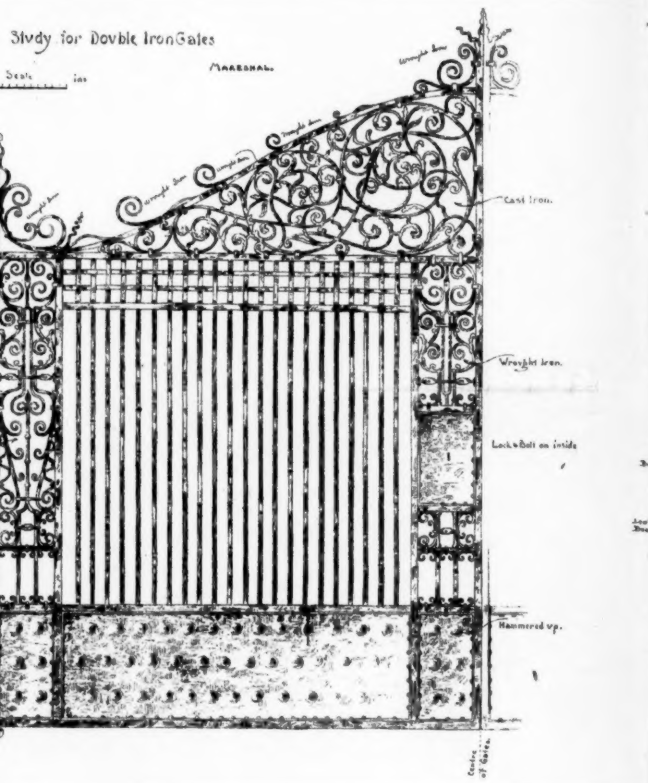

Wrought Iron

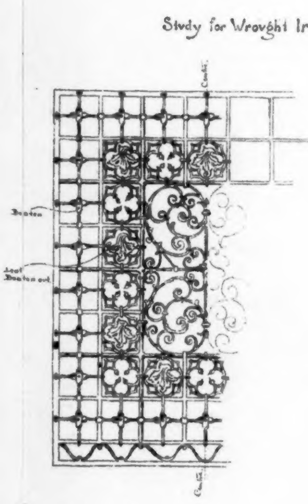

Wrought Iron Gate
"American Architect" Competition
Ironwork
by "Cross Keys"
J.W.H. Watts.
Ottawa, Canada.
Cast Iron Knocker


DESIGN FOR WROUGHT
IRON ENTRANCE GATES
HANDLE, LOCK CATCH &c. SMALL GATE.
LOCK &c. SMALL GATE
PLAN AT C
SECTION
JICH & FRAME

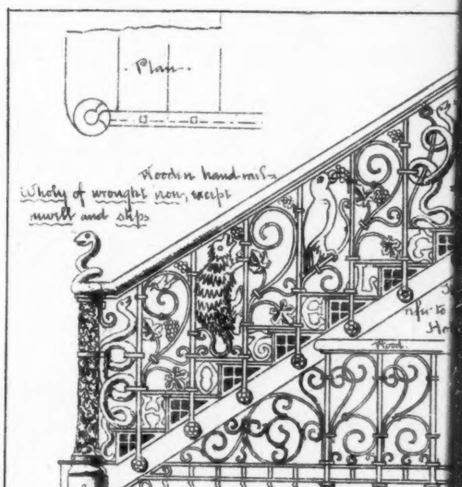

DESIGN FOR CAST
IRON WINDOW FRAME,
SASH &c.
WINDOW JAMB
SASH CAST IN ONE PIECE
FRAME JOINS AT CORNERS
PLAN OF SASH QUADRANT &c.
QUADRANT
CATCH AT B

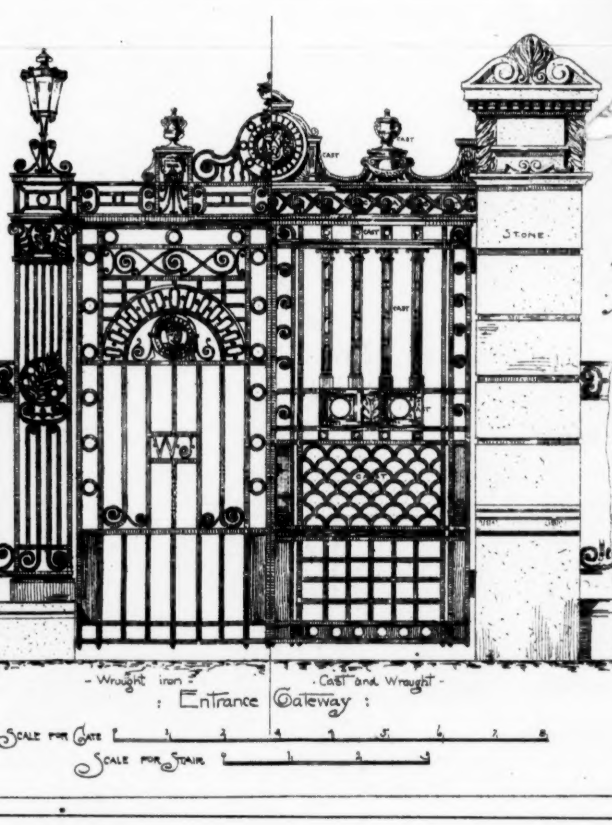

IRON GATE (ONEHALF) AND F

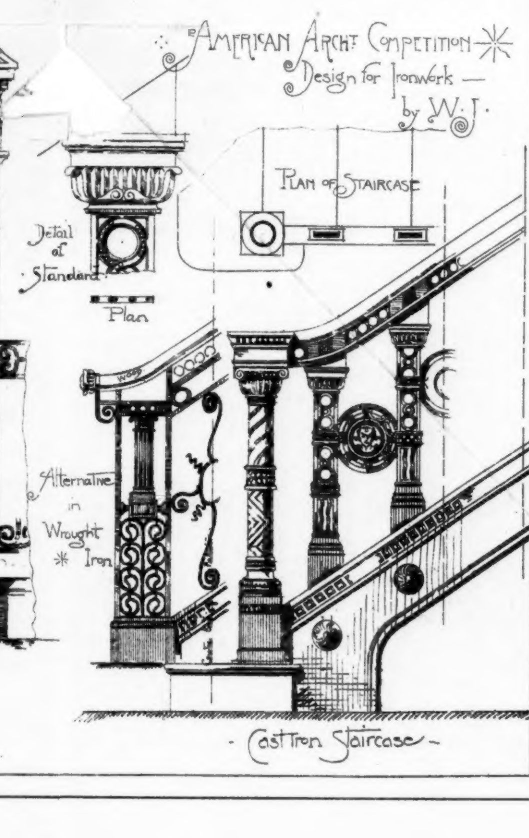

Stvdy for Dovble IronGates
MARESHAL
Scale
Wrought Iron
Cast Iron
Wrought Iron
Lock & Bolt on inside
Hammered up.
Centre of Gates

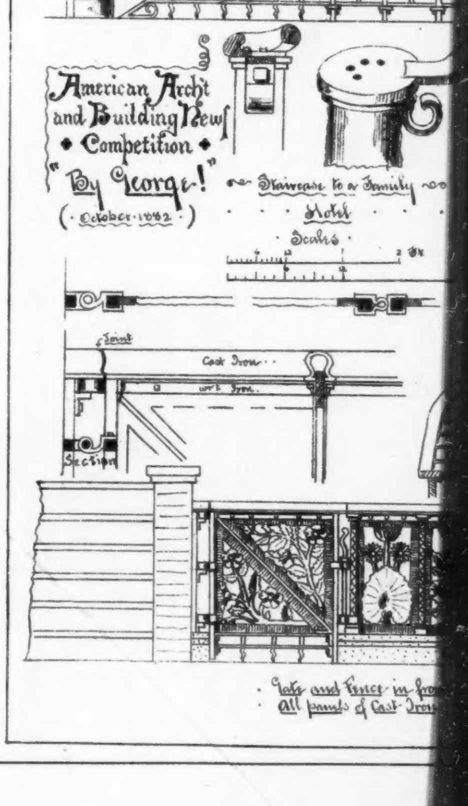

Stvdy for Wrought Iron Grille.


Design for Lamp Post "Jyre"
Scale

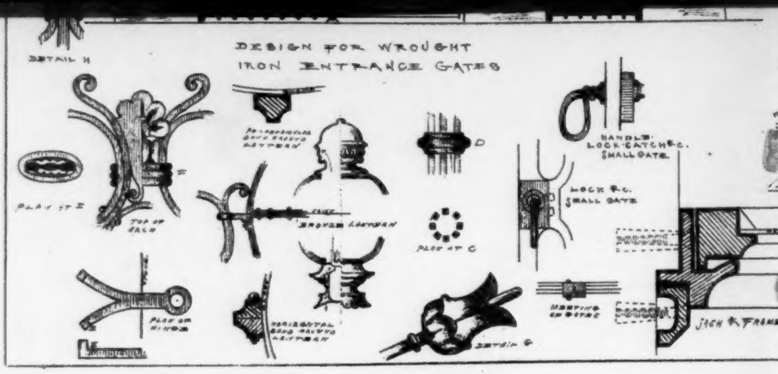

Plan
Wooden hand rail
Wholy of wrought iron, except
newels and ships

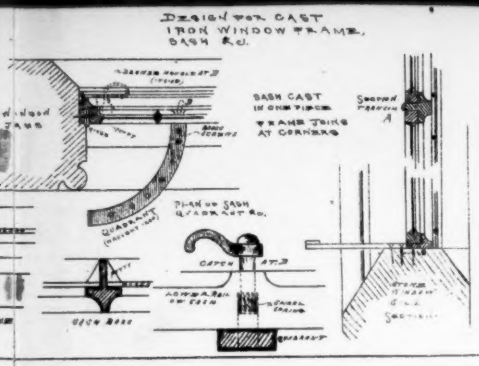

CAST
STONE
W.J.
- Wrought iron -
- Cast and Wrought -
: Entrance Gateway :
SCALE FOR GATE
SCALE FOR STAIR

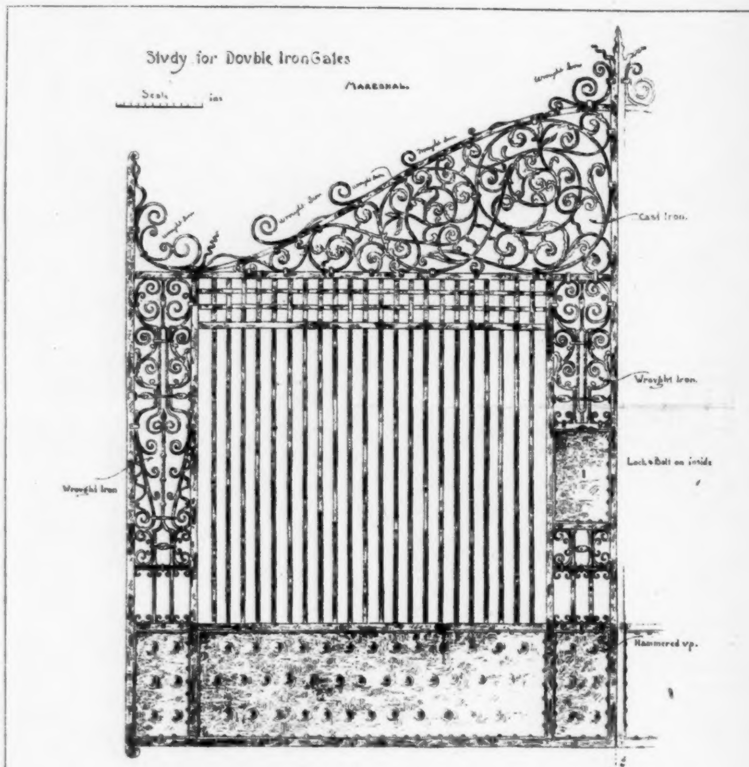

AMERICAN ARCHT COMPETITION
Design for Ironwork —
by W.J.
PLAN OF STAIRCASE
Detail of Standard
Plan
Alternative in Wrought Iron
- Cast Iron Staircase -

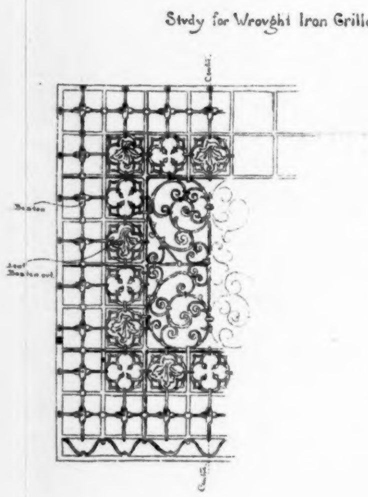

American Archt
and Building News
• Competition •
"By George!"
(October 1882)
Staircase to a Family Hotel
Scales
Section
Cast Iron
Wrot Iron
Gate and Fence in front
All parts of Cast Iron

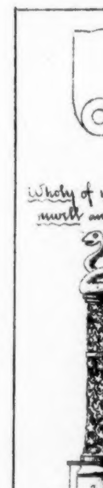

DETAIL AT BASE

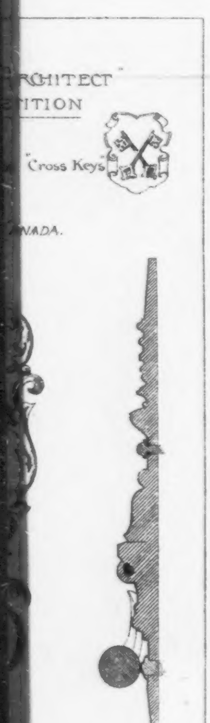

DESIGN FOR WROUGHT
IRON ENTRANCE GATES
DETAIL H
PLAN AT I
TOP OF GATE
PLAN OF HINGE
HANDLE, LOCK-CATCH &c. SMALL GATE
LOCK &c. SMALL GATE
PLAN AT C
MEETING OF GATES
DETAIL G
JACK & FRAME

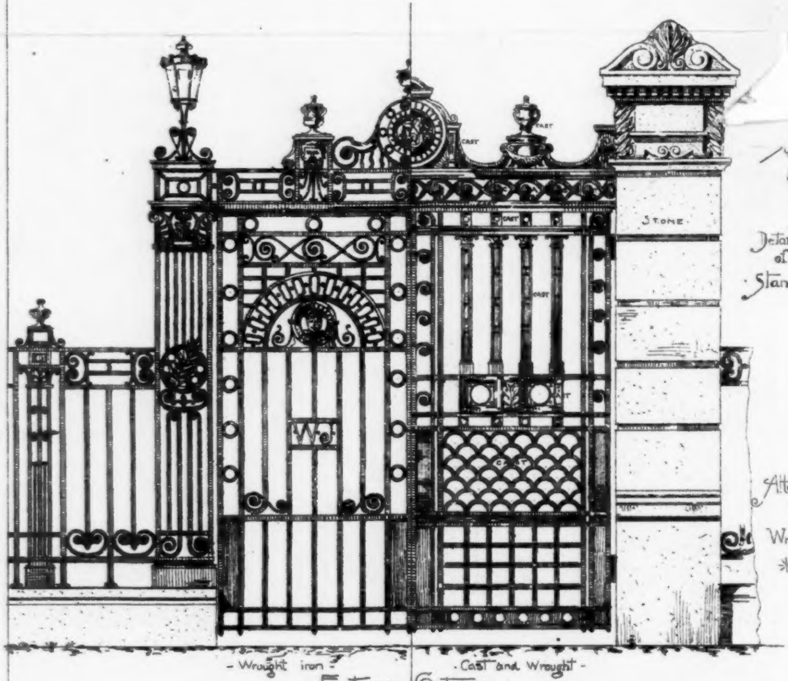

DESIGN FOR CAST
IRON WINDOW FRAME,
SASH &c.
SASH CAST IN ONE PIECE
FRAME JOINS AT CORNERS
QUADRANT
PLAN OF SASH QUADRANT &c.
CATCH AT B
SECTION THROUGH A

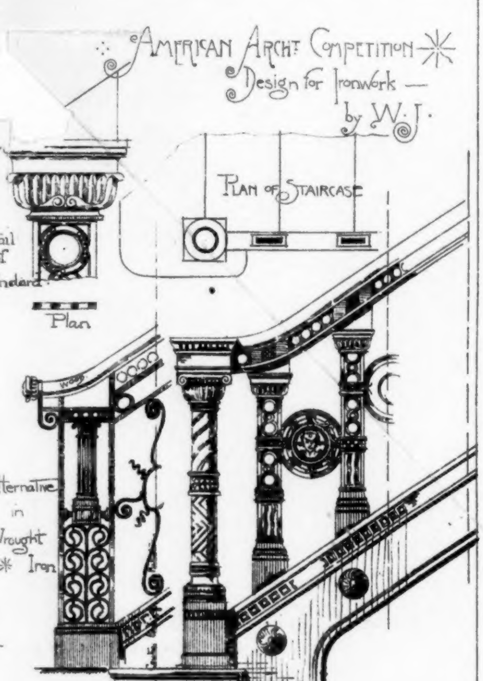

Study for Double Iron Gates
Scale
MARECHAL
Cast Iron
Wrought Iron
Lock & Bolt on inside
Hammered up
Wrought Iron

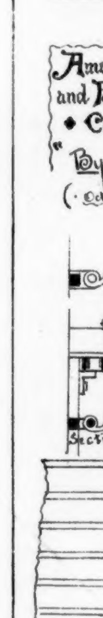

Study for Wrought Iron Grille.

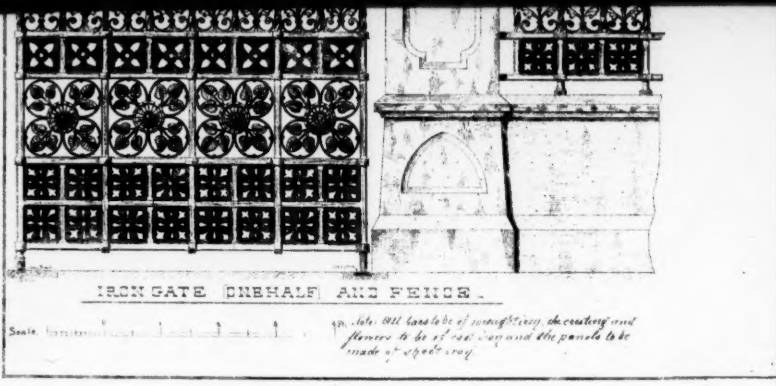


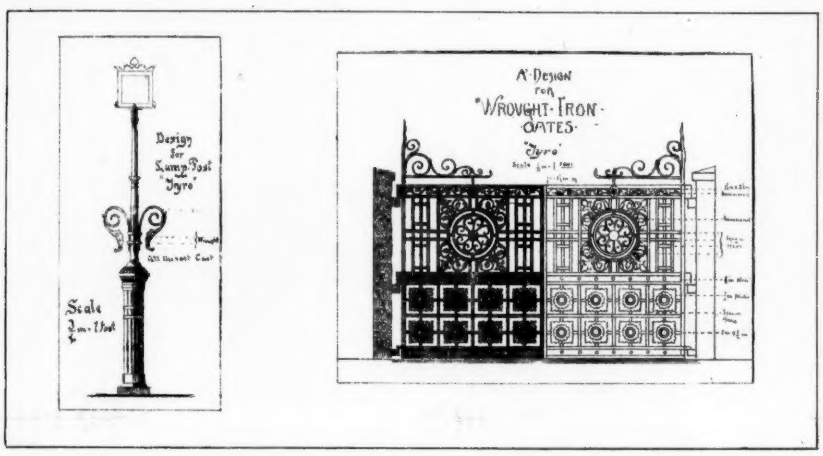

RCHITECT
ITION
"Cross Keys"
ANADA.
IRON KNOCKER

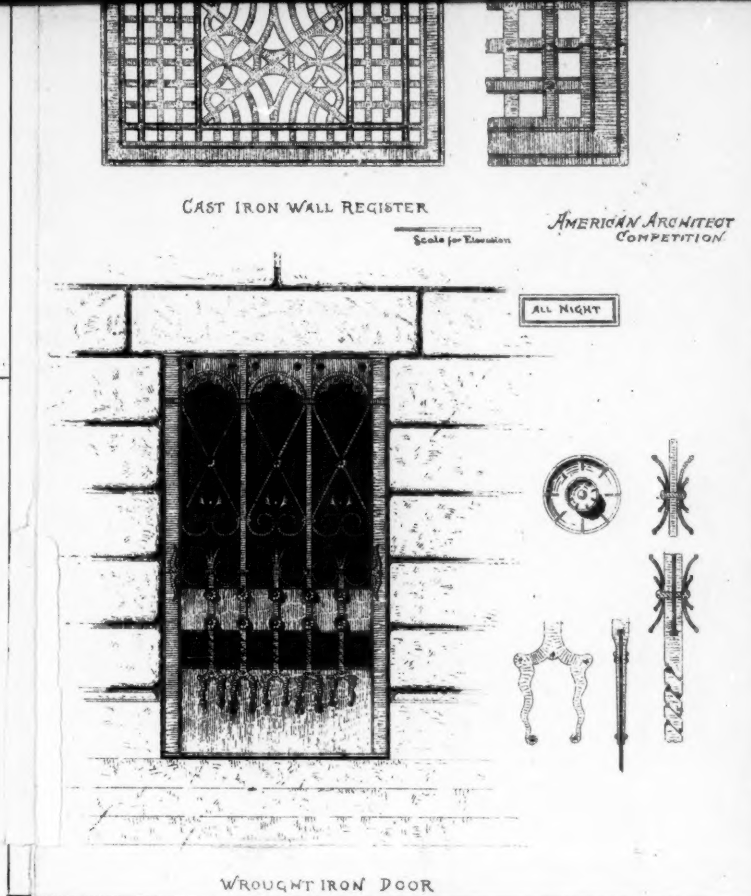

STONE
W J
- Wrought iron - - Cast and Wrought -
: Entrance Gateway :
SCALE FOR GATE
SCALE FOR STAIR

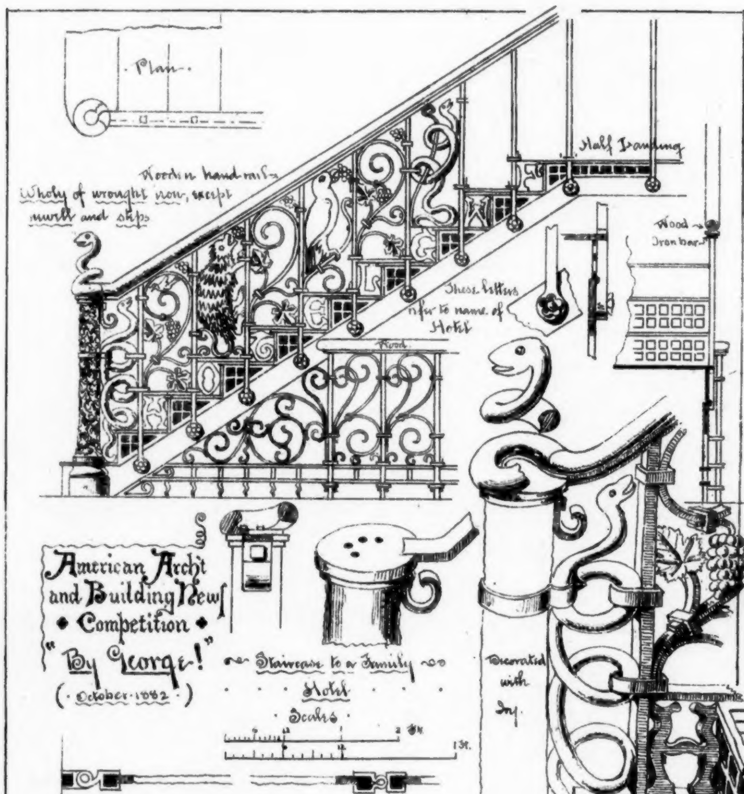

American Archt Competition
Design for Ironwork —
by W. J.
Plan of Staircase
Detail of Standard
Plan
Alternative in Wrought Iron
- Cast Iron Staircase -

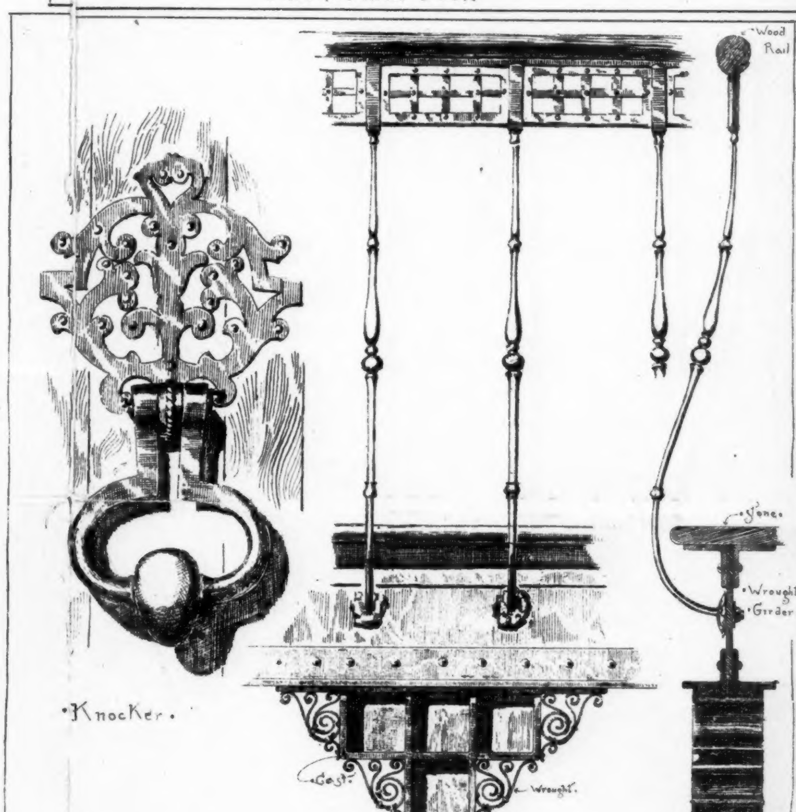












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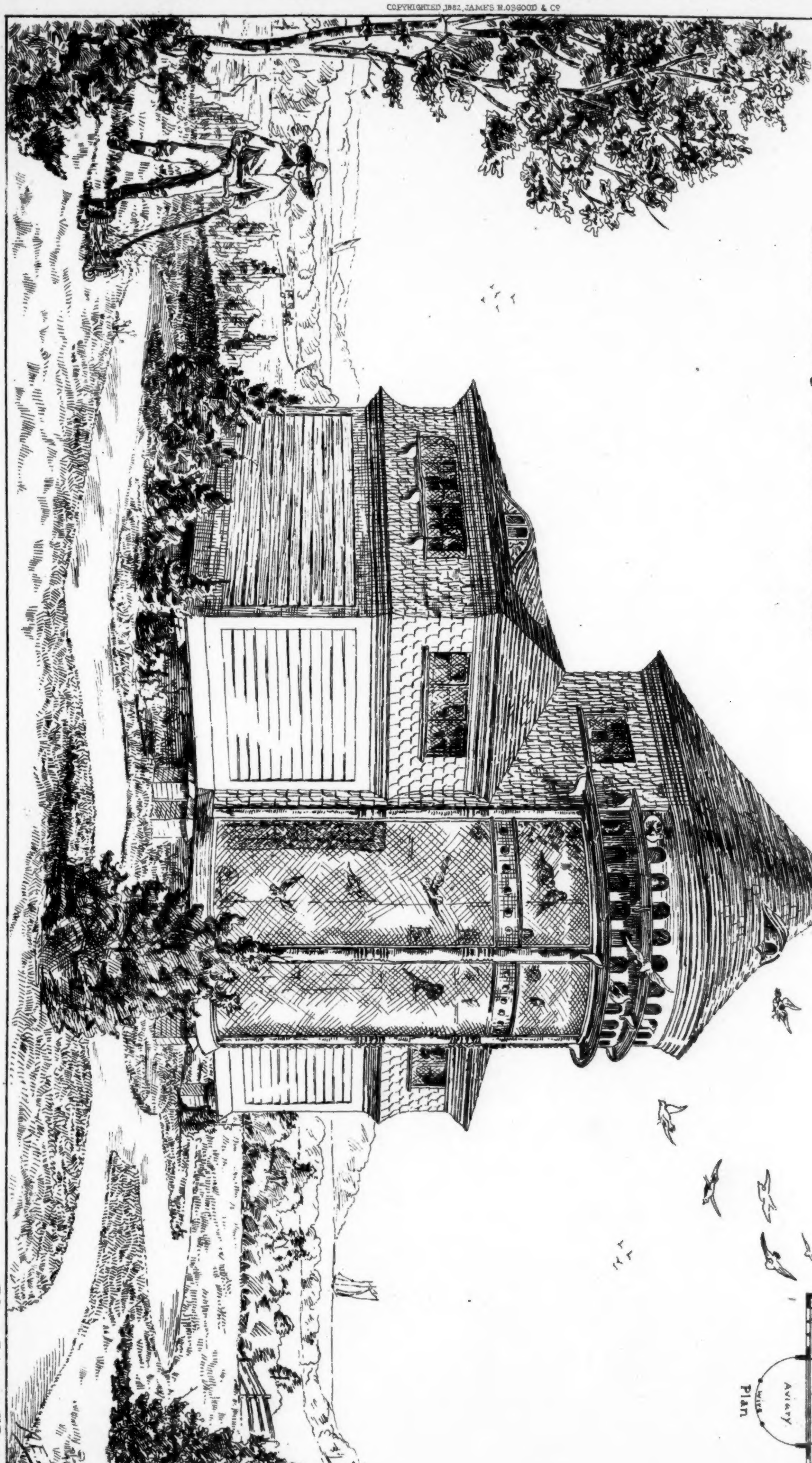
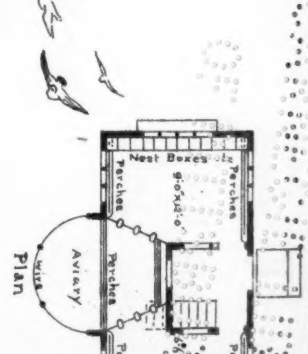
PIGEON HOUSE

At Oceanic, N.J. for Dr. H.E. Owen

Charles I. Berg Architect New York





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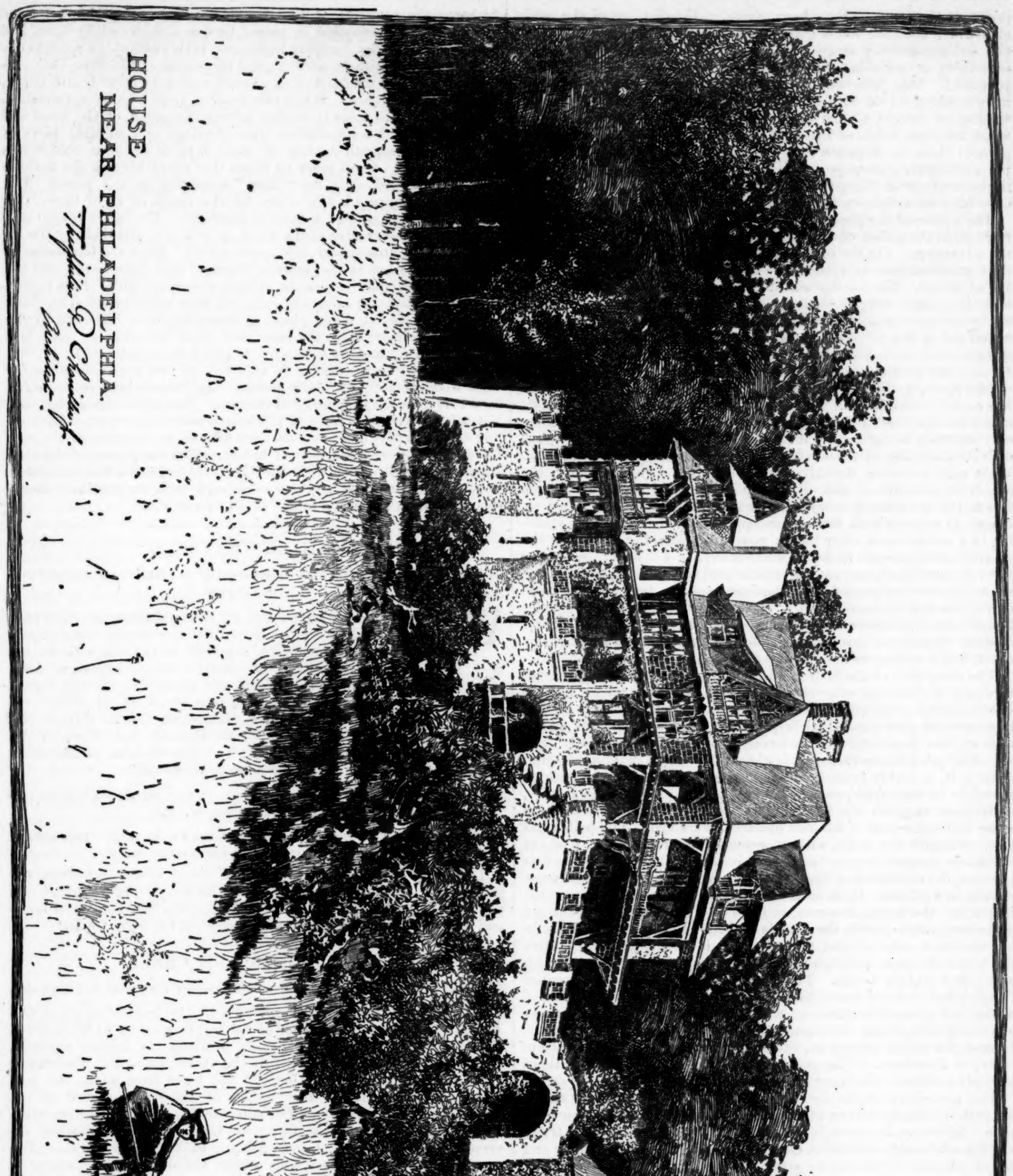


HOUSE NEAR PHILADELPHIA.

Theophilus P. Chandler, Jr. Architect.

in recent times means have been placed at the disposal of the workman which meet all these evils, in nearly every one of our joinery and cabinet-making shops the old method of filling the pores—smoothing or polishing with linseed-oil and pumice-stone—is still practised. Our joiners and cabinet-makers of the old school will have nothing to do with newer methods, because their shops are worked on the old system of smoothing with oil; it is said that the wood becomes brighter through the oil entering it, and the system permits them to dispense with the more elaborate treatment with plane, scraper, glass-paper, and Dutch rush, which is indispensable in the methods of filling the pores, as described below, and which we copy from an article on the subject in the *Deutsche Tischler-Zeitung*.

The writer of the paper, Herr L. E. Andés, of Vienna, admits that as regards the polish of the obtained surface, smoothing with oil has the advantage. On the other hand, it is a well-known fact that work thus prepared loses in appearance in a very short time by the sweating of the oil. The outside smooth surface becomes rough and dead, loses its polish, the percolating, not yet dried, and consequently still sticky oil absorbs dust, and the furniture, etc., loses in color, and a repetition of the polishing process becomes necessary. As a matter of fact, the sweating of the oil cannot be prevented by this method, for the fine particles of pumice-stone which, mixed with the oil, fill up the pores of the wood, retain the fat substance. The wood itself has eagerly absorbed all the oil, its cells are deeply filled with it; and when the linseed-oil, if exposed to the influence of the air, dries only after six to eight days, it is quite out of the question to speak of a solidification of the whole. Now, it is generally the custom to begin with polishing directly after smoothing. Thus we apply the polish upon a surface not yet dry, polish it, and only then, when this latter operation is completed, we give to the oil, which now is no longer in contact with the air, an opportunity for drying, by standing in a warm room, etc.; but in course of time, the oil below the layer of shellac begins to dry up without exposure to heat; the shellac layer is torn into numerous fine cracks and turns rough, while at the same time the fine particles of pumice-stone are beginning to come out. The still sticky oil absorbs all dust, the pumice-stone particles become more prominent, and we have, as the result, instead of the desired shining surface which should remain smooth, a rough, dirty crust, which disfigures our furniture.

The durability of the lustre and the smooth surface can be guaranteed only if the wood, after smoothing with oil, is left for six months before being polished. By that time the putty formed of the pumice-stone and linseed-oil is perfectly dried up, and the polish then applied is lasting, and the sweating of the oil prevented. But as, under present conditions, it is almost impossible to let work stand so long, it is highly desirable that means should be found by which we might be able to dispense with oil altogether. Herr Louis Köhler, of Geissen, suggests the following method:—"Polishing is still the same operation that it was one hundred years ago. The polish has also remained the same, without essential improvement. And yet the whole process is very faulty and imperfect, and as long as it is pursued, the exudation of the oil and the deadening of the best work cannot be avoided. If no oil is to sweat out of the wood, none must be put in; the latter, however, is done on a large scale with the old procedure, consequently the work is spoiled. Now instead of smoothing the wood with oil and pumice-stone, it is only necessary, after the piece of work is completely finished, to put on the lacquer with a so-called badger brush. This is done quickly because the lacquer (a spirit-lac) dries at once. Successive coats of lac are applied until a so-called ground is obtained. Porous woods, of course, require more lacquering than close-grained kinds. If the work is well performed, the whole is now smoothed with fine pumice-stone, rottenstone, or hartshorn. The polishing is proceeded with, but without oil, only a little of the latter being used for finishing."

This procedure effects one thing. The pores are completely sealed up with shellac, and as no oil can enter, none can exude in course of time. Spirit-lac, however, is expensive, and we must therefore try to employ other materials which close the pores of wood by a simple and cheap process. This may be attained by sizing with glue-water, by coating with starch-paste, or by filling the pores of the wood by the American method, with "wood-filler." By either of the three methods the pores of the wood are completely filled, and as no oil enters the wood, none can come out afterwards. Sizing with glue-water is almost exclusively employed for soft woods, the size being applied three or four times with a brush. After drying, raised fibres of the wood are rubbed off with fine glass-paper, and the polishing or japanning is proceeded with in the usual manner. Coating with starch-paste is much more advantageous than sizing, starch once dried being perfectly impervious to exterior influences. A moderately thick paste is prepared by pouring and stirring in boiling water a dough made of powdered starch and cold water. The wood is coated as required with a brush, and then treated as usual.

The most perfect process of filling the pores of wood has come to us from America. At the Philadelphia Exhibition of 1876 articles of wood were shown for the first time, the almost startling smoothness and high lustre of which astonished all experts, the latter properties being enhanced by the contrast supplied by objects, japanned and polished in the usual manner, exhibited by the side of them. The procedure by which this extraordinary smoothness and, at the same time, extremely small consumption of polish or lacquer are attained is a very simple one, and is based upon a mechanical closing of the pores of the wood by a composition of certain ingredients, hitherto the property of the inventor. This composition, termed "wood-filler," is supplied in closed tins, as a thick, sticky mass, and in applying it the quantity to be used is thinned to the consistency of ordinary varnish by adding good turpentine. The mass thus prepared is put onto the finished wood-work with a moderately stiff brush, and left to coagulate. When this coating, from a shiny appearance, becomes dull, the mass is rubbed across the grain of the wood and well into it with a handful of wood-shavings or a suitable piece of wood, at the smooth bottom of which a piece of stout leather has been fastened. Care must be taken that everything on the wood is rubbed clean off, only the "filler" remaining in the pores. The wood thus prepared is left to dry for the space of eight hours, this being quite long enough to harden the filler. The latter is also said to act as a preservative of the wood, as it is not attacked by the influence of the atmosphere, nor by chemicals. After the hardening of the filler, the wood is once more well rubbed with glass-paper, and the polishing or lacquering may be at once proceeded with. Less polish, time, and labor are said to be required than with the usual method; no sweating of oil takes place, as none has been absorbed by the wood. The lustre is, at the same time, most remarkable; there is a glassy surface; and its durability is stated to be unlimited.

The American wood-filler is supplied in two colors,—white for light woods, brown for dark woods. Any shade may be produced by a corresponding blending of the two. The white wood-filler consists of one part by weight of pulverized starch, one part of barytes, and one-sixth part of dryer; the dark filler of the same materials, with the addition of one-half part of brown. The finely-ground dry substances are well mixed with the dryer, rubbed down fine in a color-braying machine, and are now—thinned with turpentine—ready for application as "wood-filler."—*The Builder.*

THE ILLUSTRATIONS.

COMPETITIVE DESIGNS FOR IRON-WORK.—AMERICAN ARCHITECT COMPETITION.

WITH this number we publish all of the designs meriting publication which were submitted in the recent competition. The subject of the design was left to the competitors, the only requirement being that the designs should represent some articles executable in wrought and cast iron. As already stated, the five equal prizes have been awarded to Mr. J. W. H. Watts, Ottawa, Can.; Mr. J. W. Northrop, Hartford, Conn.; Mr. B. M. Lincoln, Hartford, Conn.; Mr. W. C. Hazlett, New York, N. Y., and Mr. C. H. Rau, Rochester, N. Y. The designs of the other authors are published over their *noms de plume* only.

DESIGN FOR A SUBURBAN RESIDENCE. MR. S. M. HOWARD, ARCHITECT, WHEELING, W. VA.

PIGEON-HOUSE FOR DR. H. E. OWEN, OCEANICA, N. J. MR. CHAS. I. BERG, ARCHITECT, NEW YORK, N. Y.

This is a frame building elevated about three feet from the ground, and resting on piers capped with tin, to guard against rats and weasels. The first floor and entire cage is for pigeons of fancy and high breeding, the tower being reserved for flight birds.

LEGAL NOTES AND CASES.

Mechanic's Lien.—For Lumber.—Defence of Payment to Carpenter.

IN an action to foreclose a mechanic's lien for lumber supplied, *Gilcrist vs. Anderson*, the owner of the building set up as his defence that he had paid the carpenter, to whom the lumber was sold, in full. The plaintiffs proved that the owner knew that the lumber had been bought on credit, but did not know from whom the purchase had been made. Due notice of claim was served on the owner by the material-men. The suit was dismissed and the plaintiffs appealed to the Supreme Court of Iowa, who in September reversed the judgment. Judge Adams, in the opinion, said: *The owner claims that* the case falls within the decision in *Stewart vs. Wright*, 52 Iowa, 335, and such, we doubt not, was the view of the court. In that case the defendant, Mary L. Wright, averred for answer that before the service upon her of the statutory notice she had paid her contractor, Hood, and without "knowledge of any arrangement made by Hood for labor or materials for the building." On demurrer this answer was held sufficient. While the lien is a statutory one, and dates when perfected from the performing of the labor or furnishing of the materials, yet it is to be enforced in equity, and it was thought that it ought not to be enforced where it would be inequitable to do so. The case at bar differs from that in this: that Anderson knew that Troutman had to buy the lumber for the house. It differs also in the fact that it was provided in the contract that Anderson reserved the right to discharge mechanics' liens, if any should be claimed.

The case, we think, falls more nearly under *Winter vs. Hudson*, 53 Iowa, 336. It is true that in that case the owner knew that the materials for which claim was made had been furnished by the parties claiming the liens. In the case at bar, Anderson simply knew that lumber had been furnished by some one. In neither case was it known to the owner that the materials had been bought on credit. Hudson's liability was not based upon the fact that she had actual knowledge that liens could be claimed, but that her knowledge was such that she was put upon inquiry. The case at bar is not quite as strong a case for the sub-contractors, but we cannot distinguish it from *Winter vs. Hudson* unless we can say that the owner is put upon inquiry where he knows the names of the persons who have furnished materials, and is not put upon inquiry where he knows simply that materials have been furnished by some one. The test question is as to whether Anderson could probably, in the exercise of reasonable diligence, have discovered that the plaintiffs were entitled to a lien. We have to say that it appears to us that he could. Troutman, with whom Anderson was dealing, knew of whom he purchased lumber. Anderson's true source of information was abundantly apparent. If he had made proper inquiry of Troutman, and Troutman had refused to answer, or had made false answers, the case might be different. His means of information would not appear to be so good.

DAY, J. I concur in the foregoing opinion solely upon the ground that Anderson should have inquired of Troutman if there were any liens upon the property before making payment in full. If he had made such inquiry, and had failed to learn of the existence of liens, I think the liens could not have been enforced against him.

Real Estate Broker. — When entitled to his Commissions.

A, a broker, was employed by B to sell certain real estate for him, and he brought C to him, who was able and willing to pay the price asked, but he desired time to search the title before making payment. B refused to give this time, and A brought suit for his commissions, *Watson vs. Brooks*, in the United States Circuit Court for the District of Oregon. Judge Deady, in September, in giving judgment for the broker, said: — The broker must complete the sale; that is, he must find a purchaser in a situation, and ready and willing to complete the purchase on the terms agreed on, before he is entitled to his commissions. Then he will be entitled to them, though the vendor refuse to go on and perfect the sale.

Mechanic's Lien. — Material-man. — Agency of Contractor.

The Supreme Court of Nebraska, on October 24, 1882, in the case *Doolittle vs. Goodrich*, reversed a judgment in favor of a dealer in lumber who had filed a mechanic's lien for lumber supplied to build a house, on the ground that it appeared by the evidence that credit had been given for it to the builder personally. The Court, in the opinion, said: "Frances Goodrich is the owner of lot 5, in block 240, in the city of Lincoln. In November, 1880, she contracted with one James McLelland, to erect a small house thereon, which he afterwards did. The lumber for this house was purchased from the plaintiffs by McLelland on his own account, and was charged to him on their books. McLelland was paid by Mrs. Goodrich the full contract-price for the erection of said building. Some time thereafter McLelland left the State, leaving the lumber-bill unpaid. An itemized account against Frances Goodrich and Elizabeth McLelland, the mother of Mrs. Goodrich, duly verified, was then filed in the county clerk's office in Lancaster county to obtain a mechanic's lien upon the premises above described. A judgment for the sum of $173 was rendered in the court below against Frances Goodrich, and directing sale of the real estate in question. The only question necessary to be considered in this case is, was McLelland the agent of the defendant, Goodrich, in purchasing the lumber with which the house was erected? In our opinion the testimony not only fails to establish the fact, but clearly shows that the lumber was sold to McLelland upon his individual account and that he was not her agent. This being so, she was not liable under the mechanic's lien law, in force at that time, for the payment of the claim. We adhere to our decision in the case of *McCormick vs. Lawton*, 3 Neb. 449, but it has no application to the facts of this case.

GREATEST RINGING BELLS.[1]

RUSSIA is famous for having the greatest bells in the world, but if the great *Tzar Kolokol* of Moscow, which has never served the purpose of a bell, be excluded, then Burmah takes the honor of having the largest ringing bells.

The Burmah bell-founders appear to have attained great perfection in that art, and they take great pride in their productions. The quality of tone of the Burmah bells is said to be very fine. The Mengoon bell is the greatest ringing bell in the world, weighing 201,600 pounds, and its probable diameter is 203 inches.

The great bell in Rangoon, called "*Maha Ganda*," weighs 95,000 pounds, with probable diameter of 155 inches, and is said to have a very fine tone.

The first great bell in Moscow was presented to St. Ivan's Church by the Tzar Boris Godunof, in the sixteenth century. This bell was actually hung and rung, but its weight, 288,000 pounds, was too great for its support; it fell and broke, and was recast in the year 1654. Diameter, 216 inches, and sound-bow 18 inches. During the fire in 1706 the bell fell and broke again.

The greatest bell in the world is that at Moscow, called *Tzar Kolokol*, or monarch bell. Its dimensions are 19 feet 3 inches high, diameter 22 feet 8 inches, thickness of sound-bow nearly 2 feet, and weight 443,772 pounds. The weight has evidently been calculated, because the Russians had no scale upon which it could be weighed. From the dimensions of the bell, taken by the writer, and the weight calculated, it should weigh nearly 500,000 pounds.

According to inscription on the bell, it was cast in the year 1733. In those days they had no means of transporting heavy weights and great bells were, therefore, cast in the church-yards close to where the bell was to be hung, as was the case with the great Moscow bell, which was cast in a pit close to St. Ivan's Church, in which tower it was intended to be hung.

The moulding of the bell was probably done in the ordinary way: namely, the core was built first, upon which the thickness of metal was laid with loam or clay, and the cope built over it. Judging from the unevenness of the inside surface of the bell, it is probable that the core was not swept but dubbed up, so that the bell is not of even thickness at equal distances from the lip. The outside surface is very even, and has evidently been swept by a steady sweep.

In preparing and melting the metal for casting the bell it appears that no exact composition was attempted, for the nobles and other capitalists of Moscow threw a great amount of silver and other metal into the furnace, which made it an uncertain alloy with much greater shrinkage than the minimum, which is, with 31 parts of tin to 100 of copper.

The moulding, casting and precautions for cooling and shrinkage of a bell of this size require more practical experience than probably these bell-founders were in possession of, for it is evident that the bell broke by shrinkage in the pit in which it was cast.

The cooling of a bell of this size requires a time of at least one month if not six weeks, from the day it is cast, but it appears that the bell-founders attempted to dig up the bell a few days or a week after it was cast; and it is also said that water was poured on the mould or casting; at all events, the bell was cooled too quickly, and cracked in several places around the lip, and in one place a piece weighing about 11 tons was broken off. The uneven thickness of metal also aided the breaking.

The great Moscow bell has, therefore, never been sounded, but laid in its casting-pit, partly uncovered, for a time of 103 years, in which time it was held in reverence by the natives, who were extremely jealous of its being touched or measured by strangers. Thus it laid as an object of wonder to travellers, and the people of Moscow visited it with pride at their festivals.

In the year 1836, the Emperor Nicholas decided to have the bell exhumed and raised, which was accomplished with great difficulty and expense. The engineers who first undertook to raise the bell were not given a fair chance to accomplish the work, because on their first trial the tackle were too light and gave way, for which the engineers, it is said, were sent to the mines of Siberia.

The Board of Admiralty then undertook to raise the bell, and succeeded in placing it in the position shown in the accompanying illustration, which is reduced from a large photograph procured by the writer in Moscow, in the year 1871. The bell is placed south of St. Ivan's Church, on an open plaza in the Kremlin, near to where it was cast.

It is said that the Empress Anne presented the bell to the church, but however that may be, it is known that the fragments of the bell which fell and broke in 1706 were used; and the citizens of Moscow contributed largely to the metal in the bell, which contains much silver and some gold. It is said that the value of the metal in the bell is $332,000, all uncirculating and dead money, for the bell has never struck a note.

"Think of that, ye money-mongers on the Rialto," says Rev. Alfred Gatty.

In some records of the great Moscow bell it is stated that the bell was actually hung and rung in the tower of St. Ivan's Church, and that it had been broken by falling to the ground. It is also stated that the building over the casting-pit took fire after the bell was cast, and the water used for putting out the fire fell on the bell in the pit and caused its breaking. But these records have been contradicted by competent judges.

The initial cut represents the "Bolshoy Tzar Kolokol."

The great Moscow bell rests on a granite pedestal with its broken-off piece on the ground. The enormous size of the bell can be perceived by the proportionate size of the men standing at the foot of it and by the size of the cathedral behind. The St. Ivan's Church in which tower the other large bells hang is close by, to the right of Tzar Kolokol, but not shown in the cut.

The female figure in bas-relief on the left side of the *latus* represents the Virgin, and the inscription is on the right side towards St. Ivan's Church. The uneven thickness of metal, at equal distances from the lip, can be seen and measured at the top of the broken-off piece on the ground. The form of the bell and its bas-relief ornaments are masterpieces of fine-art. Omitting the accidental unevenness of thickness, the proportions of the bell indicate that its constructor understood the acoustic properties of the vibrating metal when a bell is tolled.

Our modern celebrated bell-founders are far behind that constructor in proportioning bells for quality of sound. I should like very

[1] Extract from a paper by John W. Nystrom, in the *Journal of the Franklin Institute*.

XUM

much to see the Tzar Kolokol recast the same size, and the form and ornaments exactly preserved. With our present knowledge and experience in founding, the recast bell would be a success.

The other great bells in Moscow and other places are noted in the accompanying table, in their order of sizes.

The Russians have generally a great number of bells of different sizes in their churches, but they are not toned for musical harmony or melody, and their ringing is not agreeable to strangers, who often make severe remarks upon their noise. During my five years in Russia I could never get accustomed to or appreciate the bell-ringing, which is a disagreeable jangling.

The great bell in St. Ivan's Church is rung three times a year, and produces a tremulous effect throughout the city, like distant thunder or the low notes of a powerful organ.

The old bells of Russia are much better in tone than modern bells cast in Moscow twenty-five years ago or thereabout, but I have information that they make better bells now.

The Russians never swing their bells, but hang them stationary, and even the smallest church-bells are rung by ropes attached to the clappers.

THE LARGEST RINGING BELLS IN THE WORLD.

Names and Location of Bells.	Date cast.	Actual Vibration.	Key-note.	Diameter. Inches.	Sound-bow.		Weight. Pounds.
					Inches	Stroke	
Moscow, Tzar Kolokol, ...	1733	74	D	272	23.	0.84	443,772
Burmah, Mengoon, ...	—	94	F♯	203?	16.?	0.80	201,600
Moscow, St. Ivans, ...	1819	105	G♯	185	14.75	0.80	127,350
Pekin, Great Bell, ...	—	—	—	156	—	—	120,000
Burmah, Maha Ganda, ...	—	125	B	155	12.5	0.80	95,000
Nishni Novgorod, ...	—	125	B	151	12.	0.80	69,664
Moscow, Church Redeemer, . . .	1879	141	C♯	136.3?	10.6	0.80	60,736
Nankin, China, ...	—	—	—	112	—	—	45,000
London, St. Paul's, ...	1881	157	E♭	114.25	8.75	0.76	42,000
Olmutz, Bohemia, ...	—	157	E♭	121	9.125	0.75	40,320
Vienna, Austria, ...	1711	157	E♭	118	9.5	0.80	40,200
Westminster, London, ...	1856	166	E	113.5	9.375	0.83	35,620
Erfurt, Saxony, ...	1487	176	F	103.6	9.75	0.75	30,800
Notre Dame, Paris, ...	1680	166	E	103	7.5	0.73	28,670
Montreal, Canada, ...	1847	176	F	103	7.8	0.76	28,560
York, England, ...	1845	187	F♯	100	8.	0.80	24,080
St. Peter, Rome, ...	1786	187	F♯	97.25	7.5	0.77	18,000
Great Tom, Oxford, ...	1680	210	G♯	84.	6.125	0.73	17,024
Cologne, Germany, ...	1477	198	G	95.	7.2	0.76	16,016
Brussels, Belgium, ...	—	210	G♯	95.81	7.75	0.71	15,848
State-House, Philadelphia, ...	1875	198	G	88.	6.375	0.73	13,000
Lincoln, England, ...	1834	210	G♯	82.85	6.	0.73	12,096
St. Paul's, London, ...	1716	222	A	81.	6.08	0.75	11,500
Exeter, England, ...	1675	210	G♯	76.	5.	0.66	10,080
Old Lincoln, England, ...	1610	249	B	75.5	5.94	0.78	9,856
Westminster, London, ...	1857	219	B	72.	5.75	0.79	8,960

CHINESE BELLS.

China is next in order of great bells, but their awkward form and projecting ornaments make them far inferior in tone to our bells.

The great bell in Pekin weighs 120,000 pounds, diameter 13 feet, and height 14 feet 6 inches. It is rung by one man striking its outside by a wooden mallet. An ordinary iron clapper would probably break the bell on account of its irregular distribution of metal.

The great bell of Nankin weighs 45,000 pounds. Large bells are very common in all cities of China, but all bad in tone, and chime-ringing is unknown there. The construction of Chinese bells shows absolute ignorance of the science of acoustics as applied to that art.

JAPANESE BELLS.

In Japan ringing bells are very common, and are a little better than those in China. They make the bells cylindrical, with a spherical top, and ring them by a weight hung on a rope striking the bell outside.

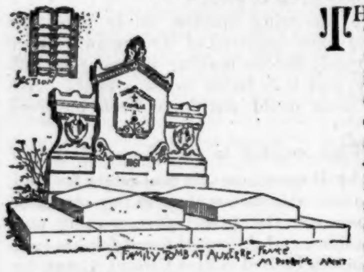
The Chinese and Japanese bells require double the amount of metal for the same volume of sound produced by our bells.

The ancient literature, that is, from the year 1495 to the end of the last century, was rich on bells, and the subject was treated by able scientific men. A civil judge, Maginus Tintunatius, in the Venetian service at Candia, when besieged by the Turks in the year 1571, was taken prisoner, and in his captivity amused himself by writing a treatise on bells, which is said to be the best written on that subject; but, as the Turks considered the bell as a symbol of sinful infidelity, the author was beheaded by the order of a pasha. The manuscript was, however, preserved and published, by which his name is immortal.

When the Turks took Constantinople, in 1453, they forbade the ringing of bells, for the purpose of preventing signals being given for popular revolt.

The art of bell-founding has not advanced in this century, but has gone backwards in many cases, which proves conclusively that a good bell cannot be produced by practical experience alone, but a scientific knowledge of acoustics is necessary with experience, not only for making a good bell, but also for producing the maximum volume of sound with the minimum quantity of metal.

THE VICTIMS OF POMPEII.



THE *Pall Mall Gazette* says: — The work of exploration which has been steadily going on in Pompeii for over a century, from the day when excavations first began on the site of what was then vaguely called "La Civita," in 1748, has led to other than purely archæological results. It has enabled a fairly accurate notion to be formed of the nature and extent of the catastrophe. We know, for instance, that the lava stream did not reach Pompeii, and that the city was not destroyed by fire. We know also that the eruption was accompanied by one or more shocks of earthquake, which threw down houses here and there, and buried men and women under their ruins. From the fact that skeletons have been found at the entrance to the public bath, which was quitted hastily by the few grand ladies who were not present at the gladiatorial performance in the amphitheatre, the time of the catastrophe can be fixed with approximate accuracy at or about noon. Above all, the discoveries of skeletons, every one of which has been carefully recorded for at least a century, enable some conclusion to be drawn as to the total number of victims of the catastrophe. It would be a mistake to suppose that the majority, or even a very large portion, of the inhabitants of Pompeii perished. The effects of the ashen shower were not instantaneous, and every one who could get away from the city on the first alarm probably saved his life. The bulk of the people were in the amphitheatre, which was situated near one of the city gates on the side remote from Vesuvius, and there was nothing to hinder every one in the great audience from getting away in time. Those who perished were those who deliberately put off their flight to save wife and child, or, still more often, valuables.

Of such victims 450 have been already found. From the year when the excavations began, in 1748, to the year 1826, the total number of human remains discovered was 160; from 1827 to 1845 it was 63; from 1846 to 1860 it was 60; from 1861 to 1872 it was 87; and from 1873 to 1881 about 100. But it is to be remembered that only two-fifths of the buried surface has been brought to light. On the whole, there appears good reason for putting the total number of human beings who perished in the eruption at least as high as 1,100. To these should be added the skeletons of three dogs, seven horses, eleven hens, two tortoises, fifteen pigs, ten oxen, and the bones of fifteen other animals. The remains of one of these dogs were found in the porch of the "House of Orpheus," and the cast which Signor Fiorelli has taken brings before us with a painful vividness one of the minor tragedies of that awful day. The poor beast was chained at his post, and in the general panic and confusion no one remembered to let him loose. The chain lay by the remains when they were found, and it was evident that the creature had strained his tether to the utmost in the effort to keep himself above the masses of ash and pumice-stone that rapidly accumulated around and over him. The cast is to be seen in the little museum at Pompeii. The dog lies half on his side half on his back, his slender head and open muzzle, gasping for a little air, buried between the hind legs, which have been convulsively brought forward in the last agony of death. But the process which has been so successful in reproducing the very form and likeness of this creature as he lived and died, has produced results no less extraordinary in the case of the human victims of the catastrophe. The idea of pouring plaster-of-Paris in a liquid state into the moulds left by the bodies in the soft ash did not occur to any one till it suddenly flashed across Fiorelli about twenty years ago.

Of the remains of the one hundred and eighty human beings discovered in Pompeii in the first hundred years of the excavations there is consequently only a written record. It is only from the *Journal of Excavations* for the year 1831 that we know of the touching and famous sight which greeted the eyes of the first discoverers of the "House of the Faun." On the floor of the banqueting-hall lay the body of a woman, probably the mistress of the house, with her jewels scattered where she had thrown them in despair of rescue or escape. The roof had been crushed in by the weight of falling ash and pumice-stone, and the hands of the dying woman were upstretched in a vain effort to keep off the impending weight. Parts of the body and clothing could still be made out, and a drawing could be made of one charming foot. But such records are lifeless and tame indeed beside the extraordinary portrait-statues which are now to be seen in the little museum at Pompeii. There are nine of these, or were a very short time since, and to see them is like seeing the men and women themselves of eighteen centuries ago. Fiorelli's method is as simple as possible. A small opening is made, the plaster is delicately poured in, and when it has had time to harden, the surface crust of ash is peeled off, and the man or woman comes back to life again. The details of clothing and feature have all left their mark on the soft ash, and are all faithfully preserved in the plaster cast. The results achieved by Fiorelli are striking and complete. Take the cast of the elderly slave, for instance, probably a man of some sixty years old, who appears to have been taking his siesta when the eruption began, and to have been painlessly asphyxiated in his sleep. He lies on his right side, the knees a little bent, the left leg drawn up, and the cheek resting on the right hand. The coarse, strongly-marked features and peaceful expression of the sleeper have all been perfectly preserved. A hardly less easy death must have been the lot of the four persons found lying on their backs in the street. Three of these were men, one of them a negro of the most pronounced type. The fourth was a woman of unusual stature, whose time for becoming a mother was evidently not far off. The three persons found lying on their faces do not appear to have found quite so quick a death. Two of them are women. One of these, an elderly woman, with a thin figure, lies by herself, her face buried in her arms, as if to protect herself from the fatal rain. The other lies side by side with a man in whose company she appears to have taken flight. She has covered her face with a fold of her dress, and the hands are tight clenched in the last death agony.

PAINTING THE CAPITOL DOME.


HEAD OF A GIRL — FOUNTAIN ON THE TROCADERO PARIS.

THE Washington *Post*, in a recent issue, says: The work of repainting the great white dome of the Capitol, which has been in progress several months under the immediate personal supervision of Signor Phillippo Costigini, the well-known Italian artist and frescoist, is offering daily attractions to hundreds of people, not a few of whom are visitors from every section of the country.

The men actually employed upon the outside of the dome are twelve in number. They are Washington painters, men of more than ordinary daring in their profession, who are not afraid to risk their lives for fancy prices, and that is what the Government pays for all its work.

It may seem incredible, but it is a fact, nevertheless, that to repaint the outside of the dome requires fifteen tons of pure white lead. This amount of material, under ordinary circumstances, would be sufficient to paint every house on Pennsylvania Avenue, from the Capitol to the Treasury building.

Common white paint would wash off the roof of the dome in the first rain that came along, and trickle down in big streams, leaving the dirt as palpable as before. The work of repainting would not be rendered so often necessary were it not for the fact that the dome is so constructed that the vertical joints or ribs of the walls, which are of iron, as is the entire structure, do not come in actual contact with each other, thereby allowing the rain to get in and rust. Were they joined, the grand old dome would assume each day, under the influence of the weather, new and horribly fantastic shapes, and some unusually cold morning would find it crushed like an egg-shell into a thousand fragments.

Fortunately no accidents have as yet occurred, although a single misstep or the giving way of a slender piece of rope would send the unlucky painter rolling down the steeply-curving roof and off into — well, eternity.

The most wonderful thing about the capitol dome, however, is yet to be told. It is said that there was a statue in ancient Egypt, called Memnon, which whispered sweet words of melody to the sun as he appeared above the horizon, and sang him to sleep with wild, weird lullabies. The grand, haughty Goddess of Liberty on top of the dome has a heart of bronze, but a good heart for all that, and one filled with true old Virginia courtesy. She has not yet picked up enough courage to attempt to do the prima-donna act, but every morning the good dame courtesies to the sun, and when he sinks in the west she again courtesies, but without turning around. Some time since architect Clark suspended a plummet-line from the interior of the dome, and it was found by actual measurement that the lead swung over a space of four and one-quarter inches, making a total dip out of the perpendicular of eight and one-half inches. This was caused by the alternate contraction and expansion of the iron.

A ludicrous mistake, which occurred not long since, may be mentioned in this connection. The coast-survey had in charge the surveying of the river-front, preparatory to locating the line for the reclamation of the Potomac flats.

The top of the dome was taken as one point of the surveyor's triangle in estimating certain distances. The calculations thus arrived at were found to sadly differ almost every day, and much swearing and perplexed thinking upon the part of the brilliant engineers was indulged in before the dipping of the dome was brought to mind. After that the top of the Washington monument did unceasing duty as a mathematic guiding star.

To remove the paint from the dome it is necessary to use potash. This is applied with a mop. In closing it may be remarked that it is in contemplation to remove the copper roof over the Congressional library, owing to its cracked, fissured condition.

The cost of repainting the outside of the dome is estimated at $6,000; this is for paint and labor.

THE $3000-HOUSE COMPETITION.

New York City, November 27, 1882.

To the Editors of the American Architect:—

Sirs, — The subject of the competition announced in the *American Architect* Nov. 18 inst., is, as you say, "of the widest possible interest." The problem of building a house for people who have good taste, but whose income is moderate, is something more than interesting: it is one of the most difficult that an architect can be called upon to solve. Many of us have found that when our client's demands were satisfied, and we had planned him a house that would thoroughly meet his wants, it could not be built for the money at command—or at least for the sum we assured him it would not exceed. Few of us, indeed, have ever been able to reconcile or adjust the wants of our clients to the price that they can afford to pay. The tendency of this state of things is to poor building; to flimsy construction and poor material, in order that the demands for space, modern conveniences, and appearance may be satisfied.

Your competition, judged as it will be by an expert jury, gives opportunity for determining what can be done — and well done — in the way of a low-priced house, and the number of competitors will undoubtedly be large. Several of us, who contemplate being of this number, are in doubt in regard to two points. These are the plumbing and heating. If allowable, we would put the direct question, are they to be included? We may anticipate your answer as something like this: The nature of the drainage and heating, and the amount of plumbing are matters left to the discretion of the competitors.

If you can consistently give any further particulars—the terms of the competition being of a very general nature — you would oblige us. If not, you may at least tell us whether we will be right in assuming that the jury of awards will take these points into consideration in making their award. I am, etc.,

F. A. W.

[We intentionally left the question of plumbing and heating an open one, and the jury will undoubtedly consider how far the inclusion or the exclusion of one or the other affects the rating of a given design. Probably no one would attempt to include more than a pump, a single water-closet, and possibly a bath-tub in the equipment of so modest a house, and of these we should be tempted to hold the pump only as an indispensable fixture. The water-closet may be properly displaced by the out-door privy or the earth-closet, while the bath-tub would be the luxury first done away with. As to heating, a small furnace — all that could possibly be needed — and a set range might be included in the cost of the more modest designs, but they are not usually considered by a client as forming part of the structure he expects to have provided for the sum he can afford to pay for his *house*. There is nothing unusual about the conditions of the programme; it is such a problem as may be brought to an architect any day. The only unusual thing — and for the credit of our architecture a very regrettable thing it is — is that when a man has so little money to expend, his first economy is usually dispensing with the aid of a properly qualified architect. This being so, we trust that we shall receive enough designs from architects in full standing to enable us to show the public that real economy lies in the opposite course. — Eds. American Architect.]

WAX-FINISH.

Boston, November 6, 1882.

To the Editors of the American Architect: —

Dear Sirs, — There are several questions the writer would like to ask in regard to the painting specification printed in your valuable paper, viz: Why you specify a coat of oil for the oak instead of a filler? Will not the hard wax-finish spot, on being wet or moistened, in the same way as the waxed floors of Europe?

Is not Pellucidite good for floors, and does it darken the wood when used? Why do you specify shellac instead of Pellucidite for the maple? Will you also tell me how to finish oak to obtain the dark color of age?

If you can spare the time and space to answer the above questions you will greatly oblige

Yours truly, Inexperience.

[The coat of oil under the wax-finish darkens the wood and brings out the figure, and also prevents it from showing grease-spots. The wax-finish spots slightly with water, but a little rubbing with a warm cloth or brush restores it. Pellucidite in our experience is too soft for floors, although it is used a good deal for finishing them. To bring out the beauty of maple the finest finish is the best, and shellac well treated is smoother than any Pellucidite finish we ever saw.

Oak is generally stained by applying strong ammonia with a brush. There is a limit, however, to the depth of color which can be obtained by this means, and some architects require a stain made with a sulphate-of-iron wash, followed by a decoction of gall or logwood, just as if the wood were to be ebonized, only using much weaker solutions. — T. M. Clark.]

POWDER-POST IN THE CHURCH AT ANDOVER.

Philosophical Society of Great Britain,
7 Adelphi Terrace, London, W. C.

To the Editors of the American Architect: —

Dear Sirs, — Last month you described the ravages of small black or blue worms in the wood-work of a small church at Andover, Mass.

I believe it will be found an effectual cure if the wood-work, or even the parts affected are painted with paraffine oil; I have not known it to fail. Yours,

F. Petrie, Capt.
Hon. Secretary.

THE ORDERS.

San Francisco, November 16, 1882.

To the Editors of the American Architect: —

Sirs, — Will you please inform me (through the *American Architect*), what works on the Orders (Classical Architecture) are the cheapest and best, and where they can be had. Yours respectfully,

A. R. M.

[The best book of the kind is Leveil's small edition of Vignola, published by Garnier Frères, Paris, and used in the Ecole des Beaux-Arts. It can be ordered through any bookseller. The chapters relating to the Orders in Gwilt's Cyclopædia form perhaps the best small treatise on the subject in English.—Eds. American Architect.]

THE PAUL REVERE STATUE.

1136 Girard St., Philadelphia, November 18, 1882.

To the Editors of the American Architect: —

Dear Sirs, — Please favor me with address of Chairman of Committee on Erection of statue to Paul Revere, mentioned in your last number. Respectfully, Frank Stephens.

[We do not recollect the name of the Chairman of the Committee. Perhaps some of our readers may know it. Mr. N. J. Bradlee, Pemberton Sq., Boston, is one of the committee. — Eds. American Architect.]

NOTES AND CLIPPINGS.

A Travelling Theatre. — A manager now proposes to make a tour with a portable theatre, including a stage, first-rate scenery, and an able company. The structure will be transported on and partly formed by eight railroad cars and can be set up in half a day. It will have a gallery, heating-apparatus, and a seating capacity of 1,500. By means of a temporary track a site can be reached half a mile away from the railroad.

Parsonages Taxable. — The Attorney-General of the State of New York has rendered an opinion that parsonages, even though they be on the same lot with churches, are liable to be taxed, if the parsonages are owned by the church trustees or corporations. It is held that the section of law referring to the exemption of clergymen does not apply to parsonages owned by the church trustees or corporations.

Removal of the Statue of the Iron Duke, London.—Decimus Burton's arch at the busy corner of Hyde Park, which supported for so many years the well-known statue of Wellington on horseback, has been taken down and will be re-erected at a lower site on Constitution Hill. The chariot group with attendant figures in the original design will be placed on it. The equestrian statue of Wellington is to stand on a new pedestal at some point not yet determined.

The Loss of Life by Fire. — Statistics of the loss of life by fire in fourteen of the principal cities of Europe between 1869 and 1879 place London at the head of the list. In every 100,000 persons in that period 8.3 lives were destroyed, while in Munich only 0.4 out of the same number perished. The *Pall Mall Gazette* can understand why fires in such towns as Cologne and Hanover, with their narrow thoroughfares and old wooden houses, should generally result in serious loss of life, "but London," it says, "possessing, as it does, an extensive fire-brigade and a fair supply of water, should at the least be as free from such accidents as the average city of the Continent. If these figures are corroborated by independent inquiry, they point to some serious defect in the construction of our houses or in our system for preventing fire."

The Efficacy of Lightning Protectors. — An interesting note on the efficacious protection of a house by a lightning protector during a recent storm at Colmar has been brought before the French Academy of Sciences by M. G. A. Hirn. The conductor was by no means a good one and terminated in a piece of iron lying in a water cistern or trough standing in the corner of a court. In spite of a terrific thunder-storm which struck the rod no part of the current left the rod, but all was discharged into the earth. The brass point was, however, fused. Experiments by M. Hirn fully confirm the views of M. Melsen that lightning rods should end in metal masses such as pipes, and not in so poor a conductor as water. When there is a flaming discharge seen at the point of a lightning-rod it is a proof that the rod is not a good one, for M. Hirn has proved that these rods act busily during a thunder-storm in giving off a silent discharge. By means of an electro-magnet in a derived circuit from the rod he has demonstrated this fact. When the storm passes the zenith the bars become magnetised. The same effect is shown by connecting a galvanometer in the circuit of the rod; and we may mention here that a plan was recently patented for charging secondary batteries in this way.—*Engineering.*

Architecture and Conquest. — The conquest of a country is not always sufficient to introduce the art or architecture of the conquerors. Of this we have ample evidence in India. The occupation of the region by the conquering race generally produces some modification of the arts practised in the locality which has been invaded. It was not so long ago that it was said, if the British had been turned out of India there would be nothing left as a monument of their rule but a few empty beer-bottles. We know that the Mohammedan conquerors of India at first employed the Hindus to build for them. There is sufficient evidence to show that Alexander did not introduce the Greek influence: it was brought to Bactria during the Greek rule of that country, and gradually worked its way thence to the valley of the Indus. If Alexander built cities after the defeat of Porus, on the banks of the Jhelum, or raised a monument to his horse Bucephalus, he must have been under the necessity of employing the workmen of the country, and they would build in their own style. The remains in the Punjab and the Peshawur Valley, which bear evidence of the Greek influence, all belong to a date centuries after the time of Alexander's invasion. As yet nothing has been found, nor is it likely that anything ever will be found in that region, with traces of Greek art upon it as old as 300 B. C. The probable date of the Manikyala Tope, as given by Mr. Fergusson, is between the sixth and eighth century A. D. This monument bears on it evidence of the Greek influence, and it was the traditional "Tomb of Bucephalus." Its character of being a Buddhist tope is now beyond dispute, and its date makes its connection with Alexander's time impossible. The Bactrian coins show that Greek artists must have been employed upon them. A glance at the plates of the "Ariana Antiqua" will make this evident. The earlier coins are the most purely Greek in their style; native artists must have copied these, and in the course of time the art, as seen on these coins, deteriorates, till at last its original character is all but lost. As these coins bear evidence that artists were brought from Greece to Bactria, it may be safely assumed that architects also came, who introduced their own architecture. At first the buildings they erected would in all probability be purely Greek in manner, but after the removal or death of the first introducers, when the style would be copied and re-copied by the natives, it would as surely lose whatever amount of purity it originally possessed, as the art on the coins did. In the Jellalabad Valley the remains show that this bastard style had come into existence and was regularly in use. It is a mixture of Persepolitan and Greek, combined with some features derived from India. — *The Edinburgh Review.*

The Timber-Lands of Puget Sound. — In a lovely country which once belonged to England, but which was ceded to the United States in 1846, there grows, according to the *Colonies and India*, the finest body of timber in the world. Fir and pine, and oak and cedar, of unsurpassed quality and practically unlimited in quantity clothe the mountains, overhang the rivers, and shadow the plains of the Puget Sound district, in Washington Territory. It is calculated that this region will yield 160,000,000,000 feet of valuable timber. The trees attain a remarkable development, both of height and beauty. The yellow-fir is frequently found growing to a height of 250 feet; the white-cedar to 100 feet, with a girth of over 60 feet; and the white-oak to 70 feet; whilst ordinary-sized specimens of the sugar-pine yield from 6,000 to 8,000 feet of lumber each. For long after its discovery this store of timber remained undisturbed; but in 1851 a saw-mill was built on Puget Sound, and thenceforward continually increasing inroads were made upon the forest until to-day no less than fifteen such mills are at work upon it. The largest of these has a cutting capacity of 200,000 feet per diem. During 1881 the export of lumber from Puget Sound amounted to 174,176,700 feet, valued at nearly $2,000,000, and since the establishment of the first saw-mill about 2,500,000,000 feet have been cut. Yet in spite of this we are told that the forests remain, for the most part, in virgin condition, except for a short distance from the banks of the streams and estuaries.

American Joinery Abroad. — Further information has reached us respecting the intended importation of American yellow-pine mouldings and joinery-work. There can be no doubt but that a vigorous effort will be made next season to create a market here for plain scantlings and other forms of American manufactured wood. Some novel forms of manufacture will be introduced, and, from what we can gather, every effort will be made to introduce them to the favorable notice of the trade here. The best recommendation which American joinery has is the really splendid quality of the material of which it is usually made. Few home-made articles at all approach it in this respect. When examining a pile of ready-made doors from the States we frequently turned over door after door without finding a blemish. For mouldings and architraves it may be quite possible to create an active demand, and with respect to pine doors, it may be said that this now exists. — *Timber Trades Journal.*

A Buried Obelisk at Rome. — Antiquarians at Rome are said to be exercised about an obelisk alleged by a writer of the seventeenth century to lie buried under the street between the Giustiniani and Patrizi Palaces. The municipality has decided to build a drain nineteen feet under the Via Giustiniani, and the accuracy of the old writer will soon be determined. During the excavations in the Roman Forum there were recently brought to light the remains of an ancient and forgotten church. The church has since been identified as that of Santa Maria in Foro. It is of small size, and was built within the western porticoes of the Basilica Julia and on the ancient level of the Forum. The discovery was made during the removal of the familiar modern causeway that crossed the area in front of the arch of Septimius Severus.

One Practice of Trades-Unions declared Illegal. — A Quebec judge has decided that the rule of trades-unions forbidding their members to work with non-unionists is illegal, and has given judgment in favor of a non-union man who sued the Ship Laborers' Benevolent Society for damages for enforcing his dismissal by a ship-master.