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VOL. XXXII.

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AUGUST 15, 1891.



SUMMARY:—

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IT has been commonly reported in the profession for some time past that extraordinary efforts are to be made to have the best possible display of American architectural designs, drawings and models, at the Chicago Exposition of 1893, and it is much to be hoped that the report is well founded. We have just received circulars from the Department of Fine Arts, from which, although architecture is included in the list of the fine arts which come under the care of the Department, it does not appear that any place is reserved for anything more architectural than "models, and monumental decorations;" but further explanations will undoubtedly be given in due time. "Constructive Architecture" is to be treated separately from the artistic portion of the art, and is classified with civil engineering; but the objects to be shown under that head consist only of plans for buildings for special purposes, working-drawings and specifications, details of construction, and drawings or models of special appliances. Any information desired will be given on application to Mr. Halsey C. Ives, Chief of the Department of Fine Arts of the World's Columbian Exposition, Chicago; and intending exhibitors, or better, at least in the case of architects, the officers of professional societies, will do well to put matters in train as soon as possible to secure a good representation from every part of the United States. There is an immense amount of very good and interesting material to be had, if the inertia inherent in the profession can be overcome in time to get it out by the spring of 1893, or rather, by November 1, 1892, when the list of exhibits must be in the hands of the Chief of the Department concerned.

A SERIOUS accident took place a few days ago, from a cause to which many casualties have been due within the last few years. The Pittsburgh Oil-Well Supply Company has been building a new puddling-mill, one hundred and six feet wide, and nearly two hundred feet long. It is usual in such structures to make the roof in a single span, and to give extra strength to the trusses, so that apparatus for hoisting and handling heavy masses of iron may be suspended from them. The trusses are therefore heavy, and need to be maneuvered in setting with a care which is not often given. In this case, the walls were ready for the roof, and one of the trusses was being hoisted into place, when it tipped over, and struck some heavy iron beams, already set in the walls. The blow against these threw over the walls in which they were set, and the rest of the masonry followed, carrying with it about forty men, who were at work in the building. Three of these were instantly killed, and three more seriously injured. It is not many months since a similar truss, which was being hoisted to its place on the outside of a building, was swung around by the

wind, and struck the walls, bringing the building down in a heap; and the safe arrival of a roof-truss at its destination appears to be quite a matter of chance. This ought not to be so. There is no mystery about the art of hoisting a truss so that it will neither tip over nor swing around; and, although the expense of proper hoisting is considerably greater than that of lifting in the simplest manner, and trusting to luck for the safe arrival of the load, the parsimony which is willing to risk men's lives to save a few dollars should be effectually rebuked by the courts.

A RATHER interesting point was decided a few days ago in the Supreme Court of Pennsylvania. There is a statute in that State, requiring contracts for public work to be awarded to "the lowest responsible bidder." Not long ago, bids were invited by advertisement for certain public work, and, in the advertisement, the right was reserved "to accept or reject all bids as the best interests of the city may demand." All the bids received were rejected, and another advertisement was made. The lowest responsible bidder under the first advertisement claimed the contract, in accordance with the statute, which says nothing about reserving the right to reject all bids, and makes no exception to the provision that the lowest responsible bidder must be awarded the contract. The question appears to have been whether the first advertisement was an absolute invitation for proposals, such as the statute contemplated, or only a provisional one, conditioned upon the decision of the proper authorities that the bids received under it were such as the best interests of the city demanded. The Supreme Court upheld the latter view, and decided that no responsibility was incurred to the lowest bidder, under the first advertisement, by the rejection of all the bids. This is not the first time that contractors have met with disappointment through too great reliance on their interpretation of the meaning of this particular statute. Some years ago, a large public contract was awarded to a person who was not the lowest bidder. The contractor who made the lowest offer sued to have the contract awarded to him, under the statute. He proved that he had ample capital, and long experience in the business, and claimed that he was the lowest responsible bidder, and was entitled to the work. The defence was that the Commissioners who had in charge the matter to which the contract related thought that they had reason to believe that the lowest bidder was intemperate, and that he had been guilty of dishonesty and attempted bribery in connection with another public contract. It was proved that these impressions in regard to the bidder were groundless; but the Supreme Court held that, if they had been well founded, the commissioners would have been justified in considering that a man who had been guilty of such misdemeanors was not a "responsible bidder" within the meaning of the statute, whatever his financial standing might be; and, while it expressed astonishment that the Commissioners should have given credence to such rumors about a man, without ascertaining the truth by inquiry, it held that their discretion was absolute, and that, in the absence of fraud, their decisions were not subject to review by the courts.

THE French Chamber of Deputies has long found itself very inconveniently housed in Paris, in the old Palais Bourbon, and, not long ago, determined to seek expert advice as to the means of obtaining relief. Among others, it applied to the distinguished architect, M. Émile Trélat, who made an extremely interesting report, containing, incidentally, a statement of the requirements to be fulfilled in planning a room for a deliberative assembly, which is of great value. Moreover, as M. Trélat came to the conclusion that the present hall of the Palais Bourbon could not, by any possibility, be so transformed as to fit it for the uses of such an assembly, it may be inferred that his convictions are somewhat radical, and they are all the more instructive on that account. The preparation of the report was preceded by a series of examinations of the hall, under different conditions of temperature, sometimes when empty, and sometimes when filled with people. Multitudes of candles were at times set on the desks, to show the direction of the currents, and anemometers and thermometers frequently used. From these indications ample evidence was obtained of its incurable unfitness for the purpose to which it is now devoted. To review a little the history of the room, as we find

it in the account which is given at length in *Le Génie Civil*, it appears that the original assembly-hall was constructed about 1794. The palace had been confiscated, under that interesting system of jurisprudence which cut off the heads of those nobles who remained in France, and appropriated the goods of those who ran away. It was then new and splendid, and its captors proudly rechristened it the "House of the Revolution," and installed the Council of the Five Hundred in a place made ready for them by throwing together some of the reception-rooms of the palace. On the proclamation of the Empire, Napoleon installed the Corps Legislatif in the same place, but the palace was soon afterwards restored to the Bourbon family. In 1827, the Government of Charles X bought from the Prince de Condé the portion of the palace containing the Assembly Chamber, for about a million dollars, and soon afterward, the Duc d'Aumale, the heir of the Prince de Condé, sold the remaining portion for about a million dollars more. The present Chamber of Deputies was then constructed, in the place of the old hall, from the plans of M. de Joly, who still lives to care for his work. At the Revolution of 1848, M. de Joly was called upon to make plans and estimates for enlarging the hall, so as to make it capable of accommodating the new National Assembly, but the project was never carried out, and the National Assembly was housed in a temporary wooden shed in the court-yard, until the establishment of the Second Empire substituted for it a house consisting of a small number of deputies. After the fall of Napoleon III, and the organization of the Republic, the Chamber of Deputies sat at Versailles, until, in 1879, the seat of government was removed to Paris, and the Chamber took possession of the quarters which had been occupied by its predecessors.

SINCE then, the complaints of its crowded and unwholesome condition have been incessant. According to M. Trélat the deputies have not space to sit comfortably, still less to move about freely; the speeches delivered from the tribune by ordinary orators are inaudible, while speakers with more powerful lungs can only make themselves heard by turning from side to side, delivering, as it were, slices of their speech alternately to the hearers right and left; and all the seats are subject, in winter, to successions of cold blasts and intolerable heat, while the public galleries are described as veritable places of torture. The room was designed for an assemblage of three hundred people, while the present chamber has five hundred and seventy-eight members, and it is not to be wondered at that two persons should object to being crowded into the space intended for one. More than that, however, the arrangement is bad. The desks of the members are only ten inches deep, from front to back, so that an official document can hardly be balanced on it without falling off, while it is impracticable to arrange papers so that notes can be taken from them. Moreover, most of the desks are placed in rows, close together, with only occasional aisles; so that if a deputy wishes to consult a fellow-member during a debate, he is obliged to climb out of his place as best he can, over the knees of those sitting beside him, accompanying, naturally, his progress by whispered apologies, which add much to the confusion of noises in the hall. Even without these dialogues, however, the room would be noisy, simply from the distressed movements of the cramped and suffocated members. The actual space allotted to each deputy is not much more than one-half the standard area per pupil established for primary schools, and the seats are not only crowded, but uncomfortable. During the long sessions of the Chamber, the members, who at first felt themselves tolerably comfortable in their places, begin to find themselves painfully confined, and they involuntarily seek relief in changes of position, which are necessarily accompanied by creakings of the chairs and desks, and movements of feet over the floor; and these, when multiplied by five or six hundred, amount to a considerable disturbance.

AFTER making these observations, M. Trélat lays down his three cardinal principles of arrangement for such places, which are, *First*: that the orator at the tribune should be seen and heard from every member's seat; *Second*: that, without changing his position, every Deputy should be able to see the whole of the audience; and, *Third*: that at any moment each Deputy should be able to leave his place, and move about through the whole extent of the hall, without incommoding any one, or disturbing the debate. Even, how-

ever, with comfortable seats, desks large enough to arrange papers on, and easy communications, a hall may be useless, or dangerous, if proper ventilation is not provided. Of all public places, M. Trélat says, a hall of legislation most needs ventilation. In a theatre, where the utmost care is taken to provide an abundant supply of fresh air, the longest performances do not last more than four hours and a half, while the intermissions reduce the time during which the spectators must remain in their seats to about three hours. Moreover, at each raising of the curtain, a flood of fresh air is admitted into the auditorium; while, in such a room as the Chamber of Deputies, there is no such general change of air, and no intervals of relief to the lungs of the occupants, who are, moreover, often obliged to sit six hours at a time, and may be summoned to two sessions in a day. Hence, artificial ventilation of the most effective kind is necessary, and this is very difficult to arrange. Even in the Palais Bourbon, where downward ventilation is used, the fans are capable of renewing all the air in the hall six times an hour, and supplying fresh air at any temperature desired, as M. Trélat finds by actual experiment; yet, during the sittings, the air is painfully vitiated. The reason of this is, that when the room is occupied, the warmth of the bodies of the members produces strong upward currents, varying according to the grouping of the people, and these currents carry up with them the products of respiration, which, on cooling, descend, to be breathed over again. Near the sides of the room, and in other places where the warm bodies are less closely crowded together, the fresh air from the inlet registers takes advantage of its opportunity to rush down and escape through the outlet pipes, causing limited but severe drafts, which are so annoying to those exposed to them that the speed of the current must be reduced, to prevent serious consequences. Whether a more successful system of ventilation could be employed, he does not say, as he condemns the room entirely, for other reasons: but it seems as if the question of upward or downward ventilation, so long agitated here, might be vigorously discussed in Paris for the next few years, in connection with the main subject.

MEANWHILE, the Parisians appear to have found a tolerably satisfactory arrangement for ventilation in the great hall of the new Sorbonne, by M. Nénot. Here a curious plan is employed. Under the whole auditorium is a mixing chamber, into which fresh air, both cold and hot, is forced, and mixed to the temperature desired. From the mixing chamber, many thousands of small holes, guarded by wire gauze or fine netting, open into the auditorium above, through the floor, the fronts of the seats and other places. Besides these, a special conduit leads to the wall encircling the auditorium, opening behind a moulding, close to the face of the wall. Before the hall is opened to admit an audience, a current of pure air, heated to nearly 200° Fahrenheit, is forced into the latter conduit, and ascends over the surface of the wall, quickly raising it to a temperature of 100° or so. Then, just before the audience comes in, the hot air is turned off from the wall, and fresh air at about 60° is abundantly introduced through the floor from the mixing chamber below, until the lecture is over. During all this time the wall remains at a temperature considerably higher than that of the air, and, in consequence, there are no downward currents, or cold drafts, near it; but the whole body of air, after respiration, ascends to the ceiling, from which it is removed by powerful exhausts, through openings just equal, in aggregate area, to the inlets.

A NEW sort of electric bell has been devised, consisting of a vibrating plate of metal, like the reed of a parlor organ, which is set in motion by the electro-magnet, and emits a clear and continuous musical sound, much more agreeable to hear than the startling rattle of the ordinary electric bell. It is claimed for the invention that it can be applied to the construction of a new class of musical instruments, and the idea seems to be an excellent one. Evidently, also, as the instrument could be played automatically by the same current that produced the sounds, an extensive field would be opened for the refinement of domestic apparatus of the sort. The front door bell, for example, instead of its ordinary noisy appeal in the kitchen, might be made to sing a song of welcome at the visitor's ear, at the same time that it notified the household, in animating strains, of his arrival; and the clang of school gongs, and perhaps, of fire alarm bells, might advantageously be replaced by a few bars from melodies appropriate to the occasion.

GERMAN ARCHITECTURE.¹—II.

SOUTH GERMANY.

THE oldest examples of Renaissance architecture in Germany are found in the drawings and paintings of the great masters and in such compositions as armorial bearings, mortuary inscriptions, and particularly in paintings on glass. Architect-



Fig. 1. Pillar after Burgkmair.



Fig. 2. Column from the Court of the Residenz at Freising.

ural forms appear here from the beginning of the sixteenth

executed in stone. We have no interest in certain fragmentary remains which, according to the historians, must have seen the light at the end of the fifteenth century; these rudimentary outlines merely furnish fuel for controversy, for they do not point unmistakably to a general movement. Little matters it that a stonecutter, whom fortune had directed to Italy, timidly attempted on his return to Germany to frame in a Gothic coat of arms with a couple of thin pilasters; what we are looking for is an indication of a marked tendency to the use of Renaissance forms, and this first appeared among the artists, then in the nobility and later among the people themselves. The movement did not, however, reach appreciable proportions before the early part of the sixteenth century.

All the great German artists of the period boldly entered at the same time the path which Italy had long been following. Among these we cite first Albert Dürer of Nuremberg (1471-1528), who in his works invented forms of exquisite originality, embodying his own ideas, and who really created by himself a living and vigorous Renaissance. The triumphal gate which he designed in 1515 in honor of the Emperor Maximilian is an inexhaustible mine of simple and artless motive of incomparable drawing.

Burgkmair of Augsburg (1472-1531), a powerful colorist, framed some of his canvases with grand architectural designs, showing a thorough acquaintance with decorative principles and revealing a profound study of the Renaissance style. In the Augsburg Gallery there is a picture by this master dated 1507, in which Renaissance forms appear: this is one of the oldest remains of the style in Germany. In another of Burgkmair's paintings, now in the gallery at Munich, in which architecture plays an important part, we find semicircular vaults and arches borne on polychrome pillars of charming composition (Figure 1). A gilded capital surmounts a wide astragal covered with *grisaille* decorations. The shaft, which is of yellow marble, is separated from the deeply-carved and gilded base by a band enriched, like the astragal, with subjects *en grisaille*. Burgkmair left a large number of wood engravings in which Renaissance forms of great originality and strength are to be seen.

We would also mention Hans Schaufelein of Nuremberg (1492-1540), Daniel Hopfer of Augsburg (1495-1549), Martin

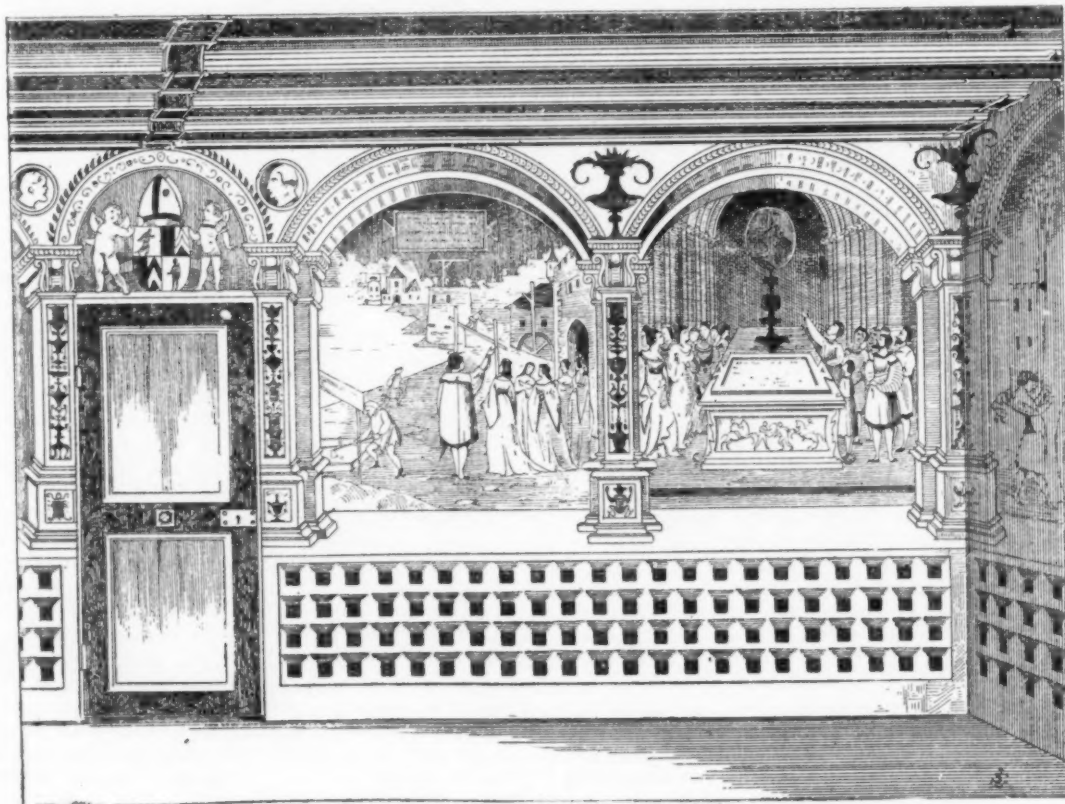


Fig. 3. Hall in St. James's Monastery at Stein.

century, or nearly a quarter of a century before they were

¹ From the French of Lambert and Stahl, in Planat's *Encyclopédie de l'Architecture et de la Construction*. Continued from No. 815, page 82.

Schaffner of Ulm (1499-1535), all of whom painted beautiful Renaissance architecture, and, lastly, that mighty and tireless genius, Hans Holbein the Younger (1497-1543), who in a way

was the incarnation of German art at the beginning of the Renaissance.

All these innovators, to name only the leaders, for a quarter of a century stood true to the Renaissance ideal, but during this time their efforts in architecture were confined to their compositions; they paved the way for their contemporaries by sending out plans as though from a school; their departures from the old track were tolerated in their drawings and paintings, but they were not allowed to touch wood or stone. The architectural forms hallowed by tradition were still maintained. Those who hold the purse-strings are always the last to be convinced. Artists found but little encouragement in Germany. Dürer wrote from Venice shortly before his return to Nuremberg: "How much I shall long for this warm benignant sun at home; here I am somebody, there a beggar." And again, in a letter addressed to the council of his native city, he complains of having toiled there thirty years for glory rather than gain, not having received more than fifty florins during that period, while the nobles of Venice had paid him two hundred ducats; later the Council of Antwerp offered him three hundred florins a year to settle in that city.

Holbein was obliged to abandon his residence in Basel, although he was treated with honor there; he went to England, where a broader field awaited him.

The contract entered into in 1507 between the magistrate of Schwabach and the painter Michael Wohlgemuth, gives a good idea of an artist's status at this time in Germany. It was about an altar picture: "In case that a change or changes shall be deemed requisite the painter must execute them, and he must alter his work until the committee, appointed for the purpose, shall pronounce the picture perfect. If, however, the necessary modifications are such that they cannot be made, the painter must keep his picture and refund any payments that he may have received." In view of the slight consideration which artists then enjoyed, it is not surprising that masters like those named above were not employed in the construction of the earliest Renaissance monuments. The first attempts at architecture in this style are all barbarous in comparison with their compositions.

Broadly speaking, it may be said that the architectural Renaissance, after having been theoretically introduced into Germany by artists in their paintings, made its appearance there practically about 1525; it received encouragement from the nobility and the clergy, and was adopted not long afterward by the burghers, who zealously entered into competition with the former in the construction of private dwellings and edifices of public utility. However, the first half of the fifteenth century was filled with disturbances; Charles V opposed the Reformation, all sense of security was lost, and the Peasants' War devastated the country. These circumstances were un-

favorable to the development of architecture, which did not take a genuine start until the return of prosperity following the peace of Augsburg in 1555. The subsequent period of activity lasted till the beginning of the Thirty Years' War in 1618.

Certain Gothic elements were long perpetuated in the new style, and did not completely disappear for a century. Down to 1560, purely Renaissance structures were simple and delicate, with charming details. The love of the picturesque and the unconventional, so strong in mediæval architects, continued to exercise an important influence. The chief decorative constituents were confined to the enrichment of the portals, turrets and gables; spiral cases of very beautiful workmanship contributed also to the embellishment of the castles.

Near the end of the century, the restoration of the main dis-

positions of antiquity was accomplished, and an eager reaching-out after decorative effect manifested itself; the massive gables were adorned with powerful volutes and obelisks, the groundwork being enriched with twisted ribbons and loud, showy modillions. About this time, also, decorative motives for columns and plane surfaces were taken from articles in leather, and, to a greater extent still, from works in wrought-iron; the first quarter of the seventeenth century is characterized by this flat ornamentation.

The Thirty Years' War (1618-1648), which ravaged the whole of Germany, almost completely arrested all architectural development, and occasioned the destruction of a large number of edifices. The constructions of this period are but poorly represented; they exhibit features having a certain analogy with the Louis XIII style. From the beginning of the sixteenth century down to this time, the style in Germany answers to the general name of Renaissance. After the Thirty Years' War, the numerous courts vied with one another in the erection of palaces and theatres, the cities in the building of public and private monumental edifices; these last have a less marked character than corresponding structures of the sixteenth century. The court of France made its influence felt, and we might designate the styles which succeeded one

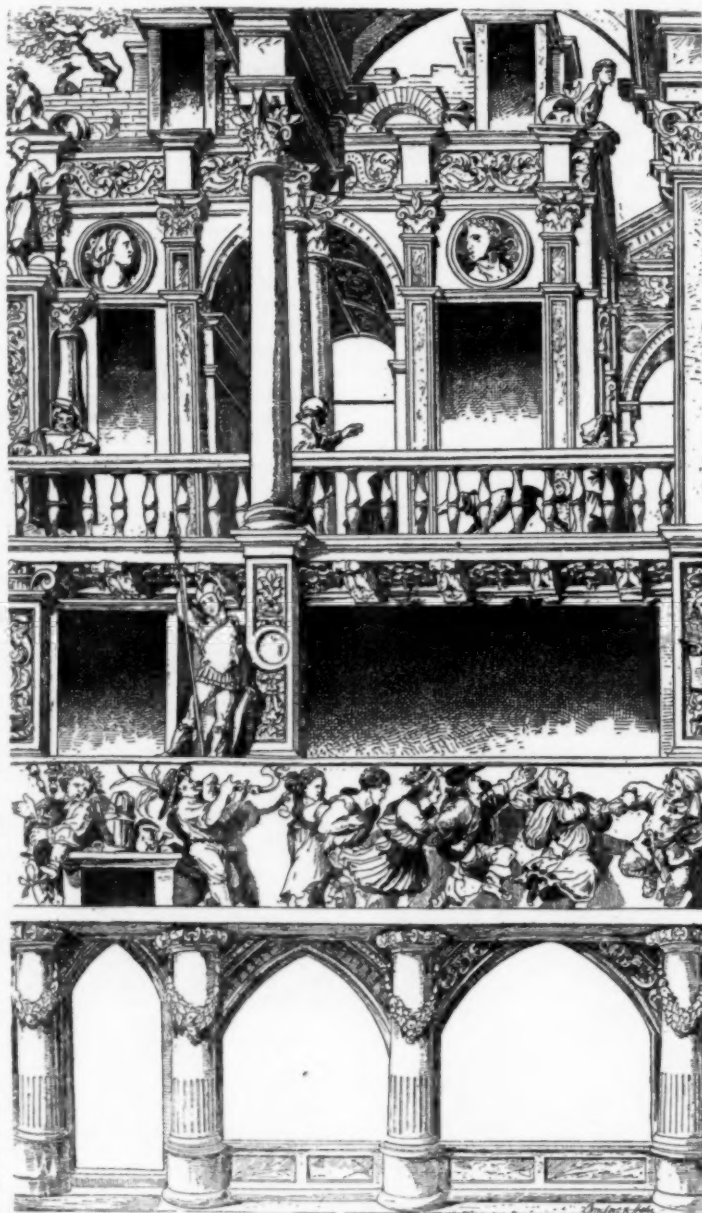


Fig. 4. Scheme of a Façade, by Holbein.

another after 1650 by the commonly accepted terms of Louis XIV, Louis XV, Louis XVI and the Empire. Religious architecture during the eighteenth century came under the influence of Bernini; it is very fully represented in the Roman Catholic sections of the country.

Beginning our review of Renaissance monuments with those of South Germany, we encounter at the outset, from 1513 to 1525, attempts betraying a most confused acquaintance with the forms of ancient architecture, the revival of which was essayed. The oldest of these structures is the tower of St. Guy at Heilbronn (1513); it is a queer but very picturesque edifice suggestive of Romanesque architecture in its heavy

details: the open-work staircase and gargoyles are Gothic; the new style appears only in the surface decorations.

The court of the Residenz at Freising, 1520, shows some progress, but the forms are not yet settled; the composition is ingenuous and primitive (Figure 2); the artist evidently did not know his Vitruvius. Clearly, the tower of St. Guy and the court of Freising, both in stone, are much farther removed from the Renaissance ideal than are the painted productions of the same period; as a means of comparison, let us examine the hall in the monastery of St. James at Stein, on the Rhine, canton of Schaffhausen. This edifice dates from 1516, and is still Gothic; the hall in question is itself in this style throughout. The mural decorations, on the contrary, exhibit a complete cycle of admirable Renaissance paintings. On large panels, with pillared and arched settings, are depicted subjects from the history of Rome and Carthage (Figure 3). The composition is severe, though graceful and perfectly toned; the characters, in sixteenth-century costumes, are painted, like the scenery, *en grisaille*; the general effect is heightened by a few gold notes, the women's jewels and hair; the men's weapons and the arabesques of the pilasters gleam on the gray background. It is one of the most harmonious decorations imaginable. Beside six grand historic subjects, which call up only serious thoughts, the artist saw fit to offer the spectator a little diversion on two of the panels; these present scenes of charming freedom, in which lansquenets seem desirous of teaching the good fathers certain things which were forbidden them. The painter is not known. The monogram (1516) on one of the frieze-panels has not yet been deciphered, but it is impossible for it to be that of Tobias Stimmer, who was born at Schaffhausen in 1539.

In this same small town of Stein, which is but little visited, there are a few painted façades that give a highly unique charm to the main street. Painted façades were much in vogue in Southern Germany and Northern Switzerland during the sixteenth century; they were especially common in Augsburg, and a few fine specimens are still preserved in the cities of the Upper Rhine, between Constance and Basel; among others may be cited the façade of the White Eagle at Stein, which belongs to the first half of the sixteenth century. Schaffhausen also points with pride to the beautiful painted exteriors of some of her houses, the most remarkable one of which is the work of Tobias Stimmer (1570). It is interesting to observe how skilfully painters utilized the structural irregularities in these compositions.

Hans Holbein the younger was marvellously successful in this line. His façades at Basel have, unfortunately, been destroyed, but the plans have been preserved at the Louvre, in Berlin and particularly in the museum at Basel. Figure 4 gives half of his design for the decoration of the house "Zum Tanz"; the original, an admirable water-color, is at the Berlin Museum; it is about twenty-two inches high by thirteen broad.

[To be continued.]

THE MANAGEMENT OF AN ARCHITECT'S OFFICE.—I.



THE purpose of these articles is to suggest a system of managing an architect's office in a methodical manner, and according to business principles.

They will, it is hoped, provoke discussion so that any differences of opinion as to the efficiency of the methods laid down, the practical details, or mistakes in principle, may be thoroughly discussed, and the writer and the profession at large be

benefitted thereby. It should be stated, however, that a large and important business has been managed substantially on these principles for eighteen months past.

Architecture, as at present practised, is, as Fergusson says, "the art of ornamental and ornamented construction," the uniting of two very dissimilar things; the designing of buildings or other structures of more or less enduring character in such a manner as to fulfil all the requirements of good taste and all the principles of art as they have been gradually developed from the time when man first constructed a shelter for himself from the elements; and at the same time making the design serve the purpose of the structure in the best manner, and so to erect the structure that it shall be as enduring as may be desired and require the minimum of outlay. The first steps may be called art, the second a mixture of art and business, and the third pure business.

In the first, business enters, since time is an element, and represents loss of interest on the capital intended to be invested.

It is often said that art cannot be driven in harness, that work of a truly good character must depend for its growth, to a certain extent, on inspiration, and that the client should make the necessary sacrifice of time as his contribution to the general advancement of the race.

The writer considers that there is a certain amount of truth in this, and believes fully that each piece of work should represent the best design of which the architect is capable. He is fully persuaded, however, that if the architect is so trained as to concentrate his mind on the problem before him to the exclusion of everything else until a scheme is elaborated, the result will be more rapid and better production.

For the purpose of our article this will be assumed to be true, and in what follows we will confine ourselves principally to the business contained in a larger proportion in the second and third steps.

When art is applied to commercial operations, as in the design and construction of buildings, it, to a certain extent, becomes amenable to the laws governing commercial operations, and it is with the view of minimizing the friction which must necessarily result, that these articles are written.

The subject will be treated under the following heads:

- A. Division of work.
- B. Relation of client and architect.
- C. Execution of work.

- I. Office arrangement.
- II. Organization of office.
- III. Methods of drawing.
- IV. Superintendence.
- V. Business details.

a. Diaries; b. Letters; c. Additional work; d. Specifications; e. Contracts; f. Certificates; g. Care of drawings; h. Files; i. Supplies; j. Book-keeping; k. Bills; l. Forms; m. Settlement of accounts.

- VI. General remarks.

A:—DIVISION OF WORK.

In the erection of the ideal building, three conditions are to be fulfilled:

- (a) It should be beautiful.
- (b) It should be well adapted to the use for which it is intended.
- (c) It should be well constructed.

It will be admitted generally that these are true, with the possible exception of the first, and that will be contested, largely, "because it would enhance the cost." If, however, we define beautiful as being the maximum possible application of art to the subject in hand, due regard being had to all other conditions, even this objection will not be valid, since good effect can be obtained by intelligent grouping of masses without adding expensive ornament.

Leaving this question out, it will be admitted that if the architect gives the best service possible to his client, each of these conditions will be studied by an expert and the results brought together into an harmonious and perfect whole. To secure this, however, widely differing characteristics of the human mind must be employed, each mind going through a course of preparatory training having the development of certain faculties for its object. It might almost be said that the training which fits the mind for one branch unfits it for the other. The writer would not be understood as saying that a good artist cannot also be a good constructor, because no construction can be truly good, that does not satisfy the sense of proportion which is inherent in all educated minds to a greater or less extent, but rather that each field is so broad that few human minds can fully grasp both and produce as goods results in each as could be produced by continued effort in one.

A great deal has been written on this subject, and, until it becomes fully recognized that at least two minds should labor together in the production of truly good work, much will be written, for it is a subject on which only the more advanced in the profession are agreed and the great mass of so-called "architects" are still inclined either to doubt or dissent.

It is trusted, however, that these articles will present financial reasons in addition to the ethical ones, which really should govern, for making the separation, by showing how much more can be accomplished by proper sub-division and systematic work than in any other way.

In every branch of industry, the tendency of the age is to sub-divide labor to highly train a man to do a few things and do them over and over until his product doubles or triples in value, that of his predecessors without harm to individual or nation.

The sub-division of the architect's office-work under such a system would naturally be about as follows:

- (a) The preparation of general plans for the work in hand, adapting them to fill the peculiar conditions of the problem.
- (b) The preparation of the exterior to fit the conditions imposed by the plans co-ordinating the one with the other, so that both may be perfect.
- (c) Arranging the purely constructive features so that the works shall be stable, enduring, honest and economical.
- (d) Preparing the specifications so that the works may be executed without loss to client or contractor (by being confused, involved, indeterminate, or too strict) and at the same time secure the fulfilment of a, b and c, and render the work of supervision less

onerous by having as many as possible of the questions of taste or expediency settled when all conditions of the problem are fresh in the architect's mind, and he is unbiased in his judgment.

(e) The supervision of the works in more or less detail, according to their importance.

(f) The keeping of all accounts.

B :—RELATION OF CLIENT AND ARCHITECT.

As getting a rabbit is the first preliminary to cooking one, so getting a commission is the first preliminary to erecting a building.

Usually the client, in ignorance of the time actually needed for the preparation of plans, defers taking the decisive step until the latest possible moment. He then tries to hurry and drive the work, using all of his influence to cause the architect to give him the preference; and usually he succeeds after a fashion, and to our shame be it said that architecture is the only profession where the clients do not receive attention in the order of precedence. Other clients coming in and finding their work pushed aside and delayed, feel exasperated, and in a short time all of the work gets into a muddled condition and the master mind, instead of being concentrated on one problem until it is solved, fritters away its energy on half a dozen. Delays still more aggravating result until finally the most persistent client gets his work under way.

The architect gets blamed, of course, in nine times out of ten, simply because he does not apply to his work the business principle of precedence, which his clients are daily practising themselves and are familiar with.

Both feel that in addition to a good design, the architect owes it to his client to prosecute the work, from the time the first studies begin until its completion and the issue of the final certificate, in a prompt and business-like manner; but in the desire to please, or to hold the client, this is lost sight of by the architect.

Ability may be so transcendent as to overcome, in part, the injurious effects of annoying delays, broken promises, designs exceeding the appropriation by 50 per cent or 100 per cent, but no ability is so great as to entirely overcome such a handicap.

The writer believes that there is no architect living (except those whose practice is so to do) who would not be benefited pecuniarily, and whose work would not be improved artistically if he would tell his client honestly, "Your work will be executed to the best of my ability in its turn, when it will receive my undivided attention until definite results are attained, but I have such and such work which must first be done."

The fundamental principle then is, that all work should receive attention in the order in which it is received and should then be carried as far forward as completed preliminary studies before it is relinquished for anything else. Then the preliminary studies should be taken in rotation and in the order of their approval and carried forward another stage and in similar manner until the work is completed.

This would insure the undivided attention of the architects and their assistants during the creative stage, which is the most important one, and would really entail far less delay to the client than under the present lack of system. Let us see how to accomplish this in the third part.

C : EXECUTION OF WORK.

I. Office Arrangement. It is an old saying that to do good work, good tools are necessary. This is particularly true of an architect's office, where there are usually a considerable number of men employed, each set having different interests; where there is an enormous mass of detail to be attended to, and where numbers of people have to be seen daily.

The offices should be so arranged as to allow the transaction of all this business without noise and confusion, and the door should be kept so as to insure to each person entering the prompt attention of that person in the office he wishes to see without discommoding any one else.

No higher compliment can be paid to the management of an office than the one the author recently heard. A client remarked "Whenever I am near Blank's, I always go in, as it is a pleasure to be received as you are received there."

The principle of arrangement is simple; there should be first a vestibule divided into two parts by a railing with a table-top and with a settee in the outer part for messengers, etc., and in the inner part a desk for office-boy No. 1; opening from the vestibule there should be the general reception-room, with plenty of chairs, a desk and a table. On one side of the reception-room, or on one side of a hall leading therefrom, should be a private reception-room and next to it the private office of the business man of the firm. On the opposite side of the room, or hall, and connecting with the reception-room, should be the superintendent's office, and next to that the stenographer's room. At the end of the hall, or on the third side of the reception-room should be the contractors' and sample room; opening from the contractors' room on the side of the reception-room nearest the private reception-room, should be the principal designer's room, of sufficient size to overlap the private office of the principal business man and with a door between.

Occupying the balance of the space on this side, there should be one large draughting-room for $\frac{3}{4}$ inch scale and full-size detail-work; this room being divided from the principal designer's room by a tier

of boxes for full-size details, about 4' 0" high and 3' 0" deep, each box being about 10" square and 3' 0" deep.

On the opposite side there should be a series of small rooms 11' 0" by 10' 0" (about) for the assistant superintendents, all opening into a passageway, on the opposite side of which should be a long row of drawers with a table-top. At one end of this passageway should be a packing-table and the telephone over which office-boy No. 2 presides.

This makes the telephone and office-boy convenient for the internal service of the office and enables him to come and go without creating any disturbance.

Electric bells should run from each compartment to the office-boy No. 2's desk and from the superintendent's and principal business man's office to office-boy No. 1's place.

Coat-rooms and toilet-rooms can be placed wherever convenient, but there should be two—one for the firm and clients and one for the general office.

There should also be a separate entrance into the general draughting-room, and if practicable into the assistant-superintendent's apartments, so as to keep the men from passing through the principal entrance.

This arrangement puts the control of the office in the hands of the principal business man and civil engineer with whom 60 per cent of the business is done.

Office-boy No. 1 receives every one entering, has each write his name and business on a card, and if there is any doubt as to whom they ought to see, refers them to the civil engineer. In this way book-agents, drummers, etc., are kept from annoying the firm, and the firm's time is kept solely for business.

II. Organization of Office. Generally the office should be organized as follows:

The principal designer.

The principal business man.

The general superintendent and civil engineer.

The assistant superintendents.

The head draughtsman and the draughtsmen.

There would be also two office-boys, students and stenographers.

To show their duties, let us trace a large piece of work through the office.

The prospective client, by appointment or otherwise, enters the vestibule and gives his name and business to the office-boy No. 1 who after showing him to a seat in the reception-room, hands a card with name and business to the office-boy No. 2 for transmission to the principal business man (who should be a member of the firm and a good designer.)

The principal business man takes the client into a private reception-room, where the general scheme is talked over—limitations learned as to lot, price, business, time of beginning and completion, etc., as well as any pet ideas which the client may have. At this interview, also, an understanding should be reached as to compensation, if the work is out of the usual run.

Then the client is informed that the studies for certain work in hand take precedence over his work so that studies cannot begin before such a date, and that at such another date his studies will be ready, after which he will receive undivided attention until a decision is reached.

The general directions, etc., are entered in the instruction-book and nothing is done until the time appointed, when the principal business man in connection with the principal designer (who also should be of the firm) take up the work together, and with the conditions before them elaborate a plan and elevation, that is the preliminary studies.

These are submitted to the client at a consultation at which both principal business man and principal designer are present; after a thorough discussion of all of the points involved, certain changes are decided upon, which are made in new studies and finally the studies are accepted. Thus far they have received the attention only of the principals who have now decided on the general scheme. They are then turned over to the assistant-superintendent, who, it is intended, shall look after the building until it is completed. He studies the instructions of the client and then elaborates the plan to a larger scale, drawing it carefully. This work is done under the general supervision of the principal business man, who sees that all conditions are complied with, and of the chief engineer, who roughs out the scheme of construction so that it may be worked out harmoniously when the time comes; sees that there is proper space reserved for machinery, pipes, elevators, and plumbing.

While this is going on, the head draughtsman is elaborating the elevations under the general supervision of the principal designer, the head-draughtsman and assistant-superintendent frequently comparing notes.

When the drawing of elevations and of the plans are finally complete, they are again submitted to the client, and pending his approval, work is suspended. As soon as approval is had, the assistant-superintendent takes all the drawings and has them traced upon linen under his supervision.

The elevations, as soon as well roughed out, go to the head-draughtsman, who starts the $\frac{1}{4}$ " scale drawings, studying the arrangements in detail.

One of the draughtsmen (three or four of whom are under the immediate charge of each assistant-superintendent) starts the section

and another starts the construction-drawings, under the general supervision of the civil engineer and the immediate supervision of the assistant-superintendent.

The civil engineer has a rough tracing made of the plans, and then makes all the necessary calculations for beams, columns, piers, etc., indicating the construction roughly for the draughtsman.

The principal business man and the head-draughtsman during this stage of the work keep it in view and are freely consulted; no changes being made without their knowledge and approval.

As the working-drawings become nearly completed the drawings for all constructive metal-work are made in detail (this will be subsequently explained), and when all are finally completed the principal business-man and the chief engineer take them and go over them carefully, the latter taking notes of all materials to be used, unusual features, etc., grouping them under appropriate heads.

Then the chief engineer takes them into his private office and dictates the specification to one of the stenographers, (a standard form of specification may be given later), and the drawings are printed.

When all is ready, complete sets of plans and specifications with a form of proposal are sent out simultaneously to three or four contractors.

The assistant-superintendent sees all contractors asking for information and explains all obscure points, keeping a record of all questions asked and explanations given, and notifying all of the competitors each day of them; and when the contracts are ready to be signed, these explanations are attached to the specifications and form a part of them.

At the appointed time (say two weeks later) the sealed proposals are received with all drawings, etc., issued to each contractor, and opened in the presence of as many bidders as choose to be present, each man's proposal being read aloud. The proposals are then considered by the client, and at his convenience the contract is awarded usually to the lowest bidder (since none but those who are fully competent should be invited to compete).

The contract is then prepared on the usual form (that adopted by the joint convention of architects and builders), and executed.

While the contractors are preparing their estimates, the full-size details should be started by the head-draughtsman acting with the assistant superintendent in charge, who would then begin the figuring of the drawings if this has not already been done, and the preparation of plans for filing with the building department. These plans can be either tracings or prints on cloth from the working-drawings.

As soon as the contracts are signed, sets of figured prints are given to the general contractor, two for himself and one each for the mason, the carpenter, the plumber and the iron contractors; these prints are new and should be muslin-backed; and the plans are filed with the Building Department.

All the $\frac{3}{4}$ " scale drawings and full-size details are also issued with one additional set, for the use of the terra-cotta contractor or stone contractor as the case may be.

The originals of the full-size details on manilla paper are issued, and tracings are kept for office reference as being much less bulky and because better results can be had from the originals.

A set of dimensioned plans is issued to the surveyor, who originally surveyed the lot just prior to the preparation of the working-drawings and who now gives all necessary lines and levels to the builder.

The preparation of all necessary details should now go on rapidly, all models for carved work or terra-cotta, being submitted for approval as fast as prepared, and photographs being sent to the office for reference.

Following the progress of the work, and keeping well in advance of it, all necessary drawings are made by the assistant-superintendent; the specifications and plans are prepared for the electric-lighting, steam-heating, and any special machinery needed, so that all may be ready as soon as the skeleton of the building is ready to receive them.

The letters, etc., relating to the work are properly answered and filed, and the entire management of the work becomes a matter of routine, so that all delays can be eliminated. This routine is more fully outlined in the matter following.

(To be continued.)

THE VALUE OF ROOF-TANKS.—The insurance companies take risks at a lower rate on houses provided with roof-tanks that supply a system of automatic sprinklers in the rooms below. They also allow the same favor to houses supplied with standpipes connected with the street water-mains. Firemen say that in many cases these are mere shams, worse than useless. For instance, Chief Hughes says that at the Cincinnati Hospital, where there are standpipes, with hose and nozzle attached, he opened the valve and started out with a nozzle, at a recent great fire there, but no water came. He says that a standpipe with abundance of hose, with nozzle attached, is provided in the great Shillito Building, and there he knows that there is always water in the standpipe and the hose can be made of service the moment it is required. Where the water is not kept turned on in such standpipes a fire may occur in such a point as to cut off approach to the place to turn it on.—*Cincinnati Commercial Gazette*, July 12.

EQUESTRIAN MONUMENTS.¹—XLIII.

THE SOUTH AMERICANS.—II.



Wooden Bas-relief at Managua, C. A.

FINDING it impossible to induce the Chilean Government to keep the promises made to him, and still less those made to the sailors under him, and believing that he was being victimized by the wiles of the adherents of San Martin, Lord Cochrane threw up his command, but not until he had succeeded in exacting a formal acknowledgment of his great services to the new republic. He did not, however, retire to private life, but, at the invitation of the Brazilian prime minister, at once repaired to Rio de Janeiro and took command of a small and ineffective fleet, with which he again succeeded in accomplishing wonders, both at sea and along the sea board.

The revolt in Brazil was of a different nature from the movements in other parts of the continent. Driven from home by the French in 1808, the royal family of Portugal at once crossed the sea and set up its court in its immense South American dependency. In 1821, Joam VI returned to Portugal, leaving as regent his son Pedro, who, when the revolutionary wave swept into Brazil, found it the better policy to side with the innovators than to attempt to turn the flood, knowing that in such attempt he would receive but little help from the government at home. The Portuguese control had been of a less exasperating nature than had been that of the Spaniard and consequently the overthrow of the established government was accomplished with a less protracted struggle, since the mere fact that



Pedro I, Rio de Janeiro, Brazil. Rochet, Sculptor.

Dom Pedro decided to throw in his fate with the malcontents tended to unite the resident opposite factions. The result was that the Independence of Brazil was proclaimed September 7, 1822, and in the following month Dom Pedro I was declared Constitutional Emperor of Brazil, and during the first part of the next nine years discharged his functions with such moderation and discretion, that he won a degree of personal consideration of rather unusual character and grew to be looked upon somewhat as the Father of his Country. But "blood

¹ Continued from No. 813, page 56.

tells," and as he grew older, he grew more arbitrary, and finally he was compelled to abdicate in favor of his son, the recently deposed emperor, Pedro II.



Francisco Morazan, Tegucigalpa, Honduras.

The only equestrian monument erected in Brazil was—the past tense is used since the new-made republicans are reported to have shown something of the iconoclastic spirit of the French revolutionists and the statue may have been destroyed—one executed by Louis Rochet, and set up in 1862 in the Passeio Publico, at Rio de Janeiro. The equestrian portion has none of the merit of the same sculptor's "William the Conqueror" at Falaise, and none of the sentiment of his "Charlemagne" at Paris. The best portion of the monument is

the elaborate pedestal with its four great allegorical groups, which typify the rivers Amazon, São Francisco, Parana and Madeira.

It is possible that there may be more statues in South America than those mentioned, as the people include a very wealthy class, who are much given to visiting Paris and other parts of Europe, and may



Carlos IV, Mexico, Mex. Tolosa, Sculptor.

easily, while there, have commissioned other statues of which no trace has been secured. But in the Spanish portion of the northern continent there are one or two which owe their existence to the same causes that brought into being the South American statues just discussed. Mention must, however, first be made of a wooden panel which bears the nearly life-size figure of a horseman cut in high relief, which is kept as a venerated relic in a private house or hut at Managua, Nicaragua. The owners believe it to be a portrait of Hernando Cortez, and their belief has some support from the fact that the remains of painted decorations—representing debarkations

and battles—on the background of the panel are of the character and in the style of the primitive Indian paintings made directly after the Spanish conquest. Yet the presence of the cross in the rider's hand and the cockle-shell—the special symbol of St. James—upon his

hat, give ground for the belief that the relief represents Santiago, the patron saint of the town.

The expulsion from South America of the Spaniard *de pur sang*, did not secure really lasting peace in any quarter, and the people of the different states seem to have acquired a chronic and strongly developed taste for revolutions. Fortunately it is not necessary here to follow up their tangled histories, and it is as fortunate that we have to touch the still more involved history of revolutionary Central America at merely a single point. At Tegucigalpa, in Honduras, is the equestrian statue of Francisco Morazan, who is generally regarded as the liberator of



Simon Bolivar, New York, N. Y. De la Cova, Sculptor.

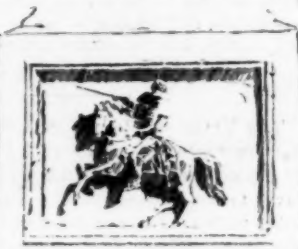
Central America from Spanish control, and the conservator of the autonomy of his native state. From 1821—September 15, 1821, is regarded as the "dia de la Patria"—until he was captured and shot while making a final attempt to restore the federal unity of the states in 1842, he led a life of constant agitation, exposure and warfare, during which he underwent all the experiences of a successful and unsuccessful military and political leader. The statue, which stands upon a high pedestal of marble, decorated with bronze bas-reliefs, was erected in 1888.

With the exception of the British provinces of North America, the Western Continent has now only a past connection with royalty: even the outward symbols of this former bond are few, and among these few relics are to be counted the statue of Dom Pedro I, at Rio, if it still exists, and two equestrian statues of Carlos IV, of Spain. One of these statues of Carlos IV is represented but by the fragments of a rudely modelled stone statue, which are to be found in an old stone tower in the middle of the Plaza de Armas in Guatemala City. It probably has a history, possibly an interesting one, but its details are not procurable.

The other statue of Carlos IV certainly has a story and an interesting one, whose details are fortunately accessible.

As sculpture is surely one of the arts of peace it is only right and proper that the "Prince of the Peace," as Manuel Godoy, favorite of the queen and prime minister of Carlos IV of Spain, was called, should have, indirectly at least, a hand in bringing about the creation of a notable bit of sculpture. Godoy believed in nepotism and had appointed his brother-in-law, the Marquis de Branciforte, to be Viceroy of New Spain, and he, probably to curry favor, asked permission to erect an equestrian statue of the king in the capital city of Mexico, giving it to be understood he intended to bear the cost himself. (This unpleasant burden he later avoided and it fell on the municipality.) This was in 1795 and work upon the group was carried on so expeditiously by the sculptor, Manuel Tolosa, that the model—whether of plaster or gilded wood is doubtful—was set up in the plaza in front of the cathedral, December 9, 1796, in honor of the Queen's birthday. The bronze casting, however, was not ready for unveiling until 1803, seven years later, to a day.

This statue has several valid claims to distinction: it is the first equestrian statue modelled and cast in America, and, barring the leaden statue of George III, it is the first group of that class erected; it is said to be of solid bronze—so unusual a fact that the statement must be accepted under reservation, but as thirty tons of metal were used in the casting and the group is only fifteen or sixteen feet high, it evidently is more solid in its construction than such statues usually



Gen. Worth, a bas-relief, New York, N. Y.

are. The probabilities are in favor of its being solid, for apart from the actual weight, it is evident that it is a simpler matter to make a mould for a solid casting than for one which has to be made over a nicely adjusted core and which has to have stiffness given to it by an elaborate skeleton of iron framework within. Still the fact that so great a mass of metal could be cast without being spoiled by warping and shrinking during cooling proves that the founder, Salvador de la Vega, must have possessed very unusual skill.

The consensus of opinion is nearly unanimous in favor of the sculptural merit of the group, the many excellences of which have

\$12,000 — a significant proof of the value which the crude New World put on an object of art. In this position the group remained until 1852, when, during the presidency of General Arista, it was again moved to its present position at the head of what is now the Paseo de la Reforma, and placed upon a low pedestal, a much more modest affair than the elaborately sculptured marble pedestal over twenty feet high upon which it was originally erected. How much money was spent in this second change of position is not stated, but when the cost of these removals is added to the unknown but presumably great original cost, the statue is found to represent a possibly greater amount



General Andrew Jackson, Washington, D. C. Mills, Sculptor.



Gen. Jackson, (a replica), Nashville, Tenn.

made a lasting name for Tolosa, who had been brought to Mexico in 1791, to take the Directorship of the newly-founded Academy of San Carlos.

The misfortunes that overtook Carlos at home were reflected in Mexico, where he was so personally unpopular that it is no wonder that he hesitated to adopt Godoy's advice and follow the example of the Portuguese monarch by transferring his court to Mexico. Revolutionary disturbances began in Mexico about 1805 and continued amid the usual vicissitudes until independence was at last declared, February 24, 1821, by Augustin Iturbide, a native Mexican, who about a year later was declared emperor under the title of Augustin I.

During these troublous times the statue of Carlos IV was imperilled by the hatred felt for its original, and had it been of marble or even of the usual structure it would probably have succumbed to the

of invested capital than any other statue of its size, and by so much gains in assurance of a permanent existence. Of the sculptor Tolosa it is apocryphally narrated that he committed suicide after hearing some rustic critics declare that as the saddle bore no stirrups, therefore the king could not ride — a criticism of which the pertinency is obvious when we recall the important place which the stirrup fills in the outfit of a Mexican caballero. On the other hand it is said that Mexican riding-masters take their pupils to the head of the Paseo, for the sake of showing them how good a seat Carlos has.

One more equestrian group — by courtesy a piece of sculpture — attempts to do honor to a South American. In Central Park, New York — fortunately in a position near the 81-Street entrance, seldom visited by strangers — is a group such as Martin Chuzzlewit might have expected to find as the embodiment of sculptural effort in the United States. It would need the assurance of an Elijah Pogram to do justice to the equestrian statue of Simon Bolivar which — the gift of Venezuela and the work of a young Venezuelan sculptor, Raphael de la Cova — was unveiled June 17, 1884.

Besides this statue and Brown's "Washington," the great metropolis of the United States has but one other piece of equestrian sculpture, and this exists in the form of a bronze bas-relief of good size, which fills one side of the die of the obelisk which the city of New York erected in Madison Square above the burial place of General William J. Worth in 1857. Who modelled the bas-relief is not generally known; possibly it was Launitz, though the figure has not the artistic feeling which this sculptor impressed on the very similar reliefs on his monuments to Colonel Johnson at Frankfort, Ky., and to Pulaski at Savannah, Ga., and moreover he generally worked in marble. It is more than likely the work of some unknown artist employed by the contractor who erected the obelisk. Above the bas-relief, in bands about the obelisk, are carved the names of the battles in which he took part, the most of them signaling events transpiring in the war with Mexico, but the word "Chippewa" draws attention to the fact that the General was a hero of two wars and had faced British guns as well as Mexican.

The part that Worth played in the War of 1812 was merely that of a young aide-de-camp who rose by merit to be major by brevet. The central terrestrial figure of that amphibious struggle was Andrew Jackson, and in his memory was unveiled at Washington on January 8, 1853, — the thirty-eighth anniversary of the battle of New Orleans — the first equestrian statue modelled and cast in these United States. Washington could better spare many of its adornments than this statue, the flavor of which is so archaic, the appearance so unique, the air and pose so ungraceful, and it is rather a matter for congratulation that its singularities are not to be obscured by the Lafayette Monument that some one sought to interpolate between it and the White House. The statue has all the questionable characteristics here hinted at, and yet it has points of much interest. It was cast from cannon captured from the British; its execution was undertaken by the Jackson Monument Association, which raised \$12,000, to which Congress added by sundry votes till \$50,000 had been expended upon statue and pedestal; it weighs



Gen. Jackson, (a replica), New Orleans, La.

assaults of the populace as other statues have fallen before other revolutionists, for it is hardly to be imagined that the natives then respected it because of its artistic merit, although a portion of the inscription it bears declares that now "Mexico preserves it as a monument of art." Influences of some kind preserved the group, but those who exercised them felt there was virtue in the adage "out of sight, out of mind," and so caused to be built about it a large globe of wood, which was painted blue. At length even this protection was felt to be too slight and, in 1824, the statue was moved from the Plaza Mayor to the court-yard of the University, at the cost of

fifteen tons and is nearly of colossal size; it was the first piece of equestrian sculpture that its author, Clark Mills, a self-educated middle-aged sculptor, had ever attempted; it is believed to exhibit a good likeness of the awkward, long-limbed, crabbed and irascible soldier, but as a work of art it is no better than some of its very mediocre successors to be found in other parts of the country. Its one great claim to attention lies in the fact that the rearing horse is positively balanced upon its two hind feet, without aid from the tail, without external accessory support and without the internal aid of the usual bolted framework; moreover, the hinder parts are not cast solid, nor is weight collected there for the sake of preserving the balance. In explanation of his work Mr. Mills says: "While watching a restive horse which was being exercised in front of my door, the animal reared with its rider and in an instant stood poised upon its hind legs. My position was such that the perpendicular jamb of the door drew a line from the horse's feet through the body to the crest of the neck, the front half of the body and legs of the rider appearing to view, while the hind parts of the body and of the rider were behind the doorpost. As he stood for an instant I caught the position of a horse balanced for a jump, and saw that he simply shifted his weight so as to bring the centre of gravity upon the hind feet." Mills was taken with the pose, procured a retired race-horse and trained him to pose in that position. He had no knowledge of the "Philip IV" at Madrid and believed he was doing what had never been accomplished before—and inasmuch as other statues of the kind did not wholly rely on unaided balancing for their static permanence he certainly had just reason to be proud of his work, in this respect at least.

After the American manner, the statue was at the time of its unveiling infinitely lauded, but Thackeray, in his "Roundabout Papers," bears testimony to the sculptor's own disbelief in the surpassing excellence of his work. "Nor was there any man more willing to own his defects, or more modest regarding his merits, than the sculptor whom I met subsequently."

Most people would think that one such statue in the country was enough to mark that always interesting article "the first of its kind,"



Gen. Winfield Scott, Washington, D. C. Brown, Sculptor.

but patriotism, politics and local pride are not always handmaids of art, and so, instead of one, there are three. In 1855 a replica was set up in Jackson Square, New Orleans, in front of the Cathedral, by the State of Louisiana, at a cost of \$30,000, but by some oversight

the pedestal was left without an inscription. This gave General Butler, when in command at New Orleans in the Civil War, in 1862, an opportunity to give an object-lesson in his usual masterful way, and he caused a stone-cutter to carve upon the unlettered base the



Gen. W. H. Harrison for Cincinnati, O. Rebisso, Sculptor.

inscription, "The Union must and shall be preserved"—words actually spoken by Jackson, but never intended to be dissociated from their context. The inscription intended for the statue at Washington made use of the same phrase, with slight difference in the wording ("The Federal Union; it must be preserved").

The second replica was erected in the Capitol grounds at Nashville in 1880.

Like Worth, General Winfield Scott served in the War of 1812 with distinction—and also with discomfort, for he was prisoner of war for a year—and, like Worth, he gained greater fame in the war with Mexico, his successful conduct of which led the Federal government in 1861 to hope that age and infirmity would not stand in the way of his conducting to a speedy and successful issue the War of the Rebellion; but his connection with this last and greatest struggle was but slight, and added hardly anything to his great personal popularity—a popularity so great that Congress, with its depleted treasury and its heavy cares of more pressing moment, did not find it unreasonable to pass an act in 1867 ordering that an equestrian statue should be erected to his memory in Washington. The work was entrusted to H. K. Brown, and the statue was unveiled in 1874, having cost only \$20,000 (probably exclusive of the cost of the pedestal). The group was cast by Robert Wood & Co., of Philadelphia, and, for its size, is very light, weighing only six tons; the total height is twenty-nine feet, of which the granite pedestal counts for fourteen. In this statue Brown again made successful use of the thoroughbred horse, but this time in a standing pose, or rather in that moment of the act of walking when all four feet are on the ground, which disguises as well as may be the fact that he is somewhat overweighed by the ponderous figure of his rider, a man of unusual size and splendid physique, grown corpulent with age. Except for the narrowness of the pedestal, this is the most successful monument of its class to be found in Washington.

Besides these actually executed statues, other heroes of these two wars may sooner or later have similar posthumous monuments erected to their memory. Thus, in the first session (1889-90) of the fifty-first Congress, it was proposed to erect an equestrian monument at Washington to General Zachary Taylor, and three bills were introduced by different members: the original bill named Theodore A. Mills (son of Robert) as the sculptor and appropriated \$35,000, the others named no sculptor, while one of them increased the appropriation to \$50,000. All these bills were read and referred to the Committee in the Library, and it is a doubtful question how soon that very busy committee may have time and inclination to report on them.

The endeavor to produce an equestrian statue of General William Henry Harrison has passed to a more advanced stage even than this. In the winter of 1886, the Legislature of Ohio appropriated \$25,000 for a bronze equestrian statue of the General, which it was hoped to unveil at Cincinnati in 1888 at the centennial celebration of the first permanent settlement in the State at Marietta. The commission was placed in the hands of Mr. Louis F. Rebisso, who has so far completed his full-size model that he hopes to send it to the foundry within a couple of months. The outline cut will serve to indicate the general lines of the group, which is to be fourteen feet high when cast.

DOM PEDRO I.—Pedro I, de Alcantara, Emperor of Brazil, was born in Lisbon, October 12, 1798, being the son of the heir-presumptive of the crown of Portugal. The royal family being forced by the French to emigrate to Brazil in 1808, Pedro accompanied them, and, his father being called to the throne in 1816, he became the heir-presumptive. In 1821 the royal family returned to Portugal, and Pedro became regent. The Portuguese Cortes, fearing a separation of the two countries, required him to return to Portugal, on the pretext of finishing his education, but the people of Brazil rose and urged him so strongly to remain that he agreed, and was honored with the title of "perpetual defender of Brazil" in May, 1822. The Cortes of Lisbon annulled his acts and threatened criminal prosecution, which Pedro answered by declaring the absolute independence of Brazil on September 7. This was received with delight by the people, and he was proclaimed Emperor of Brazil in the same year. Aided by a navy under Lord Cochrane, the Brazilians forced the Portuguese to evacuate their stronghold of Bahia in July, 1823. Maranhao capitulated the same month, and by September the Emperor's authority was everywhere acknowledged. In 1824 the new constitution was proclaimed, but was opposed by the Northern provinces, and a revolution took place in Pernambuco, which was quelled after a severe struggle. The following year Portugal, influenced by England, recognized the independence of Brazil, and a treaty of peace was signed in August. The burden laid on the finances of the new empire

by a debt of £2,000,000 due to Portugal, and the failure to suppress the insurrection of the Banda Oriental (now Uruguay), together with the complications caused by the death of John VI of Portugal (Pedro being his legal successor), raised discontent among the people, and Pedro was thought to be desirous of uniting the two monarchies. This, with some arbitrary acts and a growing inclination on his part for personal government, made him unpopular, and, tired of the strife, he abdicated in favor of his son on April 7, 1831, having previously resigned the throne of Portugal to his daughter, Maria da Gloria. Returning to Europe, he organized an army and fleet in France and invaded Portugal, the crown having been usurped by his brother Miguel, and, after a two years' campaign, established his daughter on the throne. He died soon afterwards, in 1834.

MORAZAN.—Francisco Morazan was born in Tegucigalpa, Honduras, in 1799, and, after education, entered business; but when the independence of his country was declared, in 1821, he began to take an active part in politics. He was first appointed Secretary-general, and then elected member of the representative Council. When the troops of Guatemala, which aimed to gain the preponderating place in Federal affairs, invaded Honduras in 1827, Morazan, at the head of the State troops, resisted them, but was taken prisoner. He escaped, and next took command of a force from Leon, with which he defeated the Federal troops at Trinidad. He was then declared President, and totally defeated the Guatemalans at Salvador, July 6, 1828. After other successes, Morazan invaded Guatemala in February, 1829, and was at first defeated and retired, but, besieging the city again, was successful, and received the election to the Federal executive. In 1832 the chief of the State of Salvador, Cornejo, rebelled against the Federal Government, but was defeated by Morazan at Jocoro. In 1838 a revolution broke out in Guatemala under Carrera, and Morazan marched against him. He defeated the rebels several times in 1839, but in the meanwhile his representative had been forced to make a treaty with Carrera, who, assisted by the clergy and aristocracy, overthrew the government of Guatemala. Morazan captured the city with 1,300 men in March, 1840, but was besieged next day by Carrera with 5,000 men, and had to evacuate after a day's fighting. He then resigned his office and went to Peru. Returning with assistance, he invaded Costa Rica in April, 1842, overthrew the government and assumed the leadership of affairs, but, while preparing an expedition to invade the other Central American republics for the re-establishment of federal unity, the towns of Heredia, Alajuela and San José rose against him, and he was delivered to the rebels and shot at San José in September, 1842.

CHARLES IV.—Charles IV, King of Spain, was born in Naples in 1748. He married his cousin, Maria Louisa Theresa of Parma, a woman of degraded character, in 1765. In 1788 he succeeded to the throne, and retained Florida Blanca as prime minister, but in 1792 the latter was disgraced by the Queen's influence, and his place filled by her worthless favorite, Godoy. In 1793 the French Republic declared war against Charles, who had incurred its hostility by expelling French residents from Spain. Charles was defeated in so many engagements that he was forced to sign a peace in July, 1795. He showed his joy by creating Godoy Prince of Peace and Generalissimo, with other honors. Spain, through French influence, declared war against England in 1796, and Charles abandoned the direction of the government to the Queen and her favorite. His son and heir, Ferdinand, in 1807, invoked Napoleon's intercession, and, after scandalous quarrels in the royal family, Charles resigned the throne in favor of his son in March, 1808. Bonaparte then extorted from both a renunciation of the Spanish throne, and Charles received a liberal pension and retired to Rome, after some stay in France. He died in Rome in 1819.

TOLSA.—Manuel Tolsa was born in Enuguera, Valencia, about 1750, and studied architecture and sculpture at Madrid. In 1781 he went to Mexico as Government architect, and there he directed many public works, including the erection of the towers of the Cathedral and the College of Mines. He became director of the Academy of San Carlos in 1798, and in 1803 established a successful foundry for the casting of cannon. His chief work in sculpture is the equestrian statue of Charles IV in the City of Mexico. He died in Mexico about 1810.

JACKSON.—Andrew Jackson was born in North Carolina, March 15, 1767, and began practicing law in Nashville, Tenn., in 1788. He was representative to Congress in 1796; senator, 1797; judge of the Supreme Court of Tennessee, 1798-1804; defended New Orleans against the British, 1815; served in the Creek and Seminole Wars; Governor of Florida, 1821; United States Senator, 1823; President of the United States, 1829-1837; suppressed nullification, 1832; died June 8, 1845.

WORTH.—William Jenkins Worth was born in Hudson, N. Y., in 1794, and entered the army in 1813, serving as an aide to Colonel Winfield Scott and distinguishing himself at the battle of Niagara. He was afterwards appointed superintendent of the United States Military Academy and in 1824 brevetted lieutenant-colonel. He took a prominent part in the Seminole War. He was second in command to Taylor at the opening of the Mexican War, being entrusted with the assault of Monterey. He afterwards joined General Scott and under him was engaged in all the battles from Vera Cruz to Mexico. After the war he was made major-general and placed in command of the Department of Texas, where he died of cholera, in San Antonio, May 17, 1849.

SCOTT.—Winfield Scott was born near Petersburg, Va., June 13, 1796, and was educated at William and Mary College, afterwards studying law. He entered the army in 1808, and was made lieutenant-colonel in 1812, and a brigadier-general and major-general in 1814. He distinguished himself greatly in the campaign in Canada, especially at the Battle of Queenstown Heights and the capture of Fort George, gaining additional glory later in the contests of Fort Erie, Chippewa and Lundy's Lane (or Niagara). After taking part in several of the wars with the Indians, he was made commander-in-chief of the army in 1841, and in 1847 was given the chief command in Mexico. Here he took Vera Cruz and Cerro Gordo, and won the battles of Charubusco, Molino del Rey and Chapultepec. In 1852 Scott was an unsuccessful candidate for the Presidency. He retired from active service in 1861, and died at West Point, N. Y., May 29, 1866.

HARRISON.—William Henry Harrison was born in Berkeley, Va., February 9, 1773, and was educated at Hampden-Sydney College. He entered the army in 1791, becoming a captain in 1794, and resigning his commission in 1797. In 1799 he was chosen a delegate to Congress for the Northwest Territory, and in 1801 was appointed Governor of the Territory of Indiana, holding that office until 1813. He defeated the Indians at Tippecanoe on November 7, 1811, was appointed a brigadier-general in 1812, and a major-general in 1813. In October of the latter year he defeated the British at the Battle of the Thames. He represented Cincinnati in Congress, 1817-18, and was in the Senate in 1824. In 1836 he was an unsuccessful candidate for the Presidency, but in 1840 was elected to that office by a large majority. He died in Washington, April 4, 1841.

[To be continued.]

A MAGAZINE STRUCK BY LIGHTNING.—Although lightning rods are regarded by most people as conducing to safety, a certain number persist in a contrary opinion, and only last week a letter appeared in a contemporary urging that they were either useless, or quite as useful if unconnected with earth. In view of this, it is interesting to note that, in a recent storm at Alnwick, the lightning struck the chimney of the armory magazine and stores of the Third Northumberland Fusiliers, demolishing it, and cracking the wall almost to the ground, notwithstanding that on the opposite chimney stack on the same roof a lightning conductor was affixed.—*Invention.*

ANCIENT ARCHITECTURE FOR STUDENTS.¹—XI.

BABYLONIA AND THE MEDES.

CHRONOLOGICAL TABLES.

	B. C.
Nebuchadnezzar.....	605 to 562
Evil Merodach.....	562 to 555
(Merodach-baladin of Isaiah)	
Nabonidus.....	555 to 545
Invasion of Persians under Cyrus.....	545



Brick from the Tower of Babylon.

WE have already seen how the original Chaldean Kingdom came to an end about 1300 B. C. and have remarked the fact of the restoration to independence of the descendants of the Chaldees 650 B. C., when, in conjunction with the Median hordes, they threw off the yoke of the Assyrians and established the kingdom of Babylonia.

Very little is known of the Median race, who came to the assistance of the Chaldeans, before the ninth century B. C. The first historical² notice of them shows that they are descended from Madai, the son of Japhet, whose date is settled at about 2458 B. C., (Gutschmid) so that they appear to be one of the original nations of the earth and to have settled as a number of independent tribes to the east of Asia. The inscriptions on the famous obelisk discovered by Layard, in Assyria, however, have given us more light upon the subject, as they relate the conquest of the Medes by Shalmaneser II, 850 B. C., who, up to that time, occupied the western borders of India. The Medes appear to have emigrated westward, *en masse*, and settled to the north of Persia, among the hills of the Zagros range, where they were close neighbors to that other branch of the same great Arian family, the Persians, whose religious customs and habits were so similar.

The City of Babylon, about which all the great events of this unsettled period occurred, was certainly in existence as far back as the middle of the ninth century B. C. Semiramis adding to its fortifications 810 B. C., but we have no reliable information beyond that time. Merodach-baladin³ (called in Ptolemy's list Mardocempalus, the fifth king of Babylon), was on the throne and was attacked by Sargon, the Assyrian monarch, 709 B. C., who drove him out of the kingdom, presumably for conspiracy against him, as the holder of empyrial rights over this part of the Assyrian Empire. We read of Merodach (or as he is called in 2 Kings xx: 12 "Berodach-baladin") sending an embassy with presents to Hezekiah, king of Judah, at this time ostensibly to congratulate him on the recovery from the disease of which he would surely have died, when, in answer to his prayer his life was lengthened and that wonderful sign of his recovery was granted to him, the shadow, going back on the dial of Ahaz, but in all probability to curry favor with him, whom he knew as no friend of the Assyrian, to obtain assistance from him towards the recovery of his lost kingdom. However, we find Merodach again on the throne, and Sennacherib, who was then king in the room of his father, Sargon, making war with and defeating him, and placing Belibus there to rule as his viceroy. Merodach again disturbs the peace of the kingdom, dethrones the viceroy, and, for the third time the Assyrian army came before the city, chastised Merodach, and Sennacherib placed his own son Asshur Nadin on the throne. Esarhaddon then reigned in Assyria 681 B. C., but instead of placing a viceroy in Babylon he went there himself and lived and ruled there for thirteen years, during which time he wiped out the conspiracies of Merodach's followers. Esarhaddon then left a viceroy there and took his court to the great palace of Nimroud, already described in the chapter on Assyria. The next information we derive from the inscriptions is that the Assyrian viceroy, who at this time was one named Nabopolassar, proved treacherous and made an agreement with Cyaxares the Mede (653 B. C.), who had suddenly sprung to power and united the various tribes of the Medes into one nation under his rule. He and Nabopolassar, together revolt, against the Assyrians, they went against Nineveh, captured and destroyed it, and threw off the Assyrian yoke.

Cyaxares then led his army into Asia Minor, but, as the King of Egypt, Pharaoh Neco, after waging war with the King of Judah, pushed his armies northward to the borders of Nabopolassar's dominion, he was again aided by the Medes, for his expulsion, and being old and feeble now, deputed his son Nebuchadnezzar, to go to fight with him. He, with his army strengthened by detachments from Cyaxares, met Neco at Carchemish, and defeated him so completely that all the territory as far as the river of Egypt was recovered from Egyptian sway. While Nebuchadnezzar was away on this expedition his father died and as soon as he could leave the lower countries in safety hastened home and took the kingdom, 605 B. C., and then began the great splendor and magnificence of the Kingdom of Babylon which has left its name as a proverb to this day.

With the Medes we have little more to do. The glories and power of the empire were short-lived, and with the death of Cyaxares they passed away.

Ecbatana was their principal city and there was the palace, but

¹ Continued from No. 810, page 11.

² Gen. x: 2.

³ Isaiah xxxix.

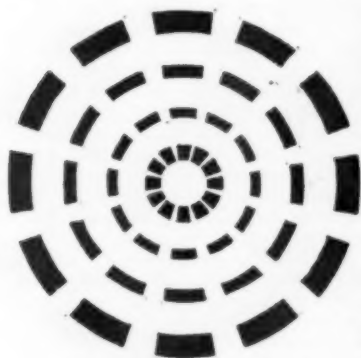
we know nothing about it except from tradition, and the various historians differ considerably in their accounts of it. It is, however, to be gathered that it contained a magnificent palace, occupying an area whose circumference was 1,420 yards, and in plan it no doubt corresponded with the palaces of Persia, yet to be described; wooden pillars, however, they used, and these are characteristic of their architecture, and, as we shall see later, this is a circumstance to remember. Their pillars were used for two distinct purposes, first, for their buildings, in the support of the roofs, and second, for the courts which were surrounded by a colonnade, or rather, perhaps, having columns in rows occupying the whole area of the interior of the court, this being the origin of the great "Summer Throne Rooms" of the Persians or "the court of the garden," as it is called in the Book of Esther, which will be described when we come to the history of that country.

The roofs of their buildings were often sloping, and internally they overlaid all their woodwork with silver and occasionally gold; the roofs themselves, we are told, were covered with silver plates in the shape of tiles, or possibly with tiles made of that very rare white mineral, the pure crystallized carbonate of magnesia polished to a dazzling whiteness, of which material a coin was found in the palace of Sargon at Khorsabad,¹ but it is more probable that their roofing material was supplied from the silver mines of Asia Minor. Besides being the originators of the columnar architecture of the Persians, they were also the means by which sculpture was transmitted to them from the earlier monarchies. But all that remains of Median art, is a fragment of a colossal lion, that up to a recent date was to be seen on the site of the once beautiful Ecbatana.

The exact year of the death of Cyaxares is not known. He was succeeded by his son, Astyages, or Darius Astyages, spoken of in the Bible record as "Darius the Mede." Of him nothing else reliable is known, but it was in his reign that Cyrus the Persian fought against and conquered the Medes, from which time, although Cyrus left him on the throne, the Medes and Persians are one nation as to laws, etc., Cyrus ruling over the whole empire.

But to return to the Kingdom of Babylon under Nebuchadnezzar. Babylon was then the largest and most magnificent city of the ancient world. It occupied both banks of the River Euphrates, but all that is left now to mark the site are a few mounds on the left bank, spreading over an area of three miles by two miles, enclosed by two long mounds, possibly a part of the ruined wall, which, with the river, form a triangle.

On the same side of the river stood the palace, a mound still known as the "Kasr" or palace, marking its site, while the site of the other great building, the Temple of Belus (Jupiter, Baal or Bel) was on the other side, occupying a square of about 400 feet each way. Both these buildings stood within fortified enclosures. The immense area enclosed by the walls of the city, included besides the city proper, on either bank of the river, parks, gardens and even tracts of arable land and pasturage sufficient to support the inhabitants with food, during any sustained siege to which they might be subjected. Herodotus describes it as "a city standing on a broad plain, 120 furlongs each way, surrounded by a deep moat, beyond which was a high



Ground-plan of the Temple of Baal.

wall, 50 royal cubits in width and 200 in height, and adds that the royal cubit is larger than a common one by the breadth of three fingers, so that 200 royal cubits would be about 390 feet. Accounts of historians differ considerably, but it is evident that the walls were something extraordinary and unlike anything since erected. At the time of Alexander, who came to Babylon 330 B. C., the walls were from 70 feet to 80 feet high, although previously they had suffered considerably at the hands of Cyrus, Darius Hystaspis and Xerxes. The wall, made of brick and cemented with bitumen, with occasional layers of reeds, was externally protected by a wide moat. Upon the summit of the wall, stood 250 towers, for the protection of the defenders, rising from 10 feet to 15 feet above the top of the wall, and they were situated on both the inner and outer edges of the wall. There were 100 gates, said to have been of solid brass. The streets of the city ran at right angles to each other, and there was a wall of brick along each bank of the river, with a "little gate" at the foot of each street.

The Temple of Belus was apparently like Assyrian temples, built in stages with the shrine at the summit; approached by inclined planes, traversing the exterior of each story. The height of the tower is unknown. Within the temple was a huge statue of Bel seated, of gold, twelve cubits high, i. e., by royal cubits 24 feet high, by common cubits 15 feet. But Herodotus, who visited Babylon in 430 B. C., says he did not see it and only describes it from hearsay.

¹ M. Berthelot in the *Technologist*.

It was taken away by Xerxes. At the foot of the tower, however, there was a shrine in which Herodotus saw a seated image of the god in gold.

Of the great palace of Nebuchadnezzar it is impossible to make out the plan. It was, however, surrounded by a triple enclosure, there were three gates, two of which were of bronze, and these were so heavy that they had to be moved by machinery; these walls were of baked brick, hence their utter ruin.

Another small palace is supposed to have existed, but few details of this have come down to us. It stood within a fortified enclosure, and a few bronze statues were found there. It may have been the dwelling of the sovereign Saracus, who is supposed by some to have reigned in Babylon prior to Nebuchadnezzar (625 B. C.), but this is decidedly doubtful.

Semiramis, the wife of Iva Lush IV, King of Assyria 810 B. C., did a great deal for the fortification of the city. She seems to have reigned here independently of her husband, having given him his crown and title to all the lands of the south. She is the first queen the earth had seen, for hitherto the queens, nominally so, were only chief wives, and had no power in the State. As a woman and queen she was most enterprising, she made war with the Egyptians, invaded Asia to the borders of India and she has left her mark upon all the great engineering works of these countries.

Herodotus ascribes to her the great embankments which served to keep the river within its bounds at Babylon, which had formerly overflowed the plain at certain seasons.

A very remarkable building, of a character not, however, without precedent in Assyrian cities, as we gather from the bas-reliefs, must be described. Like the walls of Babylon, it proved one of the seven wonders of the world, and is usually known as the "Hanging Garden," though the word "hanging" is misleading.

The building consisted of several tiers of arches rising to a height of 75 feet, "like the walls of a Classic theatre,"² and occupying a square 400 feet each way, with floors at each tier, in which were stately apartments. On the top of the whole was a great thickness of earth, the surface of which was laid out in walks, flower-beds and shrubberies, some of the largest trees of the country being planted there. Water was supplied by means of pipes from the river, and the building was so constructed that no water penetrated to the floors below.

It is generally admitted that the Babylonians were very ingenious people, and that they did a great deal towards the improvement and development of art. Their textile fabrics were renowned.

Of Babylonian statuary we have hardly any examples: only one sculpture in the round, a colossal lion standing over the prostrate figure of a man (it is so much weather-worn that all its details are lost), a few modelled figures in clay, one figure engraved on stone and a few engraved animal figures. Ker Porter discovered a seated figure, 3½ inches high, of a woman with a child in her arms, modelled in clay, simple and natural in design and execution. The figure of the King, now in the British Museum, is clumsy and profusely decorated. It represents him just about to fit an arrow to a bow. Nearly all the other examples that have come down to us are, like this figure, graven, and, therefore, neither statues or bas-reliefs; but of the actual statuary, as, for instance, the images of Bel in gold, we have no details, and their forms can only be conjectured.

The Babylonian Empire came to an end with the fall of Babylon into the hands of Cyrus the Persian, who took possession of the city 538 B. C. by means of a strategy. Finding it impossible to make any effective impression upon the walls, he hit upon the idea of turning the river out of its course, and thus making a road along the river-bed by which he might enter, his object being to prepare everything so quietly that the inhabitants might suspect nothing, and they, being secure within their walls, as they thought, gave themselves up to rioting and festivities, and kept no watch on the movements of the Persians. The stratagem succeeded beyond the highest hopes of Cyrus, as the new course of the river was completed and a dam placed across the old course not far from the entrance to the city. The Persians anxiously watched for the lowering of the water, and for any sign from the Babylonians that would show they were aware of the Persians' designs. No sign came; they had not even closed the river-gates, and, as the water ran lower and lower, man after man entered the city, until so large a body had collected within the walls that they raised their war cries and fell to the attack. The Babylonians, being utterly surprised, were soon overwhelmed, and the city fell an easy prey to the Persians.

[To be continued.]

THE EMPRESS EUGENIE'S DESIGN FOR THE PARIS OPERA-HOUSE. — A correspondent of the *Boston Herald* says that "the principal talent of the Empress Eugénie was for art, and she drew in crayons exceedingly well. This taste led her to the odd idea of competing publicly for the construction of one of the public monuments of Paris, the new opera-house. She made a design, sent it in under a borrowed name, naturally, and did not, of course, obtain the prize. Knowing nothing about architecture, she was obliged to ask the help of a practical architect to finish off her sketch, and the pretty note in which she makes a request for such aid from the minister who was her sole confidant is still extant, and is quoted in full by M. de Lamoignon."

² Rawlinson.

THE CHURCH OF PERROS-GUIREC, BRITTANY.



The Church of Perros-Guirec.

EDIFICES dating from the Romanesque period are extremely rare in Basse-Bretagne, but as on the other hand they bear the stamp of very primitive character they are very interesting subjects of study for unprejudiced searchers who really seek the true interpretation of that which they see. Initiated as we now are into the wise classification which the French archæologists have created from the primordial Romanesque of Saint-Avit and Saint-Brice, the Byzantine of Angoulême and Périgueux, to the secondary Romanesque of Notre Dame la Grande and Saint Savin, when we enter on this small region, naïve beyond everything, searching particularly for types to establish a date, we are, as it were, put to rout by what it offers to our inspection. One would say that this architecture is lost in the mists of the past, and that the little sanctuaries which we meet in these places, which are still almost deserted, have been in very truth erected there by hermits in brown cowls, who crossed the channel in ships of granite, like Saint Kirec; who used to guard their flocks by the aid of wolves, which they had tamed, like Saint Hervé; or led in leash about the country monstrous dragons like Saint Pol Aurelien.

Sainte Croix de Quimperlé, with its rotundas, recalls San Stephano Rotondo at Rome and the Oriental basilicas built on the plan of the ancient temple of the Holy Sepulchre at Jerusalem. At Saint Gildas de Rhuys, Merovingian capitals are encountered serving as holy-water founts, and one walks over the paving slabs of ancient abbeys ornamented with *croix pattées*, like those which are inscribed on the oldest Christian menhirs of the country. At Lanmeur the crypt, with its holy fountain and its low columns ornamented with vegetable forms of savage eccentricity, carries you back to the early origin of Christianity, to the time of the catacombs and the first apostles of the Good News. In this connection the church at Perros-Guirec, with its dome surmounted by a minaret, its masonry of small stones, its loop-hole windows, its doorway decorated with fantastic animals, is entirely curious. Certainly they must have been crusaders of the time of Peter the Hermit, who built this singular dome. Who knows? Perhaps some day it will be scientifically demonstrated. At any rate, this little building is worthy of attracting the consideration of savants, and for this reason we here present a sketch of it. The pointed arch which decorates the western entrance is evidently later than must have been the construction into which it was interpolated in the fourteenth century. To be sure of this only a simple analysis of the building is necessary. As for the balustrade about the dome and the pinnacles which accompany it, they must, like the central pyramidion, have been several times renewed since their original erection: the wind which storms along these coasts is so terrific that such fine needle-like forms do not endure for even twenty years its fury, and they have to be continually restored. In the sheltered portion against the southern aisle, of which a little corner is perceived in this sketch, a doorway, surmounted by a gable, unfortunately mutilated, fixes, as it seems to us, the real date of the construction of this chapel, which is dedicated to a monk the story of whose travels was recounted a short time since. The iconography is absolutely typical. In the tympanum a Christ in the act of blessing,

with the symbols of two evangelists, — the eagle of Saint John and the lion of Saint Mark. A lintel of rough stone above the head of the Christ, inserted probably at the time when the pointed arch of the western porch was cut, takes the place of the two other symbols, the angel and the bull, of which no trace remains. The Christ in act of benediction, with his halo, is, as we know, the first symbol of Christianity which was carved in France on the gables of our churches. Below, one of the capitals which decorate the columns of this opening gives us a still more certain date. It is one upon which the sculptor has represented the combat of King Arthur and the dragon of Rocheblas, which he conquered, thanks to the intervention of Saint Efflam. Arthur is clad in the "broigne," and wears the helmet with the nose-piece like the horseman shown on the tapestry at Bayeux. It is needless to say more. The stone-carvers of this time were in the habit of representing what they saw before their eyes, and did not make any archaeological researches. Therefore the church at Perros is of the most primitive Romanesque type. Ah, when will arise wise men, with minds seriously enamoured of the past, who will study with due method the ages that have disappeared, and will recount all that they have discovered concerning them? Fantastic antiquaries, who here and there make a chance note or two about things they have half seen, have had their day. Basse-Bretagne has been described in so superficial a manner that it is fairly time that the ruins of its curious monuments should be really classified and established in their rightful places.

To these future workers we will point out this doorway, comparing it with the *chevet* of the neighboring Church of Louance, over which Saint Yves ruled, where was formerly seen a chasuble embroidered with silk and gold, as ancient at least as the stuffs of Aix-la-Chapelle, Toulouse or Le Mans, where is still found one of those *stèles*, which are now known under the name of "lechs," which bears on one of its faces the significant inscription "*Disideri filius Bodoenous*," that is, stone of Didier, son of Budoc, the Victorious. We will not here enter on a dissertation concerning this Didier and this Budoc, but their mere names are enough to show that they belong to a time almost as far back as Saint Kirec himself.

Thanks to such comparisons as these, the Church at Perros is shown to have an almost fabulous antiquity. Let us hope, then, that during the current excursion season there may be some real savant who will take the opportunity to make a proper architectural study upon this canton of Basse-Bretagne. — T. H. Blanchepierre in *Le Semaine des Constructeurs*.

THE GOVERNMENT TIMBER TESTS.¹

Barfreton Church, Kent, Eng.

THE Division of Forestry of the United States Department of Agriculture has commenced a series of examinations and tests of American timbers, which far exceeds in magnitude and in scientific thoroughness anything ever before undertaken in this direction. There are three departments of the work.

I. THE SELECTION OF THE TIMBER.

The trees to be examined and tested are first selected by a competent botanist and forester from five or more localities, four large trees of a given species from each place, these sites differing from each other as much as possible in climate and soil

conditions. These trees are cut up into logs from six to eighteen feet in length, with intervening disks eight inches long. A complete record is kept of the botanical names, conditions of growth, time of cutting, age of tree, size, height, etc., and the north and south sides of each log and disk are marked on them, together with the number of the tree and of the log. The logs are shipped to St. Louis and the disks are sent to Ann Arbor, Mich. Disks are also cut from younger trees and sent to Ann Arbor.

II. THE PHYSICAL TESTS.

The physical tests are carried out at the Washington University Testing Laboratory, St. Louis, under the direction of the writer.

¹The tests, here briefly described by Prof. J. B. Johnson in *Engineering News*, are being conducted in the testing laboratory at Washington University, St. Louis.

The logs are first sawed into appropriate sizes at an ordinary saw-mill. Each log is marked off on its end by a stencil plate, in such a way as to obtain a series of four-inch by four-inch sticks in a north and south zone, and as large a stick alongside as the log will allow, up to eight inches by sixteen inches. Each stick is marked with a die with the number of the tree, the number of the log in that tree and the number of the stick in the log, the numbers being on the lower end of the log and reading upright when the north side is upward. In this way each stick carries a legend, which cannot be effaced, which fully identifies it. A series of stamps, corresponding to the stencils, is used to show in the note-book the way in which the log was cut and marked.

After sawing, the sticks are carefully stacked under shelter to await the tests. In the course of from one to three months after sawing one end (half) of each four-inch by four-inch stick is tested, and also some of the large sticks. The regular tests are as follows:

1. *The Cross-Bending or Beam Test.*—In this the load is always put on at the same rate, so as to produce an increase in the deflection of one-eighth inch per minute, and continued uniformly up to rupture. The simultaneous loads and deflections are read off about eight or ten times during the test, the scale-beams always being kept balanced and the deflection read off by means of a micrometer screw on the small beams, and from a thread over a paper scale on the large beams. The four-inch by four-inch sticks are tested in lengths of sixty inches between knife edges, all bearing-surfaces being protected by iron plates. The machine used was specially designed for this kind of work, and was described in the *Engineering News* of September 14, 1889.

The large beams are broken on a machine of an original design, consisting of a hydraulic cylinder, plunger, screws and cross-head, made by Riehle Bros., and similar to these parts used in their 100,000-lb. testing-machines. The base or beam part of the machine consists of two long leaf-yellow pine sticks, six inches by twenty inches, by twenty-four feet long, both being clear, straight-grained wood. Between these there is a steel flitch plate three-quarter inch by eighteen inches by twenty feet long, all bolted together through their neutral axes.

The weighing is done in a standard 100,000-lb. Riehle machine near by, both being connected up with the same pump, and the weighing-machine being blocked. The plungers of the two machines are of the same size, and therefore, except for the difference in the frictional resistances of their plunger packings, they should show the same loads for the same unit pressure in the pump. They have the same kind of leather cup packing, and when tested by nests of calibrating springs they show equal loads for equal deflections of springs. These calibrating springs were first tested on the Emery machine at the Watertown Arsenal, and hence both these machines are now standardized with that one. Since this large beam machine will place a load of 100,000 lbs. on a beam twenty-four feet long, there has probably never been a wooden beam or a rolled iron or steel beam which could not be broken on this machine if taken in a length from twenty to twenty-four feet. This is also the only beam machine of large capacity with which the writer is acquainted. There are following nuts placed on the power screws, by means of which any given deflection can be held, and in this way time tests can be made on large beams.

From the plotted results, loads and deflections, the modulus of elasticity and the total resilience of the timber up to the point of maximum loading in inch-pounds per cubic inch of timber are computed in addition to the strength.

2. *The Percentage of Moisture.*—After breaking the beam it is next bored through eighteen inches from each end, and one-third the width of the stick from one side, and the borings used for determining the percentage of moisture. Prof. Bauschinger has shown that when the moisture in a stick falls below twenty per cent, and especially when below fifteen per cent, the strength increases very rapidly as the moisture diminishes.

3. *Specific Gravity and Width of Annual Rings.*—The ends of the broken beam are now cut off, and used for making the other tests named below. One of these is weighed and measured, and the specific gravity determined. The number of annual rings is also counted in a radial direction across the stick, and the average number per inch is recorded.

4. *Crushing Endwise.*—From each four-inch by four-inch stick there is cut a section eight inches long and from each large beam there is cut a column forty inches long and four inches by four inches in cross-section, and these are tested in compression endwise until the fibres are crushed down and the maximum load passed.

5. *Crushing Across the Grain.*—From each beam there is taken a section and crushed across the grain on an area four inches by four inches. The maximum load is found to occur when the compression is about three per cent of the height, and hence this amount of distortion is taken as the standard and the compression load found at this limit, which is also considered a reasonable limit in practice.

6. *Tensile Tests.*—The tensile strength is found by taking a piece one and one-half inches by two and one-half inches by fifteen inches long, and cutting it down on circular curves to three-eighths inch by two and one-half inches at the centre and then pulling it on the 100,000-lb. Riehle machine. It is held between the ordinary flat wedge-shaped grips. It is very difficult to break timber in tension, but after trying various shapes and methods of holding, the above was found most simple and entirely satisfactory.

7. *Shearing Test.*—The shearing strength is found by pulling out the ends of slotted holes. A piece two and one-half inches square is slotted one inch from each end, with a hole three-fourth inch by one inch. Steel pins are inserted in these and pulled by means of suitable stirrups. The two holes are cut at right angles to each other and both are pulled out, thus getting the shearing strength both ways with reference to the direction of the annual rings. The stick is kept from spreading, or splitting out, by means of hand clamps which are put on outside the slotted holes and screwed up to a bearing before the test begins, the initial pressure being only a few pounds.

In all the above tests the direction of the rings is sketched in and the records show also its exact position in the log and in the tree, so that all known pertinent facts are recorded. It is only in this way that the laws governing the strength of timber can be found. The reserved sticks will be tested some two years or more later after seasoning, which will be under shelter.

There will probably be as many as 2,000 tests made on each of the more important species of timber, and when these are properly collected and discussed it is thought that little will remain undiscovered in regard to the conditions governing the strength of sound timber of all the common varieties. The work has begun with the Southern yellow pines and oaks, six carloads of logs having been received and sawed to date. Since one large stick is cut from each log, and at least two small ones, the relative unit strength of large and small timbers will be determined. The effects of knots, windshakes, seasoning cracks, etc., are also sure to be determined.

TESTS OF OLD TIMBERS.

It is often very desirable to know the strength of old bridge timbers, which, though apparently sound, are more or less cracked along their neutral axes and have been in service many years. If railroad and bridge engineers choose to send in such timbers full size, just as they have been used in the structure, they will be tested promptly and at a very small cost. A few tests of this kind would go a long way toward educating the judgment of a chief or of an inspecting engineer who may be charged with the responsibility of deciding when to replace an old structure with a new one.

III.—THE MICROSCOPIC AND STRUCTURAL EXAMINATIONS.

The specimen disks sent to Ann Arbor, Mich., are examined and studied by competent botanists of the University of Michigan, and photographs taken of the structural formation. The article is, however, for the information of engineers and architects rather than of botanists, and hence is mostly taken up with a description of the physical tests. This work will run for many years, if sufficiently supported by public opinion, on which all State work really rests. If it is continued in the same scale of thoroughness with which it is begun, it is impossible to overestimate its value, both to timber users and to timber growers, for one of the ultimate purposes is to learn the conditions most favorable to the profitable growth of the more valuable kinds of timber. Neither are the results of these studies of most immediate use to engineers and architects, but the carriage, wagon and implement makers, car-builders, furniture manufacturers and the public generally are equally interested, since it is only the needs of the public which all these are trying to serve.



THE TRAP-VENT LAW.

AT the last meeting for the season of the Boston Society of Architects, Mr. J. P. Putnam read a paper which exhibited the unreasonableness of the present trap-vent laws in force in many cities, for though his remarks were addressed mainly against the Boston law, they are pertinent to similar laws obtaining in other places.

Mr. Putnam began by saying that "the plumbing ordinance now in force in this city, requiring all traps to be vented by a special air-pipe, extending above the roof, or above the highest fixture in the house, is a disgrace to the building professions, and an unpardonable outrage upon the public."

"For a long time, the very serious dangers, inefficiency and great costliness of this practice have clearly shown themselves in buildings, and eminent authorities on sanitary engineering have repeatedly called attention to the evil and endeavored to have the law repealed. Their appeals, as far as this city is concerned, have been made in vain. Those who have the matter in charge have made no attempt to meet the vital objections which have been raised against the law, nor have they given any valid reasons why it should longer be continued in force. A vast amount of useless piping and labor, nearly as great in amount as that which is useful, goes on in our plumbing work, and a much-abused public, trusting to the good faith of their advisors, are forced to endure the consequence."

"It is time that architects and owners look into the matter more seriously. Plumbing comes quite as much within the sphere of the architect as does lighting, ventilating, warming, roofing, fireproofing, furnishing or decorating, for architecture consists in nothing but the aggregation of all these parts, and style in architectural design is

nothing but a graceful expression of the truth in treating them and in combining them into an harmonious whole. At any rate so long as the architect assumes control of these details, provides places for them in his plans, and accepts payment on them from his client, he is bound to interest himself in all of them, at least as far as is necessary to enable him to protect his client from just such glaring abuses as this ordinance for indiscriminate trap-venting."

At this point he entered on an argumentative dissertation upon the merits of anti-siphonic traps and large-bore waste-pipes and of the features of plumbing practice which have come into use since the obnoxious ordinances were passed. As these arguments have been rehearsed again and again in these columns, it is needless to restate them, as all our readers are familiar with them and must be in substantial agreement with the deductions that Mr. Putnam draws.

The speaker closed his remarks with the following exordium:

"Why have the people allowed this state of things to exist so long, in face of the protests of the best authorities in sanitary engineering and of many of the leading plumbers? It is because the whole matter is in the hands of indifferent or interested individuals. A plumber commenting on the absurdity of the trap-vent law, in reply to the question why plumbers as a body did not get it repealed, remarked 'The back-vent law owes its existence to the sanitary engineers, and upon these gentlemen lies the responsibility of getting rid of it again, if they can. The plumbers are not responsible for it; the public does not know enough to do it; and the architects are too much occupied with their decorations to bother with it.'

"The ordinance in question now stands as follows:

"Every sink, basin, bath-tub, water-closet, slop-hopper, and each set of trays, and every fixture having a waste-pipe, shall be furnished with a trap, which shall be placed as near as practicable to the fixture that it serves. Traps shall be protected from siphonage or air-pressure by special air-pipes of a size not less than the waste-pipe."

"This is an instance of legislation in favor of a class, namely, the dealers in lead and iron pipe, at the expense of the public.

"Since the law was enacted, many simpler and better methods of protecting the seals of traps have been invented, yet the law enforces the old method after it has been demonstrated to be the most expensive and entirely unreliable. It discriminates in favor of the pipe dealer, to the discouragement of invention, and to the great injury of the public. It should at least be so modified as to allow the public the option of employing the simpler method where it is obviously better, or is preferred by the engineer, the architect, the board of health or the building inspector.

"Moreover, the present law makes no provision against evaporation of the water-seal, which has been found, since the back-vent law was introduced and anti-siphon traps have been invented, to be a source of danger more serious than siphonage.

"The following is recommended as a substitute for the present ordinance regarding the back venting of traps:

"Every plumbing fixture shall be provided with a water seal trap, placed as near the fixture as possible, and adequately protected from loss of seal through evaporation, siphonage, or air pressure."



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

HOUSES ON WEST 74TH STREET, NEW YORK, N. Y.

[Gelatine Print.]

NEWTON CLUB-HOUSE, NEWTON, MASS. MESSRS. HARTWELL & RICHARDSON, ARCHITECTS, BOSTON, MASS.

This building is now in process of erection.

COMPETITIVE DESIGN FOR THE NEWTON CLUB-HOUSE, NEWTON, MASS., SUBMITTED BY MR. JARVIS HUNT, BOSTON, MASS.

A GROUP OF FLYING-BUTTRESSES AT MONT ST. MICHEL, BRITTANY, FRANCE. SKETCHED BY MR. R. CLIPSTON STURGIS, ARCHITECT, BOSTON, MASS.

[Additional Illustrations in the International Edition.]

DOORWAY TO A PRIVATE HOTEL, CAMBRAI, FRANCE.

[Copper-plate Etching.]

This plate, exhibited at this year's Salon, by the artist, M. Krieger-Bela, a Hungarian, was awarded a "mention."

DETAIL OF THE HOFBURG THEATER, VIENNA, AUSTRIA. SEMPER & HASENAUER, ARCHITECTS.

[Gelatine Print.]

This building has been frequently described, e. g.: See the *American Architect* of January 14, 1891, for an illustrated description, while other details have been published in Nos. 762, 768, 780, 783, 794, and 805. The two spires showing in the background belong to the Votiv Kirche.

CHURCH OF ST. MARK, MILVERTON. MR. G. G. SCOTT, M. A. ARCHITECT.

THE SAME SEEN FROM THE NORTH.

THE SAME SEEN FROM THE SOUTH-EAST.

HALL, KIMMEL PARK. MR. W. E. NESFIELD, ARCHITECT.

NOS. 30-36 EASTCHEAP, LONDON, E. C. MR. THOS. R. RICHARDS, ARCHITECT.

The above premises stand on a prominent site on the south side of Eastcheap, at the corner of St. Mary-at-Hill; the roadway here is of considerable width, and under same in front of the building the District Railway passes, its Monument Station being close by. The structure has six floors, with the basement and the extent of the frontage gives a good light interior. The angle of the site is rounded off into a bold curve, pilasters on ground-floor marking ends. Between these points a curved steel girder carries the work above. Vaults extend under the pavements, and same and basement are well lighted with prismatic pavement lights, extending right round the building. The basement is 14 feet high, and the walls of same are lined with white glazed bricks. The pilasters to front on ground-floor in red Aberdeen granite, the bases in gray granite, the cornice, etc., over in red Mansfield stone, carved over doorway. The whole of the joiner's work to shop fronts, doors, linings, soffits, etc., is in polished teak, with bevelled plate-glass to doors, etc. The work above ground story is in specially moulded red brickwork. The work is a good example of a brick front carried out in moulded work throughout, including its ornamental features. At the corner the ground floor and two floors over follow the curve of the site; on the next floor the angle is canted, and has a square bay projecting, finishing above with an octagonal turret. A square turret is placed at the east end of the building, which takes circular form in its upper stage. Both turrets have wrought-iron finials, and are covered with lead with ornamental ribs, bosses, etc. There is a fireproof floor over the shops, and the stairs are of fireproof construction to first floor. The other stairs are in teak, with mosaic to landings, entrance-hall, etc.



[The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.]

DIFFERING FORMULAS FOR DEFLECTION OF BEAMS.

NEWARK, N. J., August 3, 1891.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—If I understand the tables for deflection of beams in "Safe Building" and "Kidder's Handbook," there is a wide difference in the two authorities.

The former, for instance, gives as the safe uniformly distributed load for a 4 x 10 spruce beam, 2,220 pounds; the latter book gives 3,264 pounds.

Which is right, and whence the great difference?

Yours respectfully,

[MR. BERG, in "Safe Building," takes the modulus of rupture for spruce at 4,400, and thinks that a factor-of-safety of more than four should be used, setting his limit of allowable fibre strain at 1,000 pounds per square inch. Mr. Kidder takes the modulus of rupture at 4,860, and regards three as a sufficient factor-of-safety for quiescent loads, so that his limit of allowable fibre strain is 1,620 pounds per square inch. Applying these proportions, the difference between Mr. Berg's and Mr. Kidder's results would be even more than the letter above shows; a beam which, according to "Kidder's Handbook," would carry safely 3,264 pounds, being, according to Mr. Berg, safe for only 2,148 pounds. Which is right, it would be difficult to say. The builders and architects of the last generation used a modulus of rupture for spruce of 8,100, or more, being that given by the average of experiments with spruce models, one inch square in section. It was known to them that spruce timbers of larger sizes had relatively less strength than the small sticks, and the prudent ones provided for this by using a factor-of-safety of 5 or 6, for larger timbers, with the modulus then given in the books; and thin floors and roofs generally stood well. Since then, actual tests of spruce timbers up to 12 inches square, and larger, have shown that the average

modulus of rupture with them is from 4,000 to 5,000, the less figure being probably the most nearly correct with ordinary yard timber; and the tables of moduli have been revised; while the factor-of-safety, which was formerly taken at 6 by prudent architects, with the old moduli, is now taken at 3 or 4 with the new ones, bringing the final result of the calculations to nearly the same point.

Circumstances have, however, changed in another way. Ten years ago, few persons troubled themselves to determine the actual weights to be put on the floors which they constructed; and it was common to assume that there would be, for example, an extraneous load of 100 pounds, or more, per square foot on floors of school-houses and other public buildings, while, in point of fact, the extraneous load in such places rarely reaches 25 pounds per square foot; and floors calculated for 100 pounds, even according to the old moduli, naturally held up an actual load of 25 pounds very successfully. In the complex modern buildings, much more accurate determinations are now made, and where it is known that a girder or set of beams may actually be subjected to a given strain, we should advise using Mr. Berg's limit of 1,000 pounds per square inch, for maximum fibre strain for spruce timbers of large size, under a quiescent load. In using 2 x 8 or 2 x 10 timbers, which are relatively stronger than the larger ones; or in cases where the architect had reason to believe that, as often happens where the loads to be provided for are specified by law for different classes of buildings, the load specified is far in excess of that to which the structure will ever be actually subjected. It would be perfectly prudent to use Mr. Kidder's modulus of rupture, of 4,800. Whether a factor-of-safety of 3 would be suitable, depends on circumstances. Mr. Kidder himself says that so small a factor is only applicable under favorable conditions; and if the load were likely to reach the limit provided for, it would be best in practice to use a factor-of-safety of 4, to avoid excessive deflections, which might be inconvenient, even if they did not go beyond the safe limit. — EDS. AMERICAN ARCHITECT.]

BANK AND SAFETY DEPOSIT VAULTS.

NEW YORK, N. Y., August 8, 1891.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—For an especial purpose, I should be pleased to receive any memorandum or circulars relating to Banks, Safe Deposit Vaults, Bank Buildings, both simple and composite, i. e., containing banks and safe deposit companies, also in connection with say, apartment-houses, etc.

Yours truly,
GEORGE MARTIN HUSS.



LAMINATED BEAMS.—The roof of the Leeds Town-hall, designed by Mr. Cuthbert Broderick, is noticeable for the absence of tie-beams, which allows of the ceiling of the hall to be brought nearer to the exterior of the roof than is usually the case. The roof consists of eight sets of principals framed together. Each principal consists of a semi-circular laminated rib, formed of twelve 1 1/2-inch planks, 9 inches wide, nailed together and fastened with wrought-iron bolts and straps. They are placed in couples, and stand immediately over each of the columns in the hall. They are respectively 4 feet and 18 feet apart. The width of the room is 71 feet, and the springing of the ribs 53 feet from the ground. The entire height to the top of the roof is 99 feet, the hall being 73 feet high in the clear. This system of roof has been adopted more frequently in France than in England. The laminated rib is the invention of a French engineer. It was at first suggested for a bridge over the Rhine in the year 1811. Several years later M. Emy constructed several roofs on this plan, but all his roofs, being very near to the ground at their springing and without ceilings, are consequently much more manageable than the roof of the town-hall, which has a very elaborate plaster ceiling attached to it, and the springing is at a considerable distance from the ground. Precaution had to be taken to insert several additional struts and braces as a preventive against any change of form or outward thrust. Both these points had been attended with the most complete success, there being not the least perceptible outward thrust or change of form. The latter fact was proved very satisfactorily by the plasterers, who were enabled to run the mouldings on the ceiling from the centre. The brackets for these mouldings were not gauged from a centre, but fastened to the ribs according to their sizes. If the principle of these laminated ribs were better understood, it is possible that many of our architects would adopt it instead of depending on three or four overstrained joints for one tie.—*Architect.*

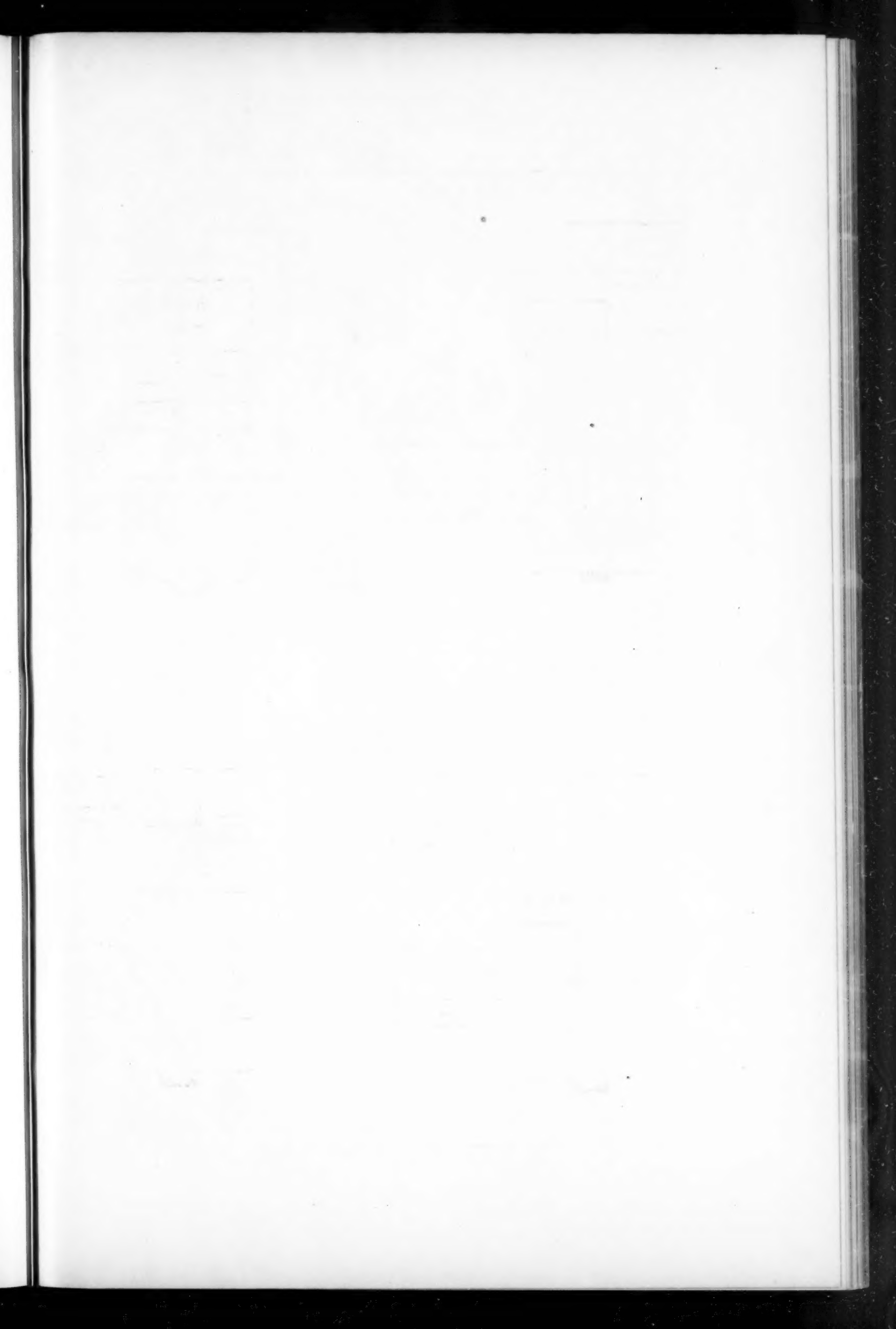
A SIMPLE PLAN FOR COOLING WATER.—At Hanover, York Co., Pa., a system is used for cooling water, that is both simple and beneficial, according to a description of it in the *Railroad and Engineering Journal*. The town is described as being closely built, and without any system of drainage, so that the water in the wells is unfit to drink. Some years ago these reasons led to the introduction of a supply of very excellent water from a large spring about three miles distant. This water is brought through iron pipes, and when it reaches the consumer in summer is warm, while the water in the wells is cool. For this reason many of the inhabitants drink the well-water, and, as a consequence, typhoid fever is a prevalent disease in that community. In order to obtain pure cool water, not impregnated with lime, some of the inhabitants of the place have adopted a plan which is so simple and gives such excellent results that it is worthy of general adoption wherever there is a water supply other than wells or springs. The plan is as follows:—A cylindrical galvanized sheet-iron tank 12 inches in diameter and 4 feet or 5 feet long, is placed in the bottom of a well. The tank is then connected by a galvanized iron pipe with the water-supply pipes, and another pipe is carried from the tank to the surface of the ground, or

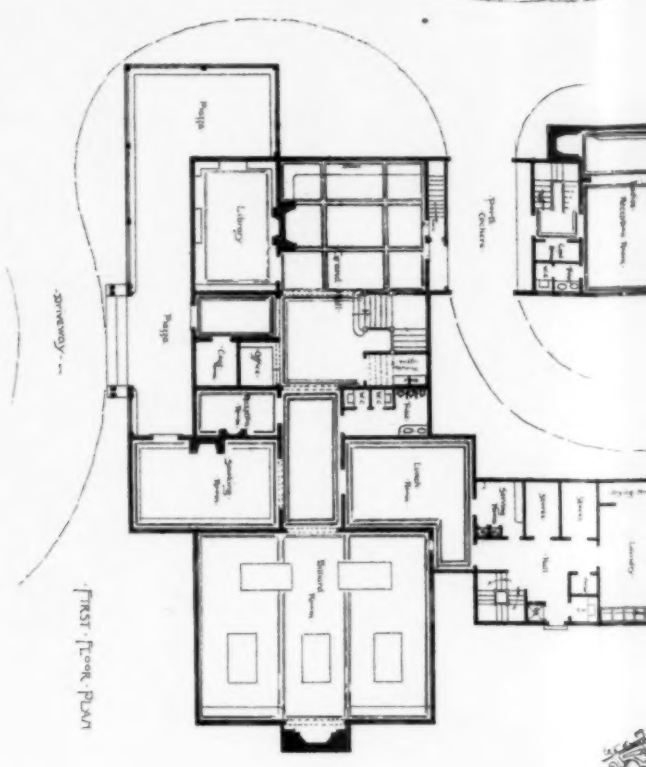
to any convenient point for drawing water, and has a cock at the upper end. The tank is consequently always filled with water from the water-supply, and being in the bottom of the well, the water is cooled off and acquires the temperature of the well, so that that which is drawn from the tank is as cool as well-water, and is without any of the impurities with which the latter is contaminated. The water drawn from the tank in one of the wells in the place named had a temperature of 56 degrees when the thermometer in the atmosphere above stood 76 degrees. This method gives an abundant supply of cool water during the whole summer, and can be adopted in all cities, towns, or in the country. If a well is available, it can be used; if not, by simply digging a hole in the ground deep enough so as not to be affected by the surface temperature, and burying the tank, it will answer equally well. This hole might be dug in a cellar or outside the building. If the water has any impurities in suspension, such as mud, the tank should be made accessible, so that it can be cleaned separately. — *American Engineer.*

HAINBURG FORMERLY A GREAT ROMAN FRONTIER TOWN.—Our Vienna correspondent, recalling the *Daily News's* description of the Roman remains at Hainburg, about twenty-four miles from Vienna, on the site of the ancient Roman frontier town of Carnuntum, on their discovery a year or two ago, says that new excavations are now taking place in the immediate neighborhood of the Castle of Petronell, the residence of the Counts of Abendsberg Traun, which is about two miles distant from Hainburg, and have resulted in the discovery of many interesting architectural remains and much sculpture. These discoveries lead to the conclusion that Carnuntum must have been a much larger town than was thought, for it seems that it must have contained several hundred thousand inhabitants. — *London Daily News.*

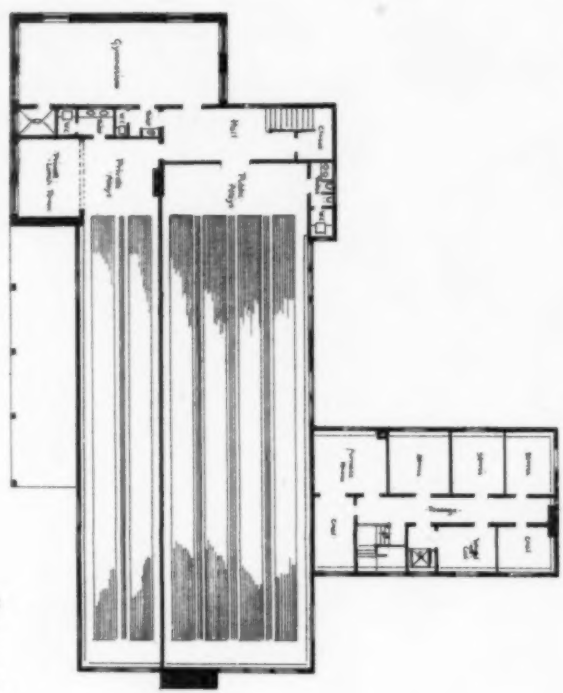


THE spirit in trade, manufacturing and financial circles is to hold on to present advantages and conditions until recuperation sets in, as it is expected to do in a vigorous way in early autumn. The liquidation in values which set in nine months ago has not spent its force, as is evident in commercial channels on both sides of the water. A careful observation of facts and developments does not show any weakness in the financial world outside of or in addition to those chronic conditions to which the business world has become accustomed, and by so many regarded as inevitable and necessary. The business of the world is being adapted to the restrictions, which mistaken opinion regards as wisdom. There are increasing evidences of the brewing contest, which, when it is precipitated, will do much to unsettle confidence. Here in Massachusetts, very recent semi-political utterances of the Chief Executive, and of others who certainly do not misrepresent the fundamental conceptions of the people of the State, clearly show that what are here regarded as financial heresies will not be tolerated in the next political contest. In the West, a more determined spirit to overturn what is there regarded as Eastern financial and political control never existed. The only reason for dwelling on this difference in party lines is to note the fact that serious political contests are at hand, involving disadvantages to business interests, growing out of the possible overturning of one set of ideas and the setting up of others. The political leaders will have more material to work over than they bargained for. Public opinion is growing against unnecessary interference of politics with business, but new issues of real interest are now cropping out on which intelligent men can honestly differ. For decades past the East has been organized in all great interests, and the West has been disorganized, or rather unorganized. The spirit of organization has lately been at work. Census figures have shown enormous development. Railroad statistics have exhibited an enormous expansion of traffic. Investments of capital have surprised investors. A steady and healthy appreciation of values has taken place throughout some twenty of the Western States and Territories. All this means that a new factor is about entering, and must be considered. On some matters there is almost as great a difference between Eastern and Western sentiment as there was between the North and South before the war, though the outcome of the differences is by no means likely to be so serious. The fight will be on the free coinage of silver. Midsummer trade is kept slightly below last summer's average. Traders everywhere are following the course adopted as far back as last winter; viz, to buy as little as possible and keep obligations down. This is something of a new policy, and accounts for some of the apparent deficiencies in the volume of business. The New England boot and shoe makers admit that the volume of business is heavy, but that trade methods have changed, that cash dealings are being approached slowly, and that more healthy conditions exist now than for years, even in the face of narrowing margins. The managers of large Eastern jobbing-houses also note a changing of business methods consequent upon the expansion and spread of manufactures, and the multiplication of distributing and trade centres throughout the interior. The demand for machinery even at this dull season is large, especially for all manner of shop equipments. Railroad companies are heavy buyers, especially in the direction of rolling-stock. Recent figures show a gradual decline in the volume of non-paying dividend securities in railways. Western roads improve more than Eastern. Southern short lines are making good returns, due to the growth of local traffic. Builders are not keeping up to their last year's average. Architects, in speaking of probabilities, think that the hesitancy shown in so many quarters will be compensated for next year. Building material of all kinds keeps stationary, because most of it is low as it can go. Lumber men are carrying large stocks, but there is no weakness in the markets. Hard woods hold up well. The production of coal keeps ahead of last year, and the opening of new mines is a matter of almost daily occurrence. The iron trade is steady. Steel-makers have their mills nearly all on full time. Factory and shop labor, as a rule, are busily employed. Labor agitations are few in number, and there is but little disposition among employers to unsettle wages. The percentage of unemployed labor is slightly above the average at present, but there is a corresponding advantage in the fact that cost of living is declining rather than advancing, and there are no accumulations of stocks. What is still more to the point, is that the consuming-capacity of the people is rather increasing than declining.





FIRST FLOOR PLAN



Basement Plan



THIRD FLOOR PLAN

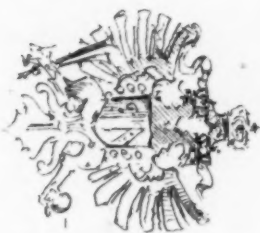


SECOND FLOOR PLAN

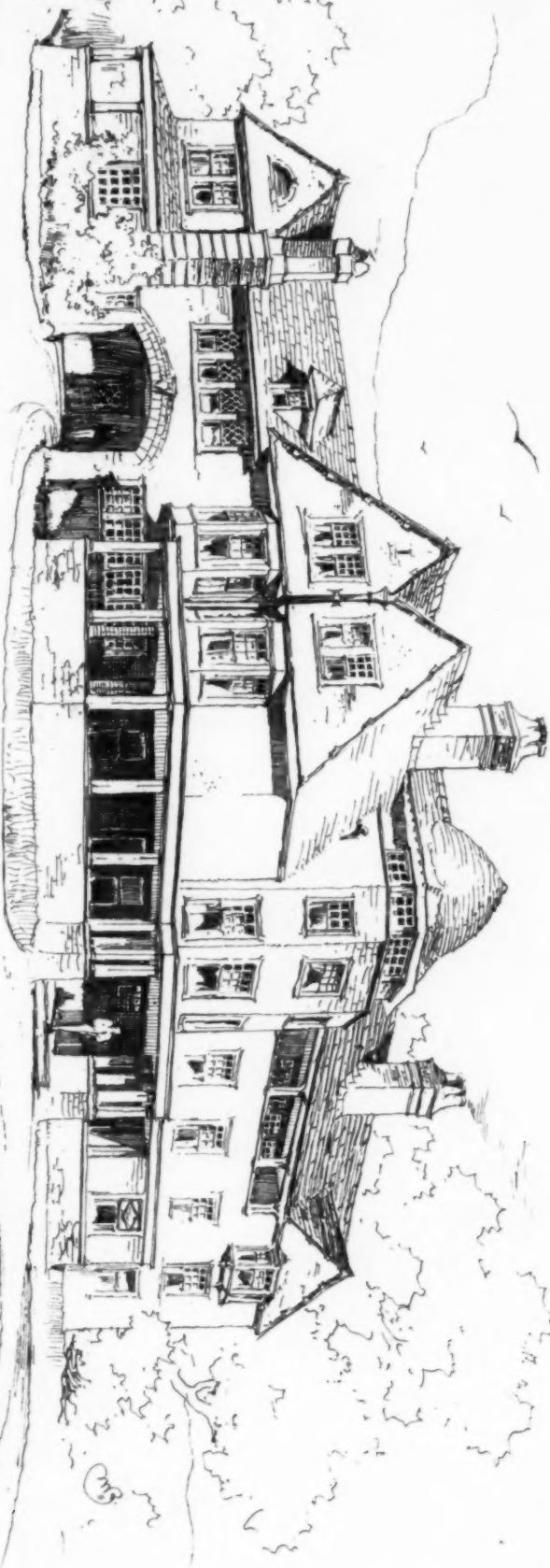
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AMERICAN ARCHITECT AND BUILDING NEWS, Nov. 15, 1891.

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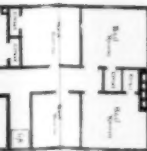
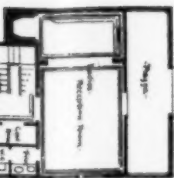


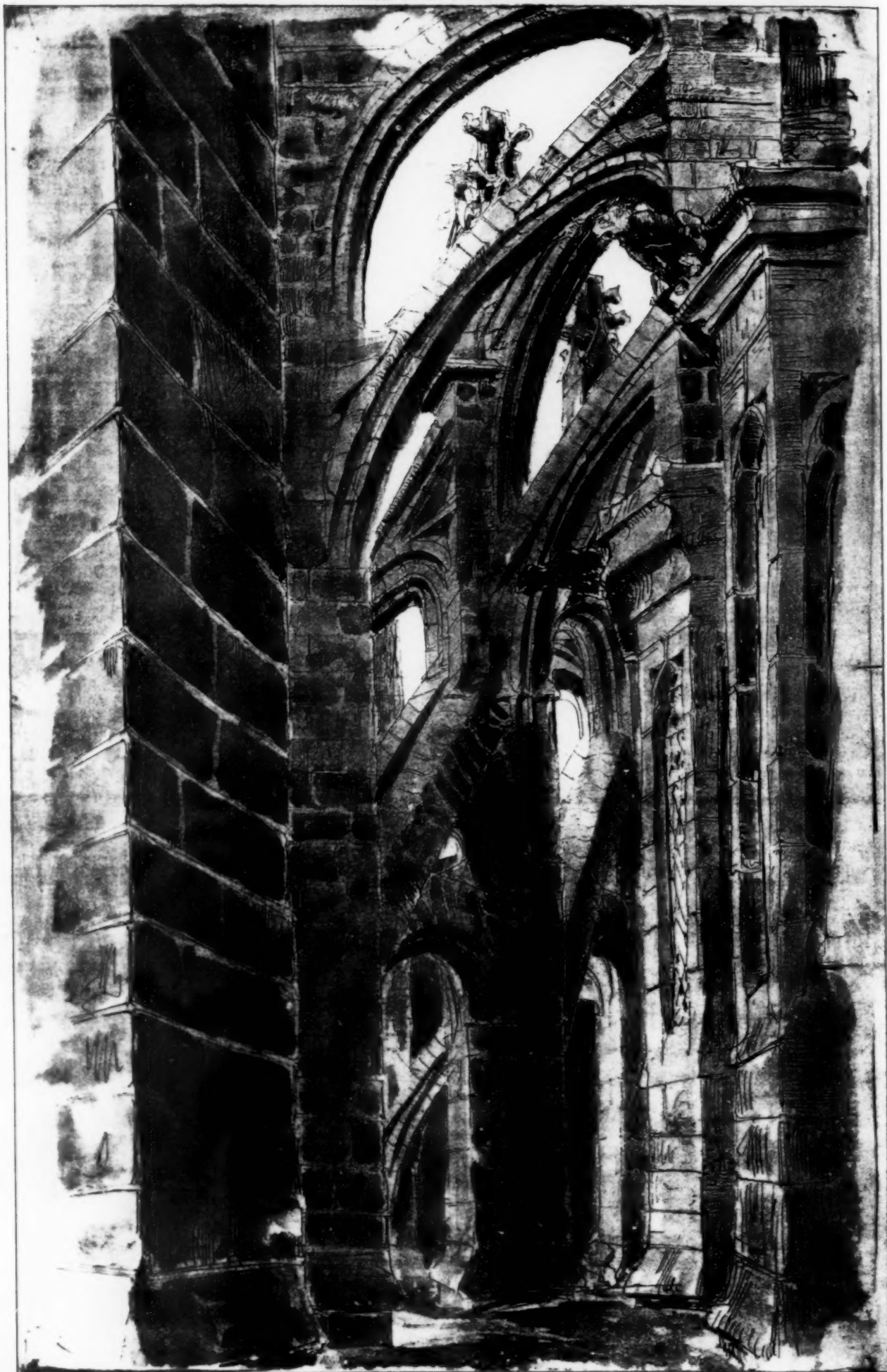
NEWTON—Quincy—



[An unaccepted design.]

John H. Hunt
Archit.

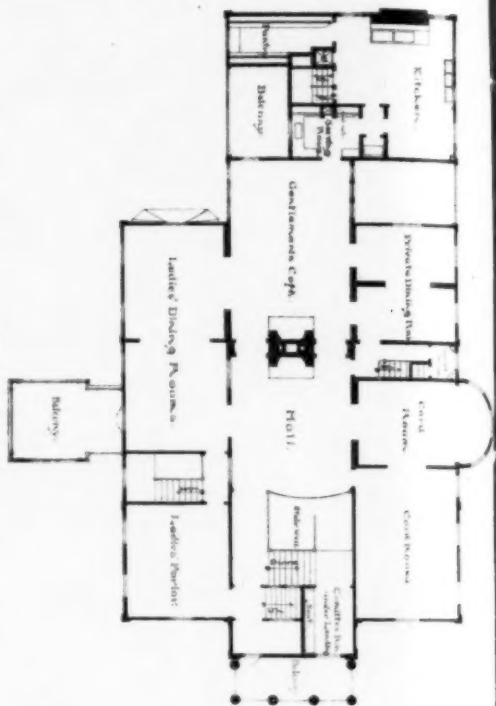




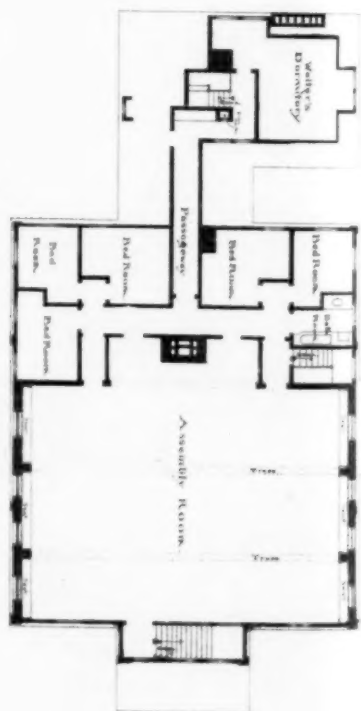
HELIOTYPE PRINTING CO. BOSTON.

FLYING BUTTRESSES AT MONT ST. MICHEL, BRITTANY.

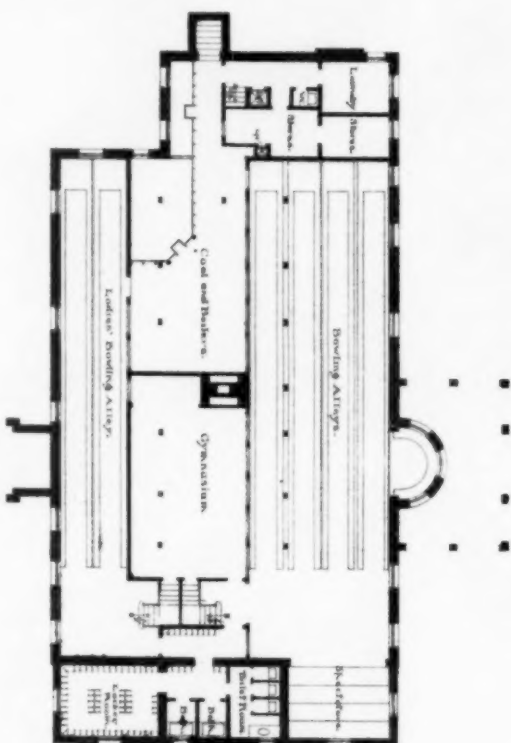




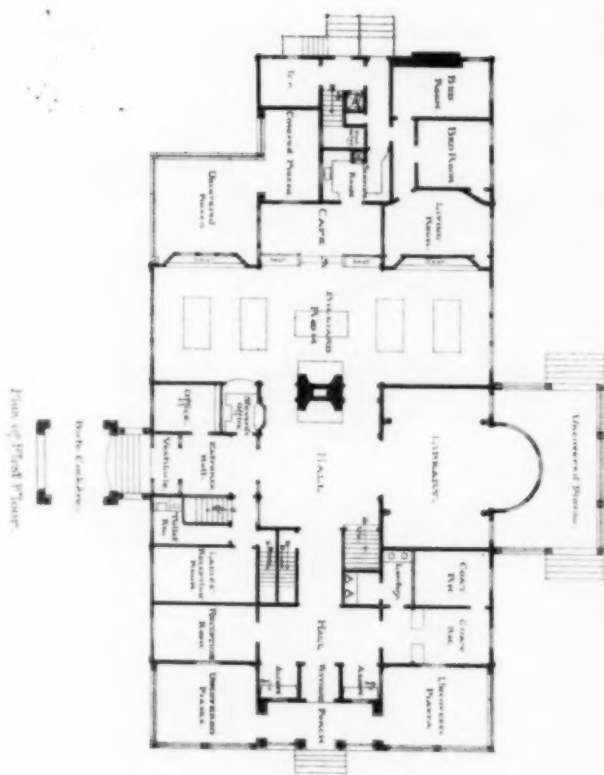
Plan of Second Floor



Plan of Third Floor



Basement Plan

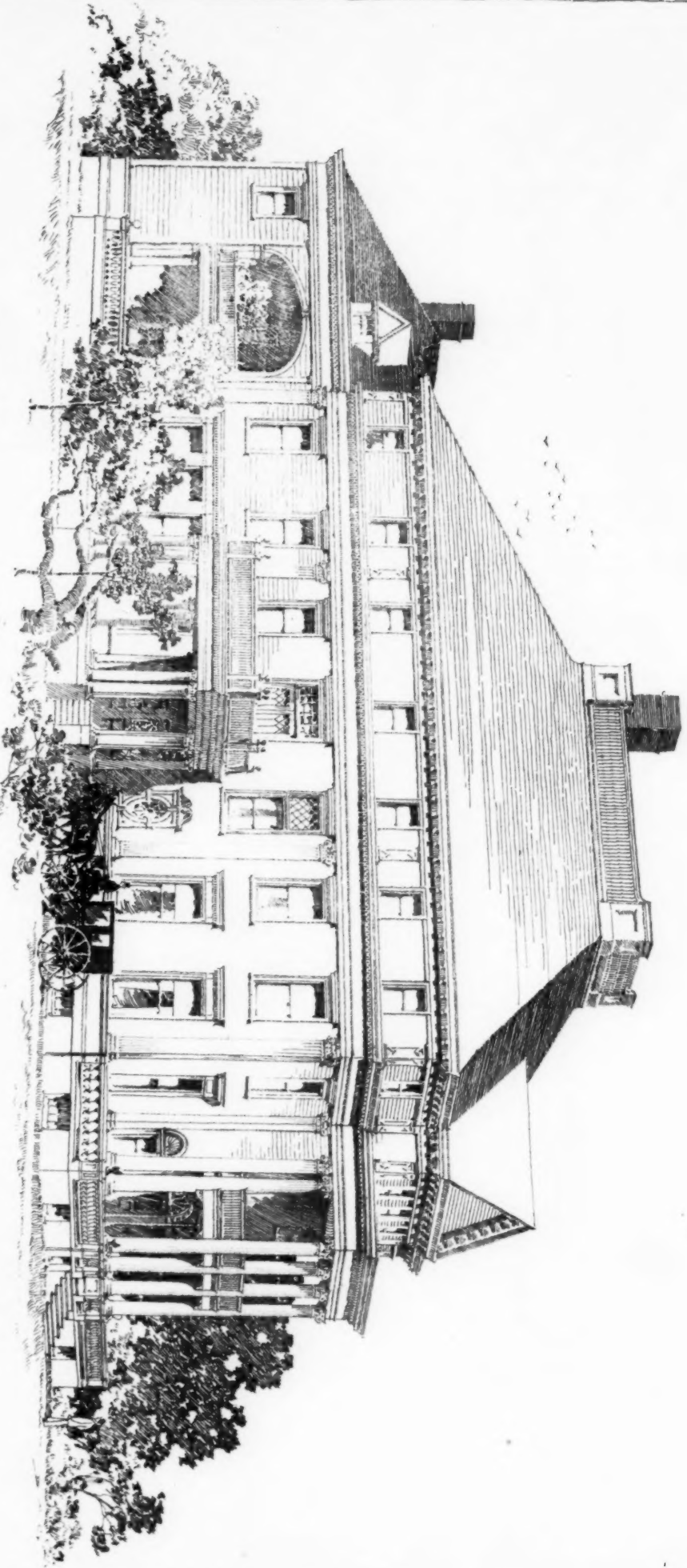


Plan of First Floor

No. 516.

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NEWTON
CLUB HOUSE

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NEWTON
CLUB HOUSE

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