PRICE 15 CENTS.

FEBRUARY 8, 1890.

THE AMERICAN ARCHITECT AND BUILDING NEWS

VOL. XXVII. * REGULAR EDITION * NO. 737.

ARCHITECTVRE

ENGINEERING

DECORATION

CONSTRVCTION

TICKNOR & COMPANY

BOSTON MASS.

CONTENTS.

ILLUSTRATIONS

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XXVII. No. 737.

Entered at the Post-Office at Boston as second-class matter.

FEBRUARY 8, 1890.

CONTENTS

THE Convention of the National Master-Builders' Association at St. Paul appears to have been a very successful one. From the reports in the local newspapers we gather that the most noticeable feature of the meeting was the reading of a paper by Mr. Richard Deeves, of New York, on "Industrial Education," in which he denounced, with characteristic energy and courage, the action of certain labor-organizations, in limiting the number of apprentices in the shops, as a crime against American principles and American youth. Colonel Auchmuty has, on several occasions, given expression to the common opinion on the subject of persons outside the trades, but Mr. Deeves appears to have been the first man immediately concerned with the Unions, and to a considerable extent dependent on them, who has dared to stand up for a principle against them, and, according to the St. Paul papers, there were, among the builders who listened to him, a good many expressions of surprise at his audacity. Some sensible resolutions were adopted, advising local associations, in view of the uncertainties arising from the eight-hour agitation in many States, to adopt the system of payment by the hour; and a report was presented, advising that no change should at present be made in the standard form of contract, which, we hope erroneously, is said to be now in very general use. As our readers know, we desire nothing more ardently than to see a form of contract universally adopted which shall define the rights and duties of owner, builder and architect so clearly that the province of each shall be perfectly distinct, and that there shall be no possibility of mistake as to the meaning of a single word or sentence in the whole document; and it is precisely because the standard contract, in its present form, confuses the architect and the owner, and leaves the reader uncertain as to some of the most important duties of all the persons concerned, that we wish to see it revised without delay, and believe that, as it now exists, it is framed in the interest neither of builders, architects nor owners, but solely of the lawyers, who will, if it is generally adopted, before long be reaping a rich harvest out of the misunderstandings to which it will inevitably give rise.

A RATHER unpromising scheme is said to be under consideration in Philadelphia, in the shape of an "American Engineering and Construction Company," which is to be formed, with a capital of one million dollars, for the purpose of "designing and constructing" all classes of engineering and architectural work. The company is to have branch offices in "every important city in the Union," and its promoters claim that it will be able to buy materials cheaper than private contractors, and to underbid them in competing for work. The stock, which is, we suspect, the important thing, is divided into ten thousand shares, of one hundred dollars, ten per cent of which is to be paid in at once, and the remainder from time to time, as the growth of business may demand. We have no unfriendly feeling toward the new enterprise, but, at the same time, we can see no prospect that it will be profitable to its stockholders. As every contractor and architect knows, the business of designing and constructing buildings can only be made to pay a profit by the exercise of the closest care, aided by skill and experience, not only in estimating, but in executing the work contracted for. To hire some one to make estimates, as the new company apparently expects to do, and, after signing contracts in accordance with them, to hire some one else to carry out the contracts, is to invite speedy ruin, whether the capital of the company is one million or ten. There are several builders in this country who use as large a capital in money as the proposed company can command, and possess a still larger capital, in the shape of honesty, skill and responsibility, proved by many years of successful business. These people, whose private estates are liable for their debts, can certainly buy materials as cheaply as a corporation with nothing in the shape of assets but unfinished, and perhaps unprofitable, contracts, and they can make them into buildings to far better advantage than a company composed of stockholders who know nothing of the business in which they have invested their money, and managed by salaried officials, whose income does not depend upon minute attention to constructive details, even if their training would fit them for such work.

WE ought to notice the death of M. Eugène Oudinot, or Oudinot de la Faverie, of Paris, in his way one of the most distinguished artists in stained-glass of his day. He was trained to his profession almost from infancy, having, at the age of fifteen, entered as a pupil the workrooms of Choisy-le-Roi, then directed by M. Bontemps. Six years later he came to Paris to study under Delacroix, and in 1862 he was appointed worker in stained-glass to the City of Paris. From that time his reputation rapidly increased, both at home and abroad, and, besides innumerable works for the City of Paris and the French Government, he executed many commissions for foreign countries, among them being one or two large windows for Trinity Church, Boston. His preference was, perhaps, for Renaissance design, which he understood perfectly, and in which he could display his admirable figure-drawing. He received various public honors during his long life, which was an active one almost to the last, the colored windows made for the Palace of the Argentine Republic at the recent Exposition having been his work, although he had then reached the age of seventy-two.

THE *Builder* for January contains a paper on the planning of schools, by "a Head Master," which, together with many suggestions of value to architects interested in the planning of schools, contains the frank acknowledgment that, in the maintenance of discipline in a school, "the architect can greatly aid" the master, or "can render good discipline almost impossible." To accomplish the latter end, as he says, nothing is necessary but to build all the class-rooms in a line, connected by a narrow corridor, which should be dark, and have a few sharp turns in it. Then the classes, to get from one room to another, will have a long distance to go, and can beguile their weary way by running races, hustling, riots at the angles when two classes meet, and private bullying parties in the obscure corners, while, if the corridor is dark, the ringleaders are safe from detection. By paving the corridor with stone, the noise of feet in it will resound all over the building, and day after day, and year after year, the echoes will roar their disorderly hymn to the architect who did not know how to plan a school, and did not care to learn.

THE four chief foes to school discipline, as "the Head Master" says are, Disorder and Noise; Bullying; Petty Larceny; Indecent Writing. Inside the school-building, the two former are chiefly promoted by long, dark corridors. With

short, wide, straight and well-lighted passageways, which can be supervised at a glance, they can easily be repressed indoors, but the scene of them may be transferred to the playground entrances, or outbuildings, and these must be arranged for easy inspection. Every corner of the playground should be visible from the head-master's room, and from some of the class-rooms; the entrances should be commanded, both from the head-master's room and the janitor's office, and the latter should be placed so that the janitor can oversee, also, the lavatories, and observe every one who enters or leaves them. The existence of the third defect in school discipline may be said to depend entirely on the architect; if he plans the wardrobes so that they can be easily observed from the class-rooms, there will be no stealing from them: if he does not do so, there will inevitably be pilfering and consequent unhappiness. To meet the fourth evil, corridors should, as before, be few in number, light, and easily supervised; and their walls, as well as those of all lavatories and closets, should be lined with glazed bricks or tiles.

AMONG the details of construction, as distinguished from those of planning, which affect school discipline, the most important are those which have to do with the suppression of noise, dust and foul air. The ideal room, in our Head-Master's opinion, would have an asphalt floor, walls of glazed brick and washable ceiling, with no mouldings, shelves, cupboards or other projections to hold dust, and the whole should be washed clean every day. In the new Ecole Monge, in Paris, which he considers the model school-house, this idea is actually carried out; and he speaks of seeing the great school dining-hall, just after a relay of boys had left their places. They had been eating at little marble tables, and, as they disappeared, a body of servants carried off the dishes; then "a mighty hydrant" was opened, and "a deluge sent flying over tables, floor and walls"; the windows were thrown open, and "crumbs, crusts, smells and foul air disappeared in one gush." "The windows were then closed, heat turned on, and in a few moments the hall was ready for another batch of diners." In regard to ventilation, he has never seen a thoroughly successful school-building, and there is no doubt that very few exist, and nearly, if not quite, all these are in the United States; but his sense of the importance of the subject is so profound that he promises architects that they can raise the efficiency of teachers at least one-fourth, and the happiness of masters and boys at least one-half, if they can build school-rooms which shall have pure air, and be at the same time free from dust and noise.

LE GENIE CIVIL gives an account of the operations of the Compagnie Générale des Asphaltes de France, which is particularly interesting just now, in view of the efforts which are being made to improve the pavements in most of our large cities. Every one knows, in general, that the asphalt used for paving the streets of London, Berlin, and, more particularly, of Paris, is a natural mixture of particles of carbonate of lime and bitumen, and that the substance is found in the neighborhood of Seyssel, among the Jura mountains, near the boundary of France and Switzerland; and that it is put down in a layer about an inch thick, on a foundation of cement concrete, by the simple process of bringing it to the ground in the shape of a brownish powder, heated to a temperature near the boiling point of water, spreading it over the concrete with shovels, tamping it with heavy iron rammers, and finally rolling it smooth, after which it is, although still warm, ready for traffic. The original idea of the asphalt pavement is generally credited to the Emperor, Napoleon III, who, in the early years of his reign, is said to have looked out anxiously for a pavement which could not be torn up and made into barricades, but the fact is that in 1850, or a little later, a part of the highway between Pontarlier and Neuchâtel, in Switzerland, was coated with asphalt by M. Mérian, a Swiss engineer, and it was not until 1856 that, under the favor of M. Alphand, the Asphalt Company began to try its pavements in Paris. The first ventures were not very successful. The asphalt, being simply an elastic skin, must be supported by a perfectly firm mass below it, or it will soon be broken through; and the earlier pavements, which were laid on a concrete made with lime, failed, by reason of the crushing of the soft foundation. This experience, joined, perhaps, with the improvement and cheapening of the manufacture of cement, soon led to the exclusion of lime from road foundations, and asphalt pavement is now always laid on cement concrete.

SO laid, it forms an elastic, impermeable pavement, free from dust or mud, which is easily washed clean, and soon dries after wetting; which offers peculiar advantages for easy and noiseless traffic, and is readily repaired, by warming fragments of itself until they fall into powder, and spreading, tamping and rolling the powder as in the case of new work. The only precaution to be observed is to see that proper materials are selected at the outset. The two principal sources of the paving asphalt are the mines of Seyssel, and of the Val de Travers, in Switzerland, near Neuchâtel. Of these, the Val de Travers mine produces a material which softens under a hot sun, and moves, under heavy traffic, into ridges; while the Seyssel mineral is harder, and less charged with bitumen. Originally, the Val de Travers asphalt was used alone, but the importance of hardening it soon became evident, and that from Seyssel is now always introduced in the proper proportion for making a mixture which will be permanently hard. Very recently, the character of the Val de Travers deposit has changed, the asphalt being found to have assumed an oily character, which renders it less suitable for paving, and the Compagnie Générale is now using, in place of it, a new asphalt from Ragusa, in Sicily, which is found much tougher and better, and, mixed with the Seyssel rock, gives extremely good results.

THE *Bautechnische Zeitschrift* has been interesting itself in the subject of contracts for building, and has published a form which it considers fairer to both owner and builder than the common one. As it claims that its own form, which makes the contractor responsible for two years after the completion of the building for all damages and expenses arising from imperfect materials or workmanship, is more favorable to the builder than the ordinary printed contracts, we infer that the ordinary German contracts must be stricter than anything known here; but they also appear to leave out a good many stipulations which we are accustomed to regard as necessary. We find, for instance, nothing said about insurance, underletting, or the completion of the work by the owner in case of the insolvency or misconduct of the builder; nor is the architect mentioned anywhere in the document. In regard, however, to the times of completion of the successive portions of the work and the payments, it is very full and strict, the builder being held to a penalty for delay of any portion, while, if the owner has not his money ready at the appointed time, the builder is at liberty either to abandon the work, or to charge the owner with interest on the deferred payments at the rate of five per cent. We doubt very much whether either of these courses would be satisfactory to the contractor, and, in fact, the whole contract has, to our mind, a rather impracticable air. The clause extending the time of completion in case of "general strikes," which, as it explains, is commonly inserted in such contracts, it purposely leaves out, for the reason, as it says, that no strike is ever "general," since there are always some independent old journeymen who will not join in any strike, and usually one or more contractors who accede to the demands of their men, and in either of these cases the strike is not "general." This appears to be a new view of the matter, and we commend it to the Master-Builders' Association for consideration.

THE *Schweizerische Bauzeitung* describes some locomotives which have been ordered by the Belgian Government to draw the new express trains between Ostend and the German frontier, which are intended to run at the rate of sixty miles an hour. Unlike, perhaps, any others yet built, the new locomotives have their four driving-wheels in the centre of their length, and a pair of small wheels at each end, the forward pair having radial axles, like those of the six-wheel electric-cars sometimes seen here. This disposition gives, artistically, a peculiarly well-balanced and energetic air to the machine, and, as the driving-wheels are so near together as almost to touch at the circumference, the locomotive will run with perfect ease around curves of one thousand feet radius, although the length, from centre to centre of the axles of the front and rear wheels, is twenty-one feet.

CIVIL AND DOMESTIC ARCHITECTURE.[1] — V.

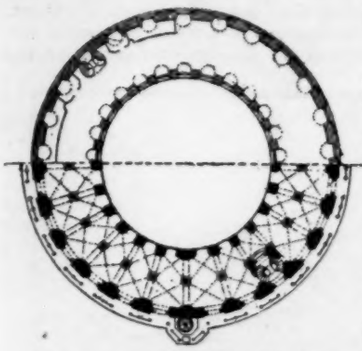


Fig. 30. Plan of the Halle aux Blés, Paris.

THE transformation in private houses which we saw beginning with the Hôtel Rambouillet still continued. Changes in manners and social customs always bring corresponding changes in the arrangement of dwellings. The Renaissance, already freed from the care of defending the homes, had allowed light and air to enter them. But the refinements and elegancies of the new society soon demanded designs better adapted to meet the new wants — designs at once more imposing and more convenient. In mansions, the principal building stood between a court and a garden; on the sides of the court the servants' quarters and out-buildings were located, and the main edifice was divided into reception-rooms and living-rooms; the first were on the ground-floor, and had access to the garden, while the others in the story above provided comforts and admitted of pursuits unknown until then.

The dwellings of the *bourgeoisie* were more and more neglected, at least in the interiors. More attention was given to the external appearances, for an ugly façade might shock the sensibilities of the great and impair the beauty of the city. As for the interior arrangement, what mattered that in a society where the *bourgeoisie* counted for naught?

The same comforts, the same symmetry of arrangement within and without, existed in the castles as in the mansions. They were of monumental aspect, with their lofty roofs and their encircling moats, the survival of ancient traditions.

A large number of castles and mansions were erected in the seventeenth century.

With Louis XV and the somewhat licentious manners of his reign private architecture became belittled; it sought before everything else the comfortable, the pretty, the pleasing. Public edifices, on the contrary, preserved the imposing character of the monuments of the preceding century, for the architects charged with their construction refused to bow to the caprices of fashion. Gabriel was one of the most earnest of these defenders of Classic art. The Military School, which he began in 1752, recalls the style of Mansart and Perrault,

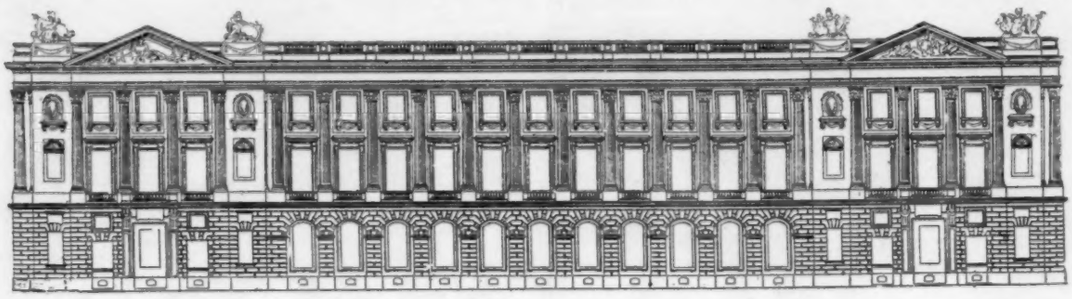


Fig. 25. The Garde-Meuble, Paris.

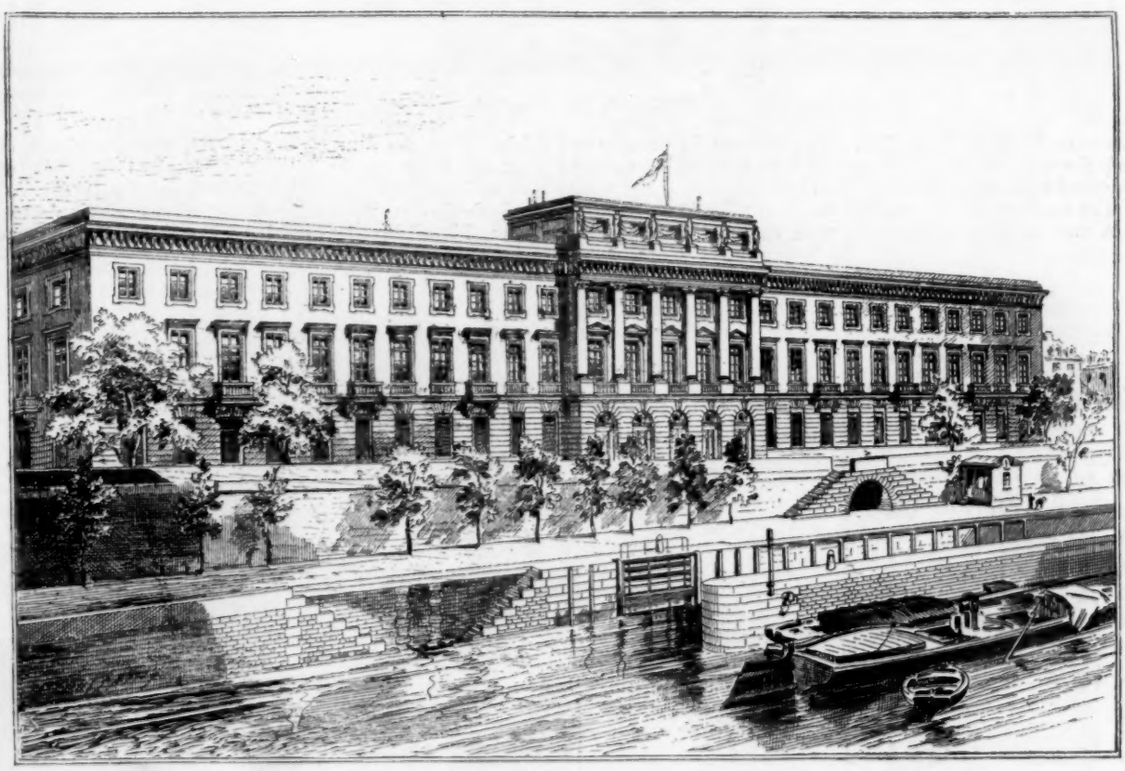


Fig. 26. The Mint, Paris.

[1] From the French of G. Guicestre, in "*Encyclopédie de l'Architecture et de la Construction.*" Continued from No. 736, page 72.

with, however, a greater regard to fitness and the adaptation of architectural forms to their proper destination.

His two masterpieces were the Ministère de la Marine (Admiralty Office) and the Garde-Meuble (Furniture Repository, Fig. 25) erected on the Place de la Concorde, then known as the Place Louis XV. The Château de Compiègne and the play-hall in the Palace of Versailles, which excited universal admiration, were also built by him.

The architect Antoine erected the Mint (Fig. 26).

A vast number of play-halls were constructed during the eighteenth century. They responded too well to the tastes of the times to be neglected. The architect, Moreau, was commissioned to rebuild the Opera-house: a little later on the Odéon was erected (Figs. 27, 28). The taste for theatres even invaded the provinces. Soufflot constructed one at Lyons, and the architect Louis erected the Grand Théâtre at Bordeaux.

Letters, sciences, commerce and law were, meanwhile, not neglected. The buildings of the Collège de France, left unfinished since the days of Louis XIII, were completed, and work was begun on the École de Médecine; the Halle aux Blés, or Corn Exchange (Figs. 29, 30), and the façade of the Palais de Justice were erected. Architectural development continued in all directions and in all branches. Paris annexed new quarters, which were quickly built up. At the different gates of the capital toll-houses were established under the direction of the architect Ledoux; these were of massive

Fig. 27. The Odéon, Paris.

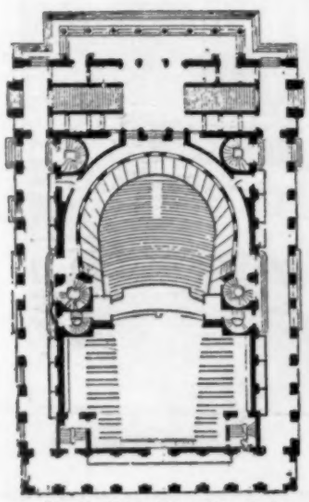


Fig. 28. Plan of the Odéon, Paris.

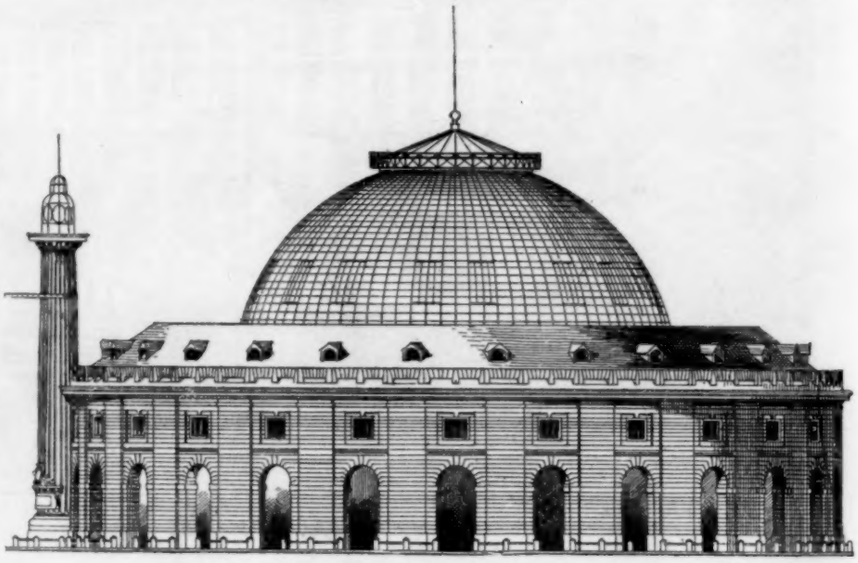


Fig. 29. Halle aux Blés, Paris.

construction, with rotundas and colonnades, often in very doubtful taste. The engineer Perronnet threw across the Seine the Pont de Neuilly. Beautiful squares were laid out and surrounded by noble monuments, at Nancy (Figs. 31, 32), at Bordeaux, at Valenciennes, Rennes, Rheims and elsewhere. Attention was turned more and more to the antique. Roman

Fig. 31. Place Stanislas, Nancy.

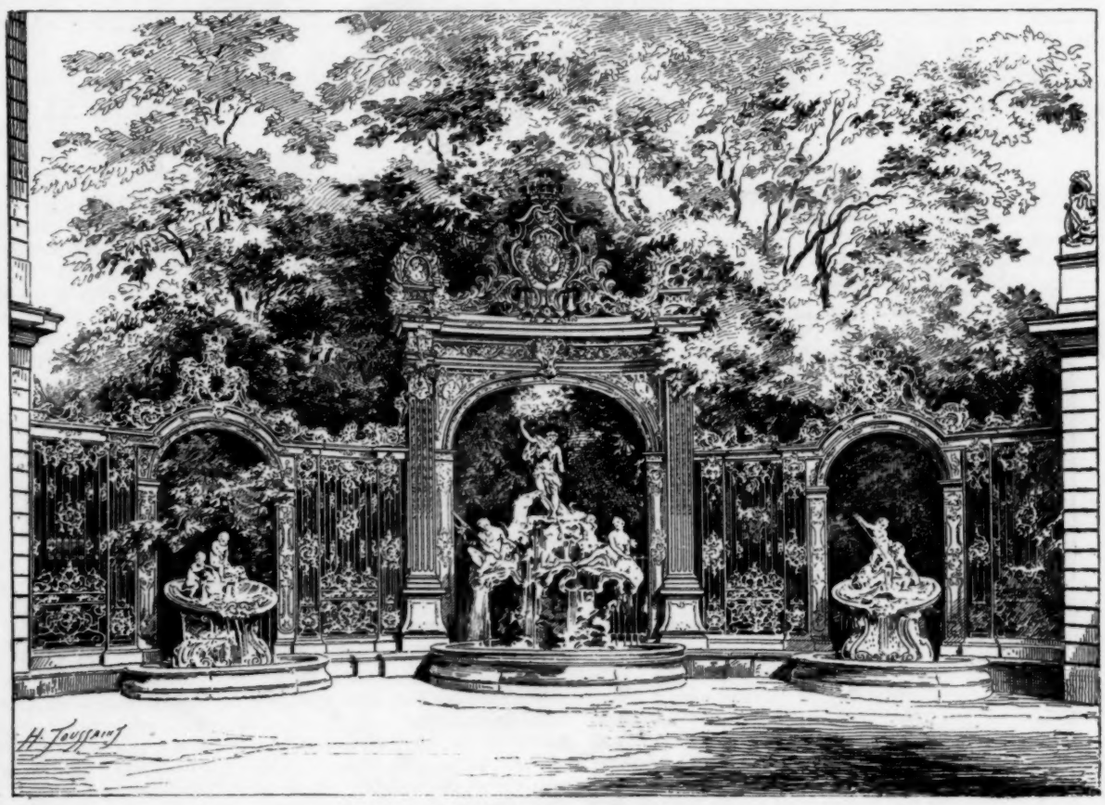


Fig. 32. Fountain of the Place Stanislas, Nancy.

edifices ceased to be the only ones studied; researches were pushed into Greece, and books appeared in which the Grecian monuments and ruins were minutely illustrated.

The Revolution did not divert this current of ideas; during its sway the style of costumes and the forms of even the smallest objects of art were borrowed from the Greeks and Romans. When the Empire came in, France believed that the days of the Roman Empire had returned; therefore, the chief aim in the construction of monuments then was the revival of Roman monumental art, and no heed was given to climatic or social differences. This was the period when Percier and Fontaine were employed to continue the Louvre and to erect "to the glory of our armies" the Arc de Triomphe du Carrousel; it is a faithful copy of the Arch of Septimius

Severus in the disposition of parts and almost in its proportions, but the decorations bear evidence of a more modern spirit.

The same year (1806) which witnessed the beginning of the Arc de Triomphe de l'Étoile also saw the foundations laid for the Colonne Vendôme, an imitation of Trajan's Column. All these triumphal monuments were designed to commemorate the glory of France. It was also proposed to rear a temple to this glory on the foundations of the Church of the Madeleine, work on which had been suspended. But, on the downfall of the Empire, the famous temple was restored to its original purpose.

Fig. 33. Opera-house, Paris.

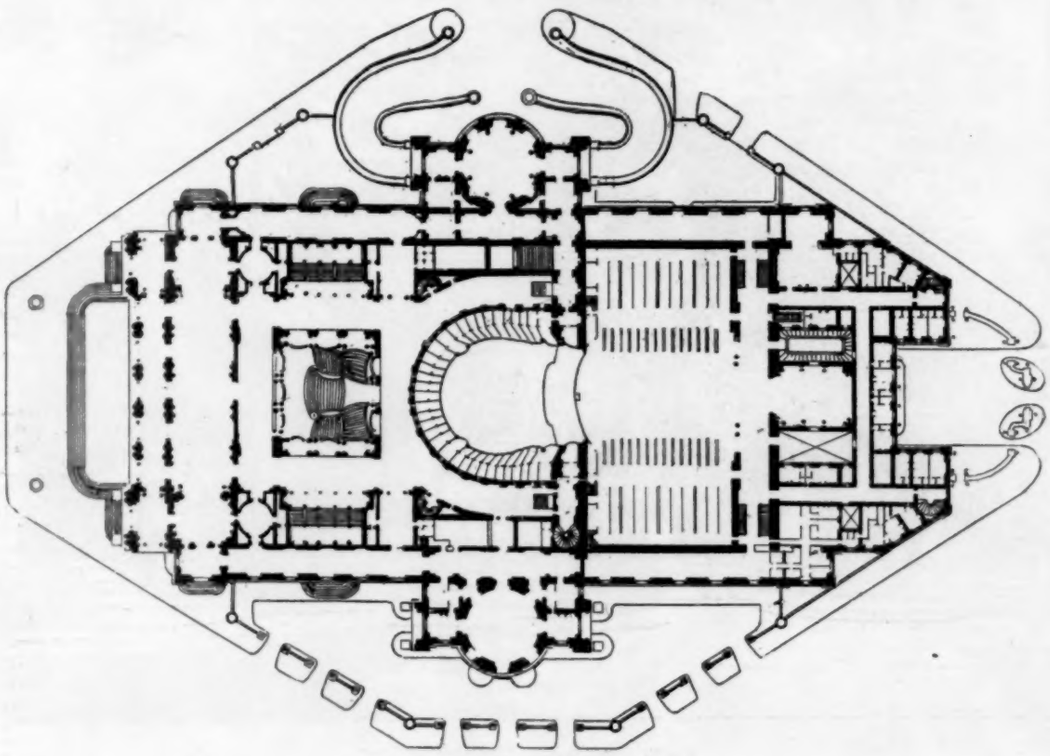
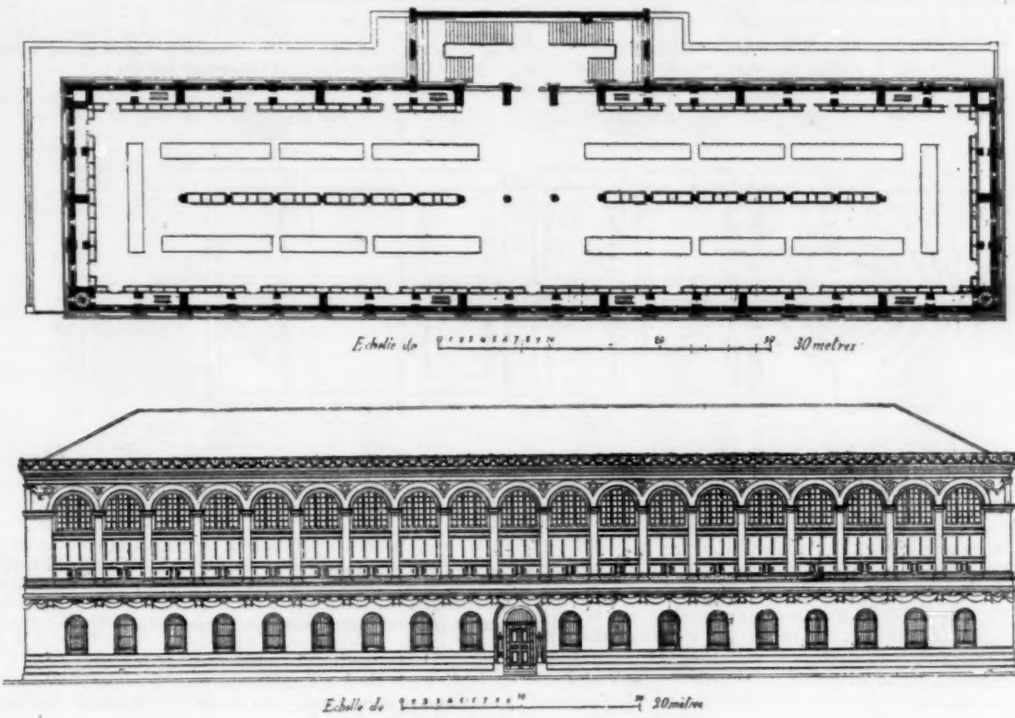


Fig. 34. Plan of Opera-house, Paris.

All the important edifices of this period are either surrounded by Corinthian porticos or adorned with peristyles of the Corinthian order. As a counterpart of the façade of the

Temple of Glory we have the peristyle of the Palais Bourbon, and, in the centre of Paris, the lofty colonnade of the Bourse, a structure inspired rather by antique temples than by the Roman basilica. The Bourse proves that "Glory" did not have a monopoly of architectural genius. Napoleon, while winning battles, at the same time devoted himself to the great interests of State. A large number of public works were executed during his rule: markets, consisting of vast galleries running around a court, like the Market St. Germain, were constructed, as well as *entrepôts*, like the *entrepôt* for wines and brandies; bridges, like those of Austerlitz, Jéna, la Cité court-houses, barracks, hospitals and prisons, and the interior arrangement in each case had to answer the needs of the time.

The Second Empire continued this work, at the same time giving it a new impulse. The external simplicity of the buildings of Louis Philippe's reign were superseded by decorations, often in bad taste, made of pilasters, escutcheons, wreaths, medallions and cartouches. Pulled about in all directions, drawn toward archæological studies by the works of De Caumont, Du Sommerard, Mérimée and Viollet-le-Duc; torn asunder by the advocates of the Classical, Neo-Grec and Gothic styles, and at war with new elements of construction,



Figs. 35 and 36. Library of Saint Geneviève, Paris.

and les Arts; canals, like those of the Ourcq and Saint Martin; reservoirs, like the Bassin de la Villette; public fountains, new sewers and cemeteries.

The Restoration presents a period of stagnation after this return to ancient traditions. It essayed the completion of the important unfinished constructions of the Empire, but no new ones were undertaken. However, with the advent of Louis Philippe to the throne and the establishment of a sound financial basis, a large number of public edifices sprang up all over

architecture struggled along, feeling its way in multitudinous attempts. In the midst of this architectural eclecticism efforts were made (and this was the real tendency) to indicate by the divisions of the façade the internal arrangements and to show the destination of the different stories in the character of the decorations and the piercing of the bays. In the Grand Opera-house, M. Charles Garnier boldly denoted in the façade the three principal divisions: foyer, audience-hall and stage (Figs. 33, 34).

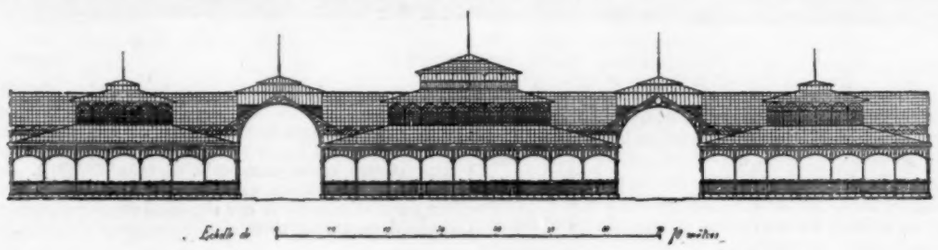


Fig. 37. Halles Centrales, Paris.

France; in all these the architectural elements were borrowed from Italy. An illustrated work by Le Tarouilly, entitled "*The Edifices of Modern Rome*," had recently appeared, which powerfully influenced the architecture of this period, but the plans had to respond to new needs. The great institutions founded by Napoleon in view of the centralization of all powers had not died with the Empire. The reorganization of the political and administrative machinery, and new laws concerning public instruction, justice, the army, sanitation and public safety called for a vast number of new structures — ministerial buildings, prefectures and sub-prefectures, lyceums and colleges, communal and government schools, museums,

But it was notably in the interiors that modern demands had to be met, and it must be admitted that extraordinary architectural skill was displayed here. The use of iron made it possible to span wide spaces without intermediate points of support. Labrouste had already employed this material in the beautiful hall of the Library of Saint Geneviève (Figs. 35, 36), and he employed it later on in the National Library; Baltard used it exclusively in the construction of the Halles Centrales (Figs. 37, 38). Thereafter all exchanges and markets, all vast exhibition-rooms and great government halls were destined to be built of iron.

Again, the establishment of railroads called for the erection

of structures of a special nature, and in these the use of iron became general. Such buildings as passenger-stations (Fig. 39), freight-stations, storehouses, car and locomotive shops and other buildings, all designed for special purposes, extended the realm of architecture and opened up new horizons to the art of building.

There was also a complete alteration in domestic architectural forms with the accession of the *bourgeoisie*. Instead of dwellings for a single family, the tenement-house was instituted, in which every story contained one or even several complete suites of apartments. Such buildings becoming a money investment, their construction went into the hands of speculators, who pushed the work with deplorable activity.

What will be the fate of art thrown into the power of wild speculation? No heed seems to be given to this question.

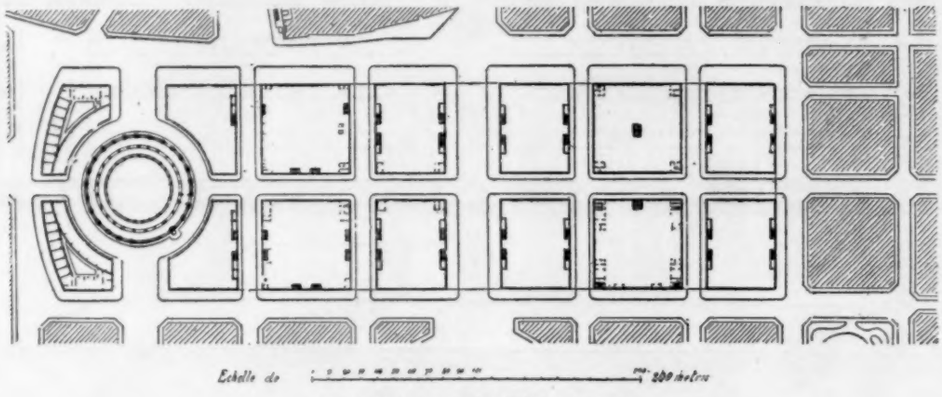


Fig. 38. Plan of the Halles Centrales, Paris.

A few artists are still to be found, who are defending the domain of domestic architecture, step by step, against the invasions of the money-making interest, and who are seeking to discover the architectural expression adapted to the needs of society as now constituted. Without yet wholly abandoning the tenement-house system, they are putting up small *hôtels*, on which much talent is exercised. Entire quarters of Paris are being covered with these pretty dwellings, which give them a unique and picturesque character. All styles are to be found there side by side, more or less happily adapted to the Parisian customs; all sorts of materials are used in the construction,

Fig. 39. Gare d' Orléans, Paris.

their varied hues glowing in the sunlight. What will be the outcome of all this effort? We must seek the answer in the future.

Civil and domestic architecture has never been called upon to respond to so many or such diverse demands as are made upon it to-day. In the past, the demands have been in most cases triumphantly met, due heed having been given to hygienic requirements, as well as to the choice of materials and fitness of arrangement. And now let greater care be exercised concerning the character to be stamped upon the exteriors; let there be a profounder study of their proportions and a purer taste in details, and the civil architecture of our time will find nothing to envy in that of past centuries.

G Guicestre.

The Light-house at Housholm. — The new light-house at Housholm is the most powerful in the world. The beam is of 2,000,000 candle-power, and shows clearly at Blokhus, a distance of thirty-five miles. It is produced by arc-lamps fed by De Meriten's dynamos, driven by steam-engines. To prevent the extinction of the light through an accident to the machinery the latter is duplicated, one set coming into play should the other fail. The light is further supplemented in thick weather by two powerful sirens, or fog trumpets, working with compressed air. — *Metal Worker.*

NOTES RELATING TO CONCENTRATED RESIDENCE IN VARIOUS COUNTRIES.[1] — I

In our issue for August 10, last, we published what we understood to be a complete tabulation of the results obtained by Mr. E. T. Potter in his interesting studies on the possibilities of concentrated residences, but it seems that we were only furnished with a portion of the material and it becomes desirable to reprint it with Mr. Potter's discussion of each statement of the tabulation.

CONCENTRATION: —

1. *In Rows.*

It allows of being Built in Rows; *i. e.*, with each Dwelling enclosed between two others.

This differentiates this System from: — All "detached" or "semi-detached" dwellings, such as most Farm-houses, Country-houses, Villas, and other rural and suburban dwellings in the United States, British Kingdom and Colonies, and parts of Continental Europe.

We find the farming population of Italy, and some other parts of Continental Europe, dwelling in city-built villages and towns which often combine most of the faults of cities with but few of their advantages. In the Tyrol, large numbers of the isolated châlets are, in fact, tenement-houses containing several distinct families.

2. *In Stories.*

It allows of Placing Families one over the other in Stories.

This differentiates this System from: — All dwellings intended for but one family under one roof.

Houses, whether large or small, planned for but one family, are the rule in England, where the head of the family is also the head of the house or householder; and householders, until recently, were alone allowed to vote. But many householders take lodgers who are more or less independent, and usually occupy the best parts of the house. Where a family and servants, or a family and lodgers fill a many storied house completely, or even crowd it, there a form of concentrated residence exists. Yet a system which gives all the best parts of a house to one class and the worst parts to another, is unsuited, because of these distinctions, to general use.

HEALTH: —

3. *Direct Light.*

It gives Direct Light in every Room.

This differentiates this System from: — All dwellings which contain any rooms lighted solely from other rooms, or from "shafts" or "wells" of light.

Light and air shafts are usually, in Paris and New York, of one size throughout their height; but in Italy they often increase in width, though in an irregular way, with each story as they ascend, so as to secure more light to the rooms lighted from them. A similar careful securing of the most possible light, while giving up the least possible space, results often, in London and New York, in a similar irregular funnel-shaped cross-section to the space left for

[1] The portion of the table to which each note is an appendix is here repeated before the note.

light and air at the backs of the houses. Such funnel-shape of the cross-section of the light and air space is usually the result of after building, of various forms of rear extension, on the ground and lower stories. In the profile of Paris attics and roof lines which, by civic requirements, are kept back to give more light in the streets, we have an example, somewhat more remote, of the same form, by first intention. An instance of this term is seen in the profile of the house tops of this System; and the space taken by the enclosed entrance-way takes the place, or rather space, of a ground-floor extension. Where stores or other large rooms occupy the ground-floor and basement, or where the plans of apartments or dwellings admit of reduction of size or number of rooms as they ascend, a further advantage can be taken of the funnel-shaped section for the light-space, giving greatest width at the top, where the light enters, and where rooms, except in elevator buildings, are least in demand.

4. *Good Air.*

It gives the best Air at the Site.

This differentiates this System from :— All dwellings which have any rooms which get air solely from other rooms, or from close-bottom courts, shafts, wells, etc. ; which air is therefore liable to be foul, because stagnant, or vitiated, or bearing smells or germs of disease, etc., from other dwellings opening into the same shaft or court

The *patios* of Seville open to the street by a passage closed only with a grille, affording thereby a carefully arranged and attractive, but often deceptive, glimpse of their too-often cramped and mean interiors. The carriage courts of most fine Paris apartment-houses open to the street by driveways usually left open except at night. The absence of sun cools the air enclosed in the patio or court, so that it falls and escapes, by an outward draught, through the passage or driveway. Such a downward movement and consequent change of air is obtainable through most courts and shafts if they are left open at the bottom. But this fact, and its importance, is not generally recognized or taken advantage of.

The value of space in cities leads also to making use, on the lowest floor, of space left open in the upper stories for light and air; and the ease of lighting a single story by a skylight leads, except where hot weather is almost constant, to roofing-over such space on the lowest floor; so that the smaller courts and wells of light in Paris and many other places, usually only commence above the ground-floor. If the skylights at the bottom of the shaft or court, or any of the windows on its sides, are left open, and there is a further escape, beyond them, for the air, a downward draught is generally felt, which empties any bad air in the court into or through the apartment or dwellings to which the opened window belongs. Windows opening into such small close-bottom shafts or courts, are, therefore, in Paris, generally kept carefully closed, the air in the court or shaft being considered unhealthy. The advisability of leaving such windows open where a person is sleeping is especially to be questioned, unless indeed so strong a draught is kept passing through the shaft as to insure the constant changing of the air.

Isolated examples of inside sleeping-rooms, the result of after-building or original bad planning, are to be found, even in rural districts, in the United States, Switzerland, the Tyrol, etc.; and such rooms are numerous in the cities, and especially in the old and once fortified smaller cities of the European Continent; but, in New York, and wherever deep, close back-lots, like those in New York, have been adopted, and largely built on, such rooms tend to constitute, or already constitute, a majority of the sleeping places.

Horizontal air-ducts, separate for each dwelling and room, and affording easily controlled direct air and ventilation are shown, in connection with the bath-rooms, on an application of this System published in the *American Architect and Building News*, October 15, 1887; but are not shown, because not required, in some other applications of this System. Such ducts, for ventilation, might with great advantage, be introduced, in most cases of existing inside sleeping-rooms, bath-rooms, etc.

5. *Thorough-Draught.*

It has a through-and-through draught of air at command through every Dwelling.

This differentiates this System from :— All dwellings whose windows all face in one direction ; or which from any cause, lack command, at pleasure, of a through and through draught of air.

The plans of many old palaces show suites of rooms without command of a through-and-through draught of air. In Paris, many fine apartments (*i. e.*, dwellings) have all their windows facing only on the street, and so all facing in one direction, while behind them, on the other side of their rear wall, are equally fine apartments, wholly distinct and occupied by other families, which have all their windows facing in the opposite direction, on a court or garden. Through such apartments, no thorough-draught is possible; but in the Paris climate, a degree of heat which makes thorough-draught in New York not only a luxury but often a necessity to comfort is rarely, if ever, felt. The value of thorough-draught in the further matter of ventilation, is shown by the following, extract from "The Tenement-house Problem" by the President of the Health Department of New York: "If there is not a through-and-through ventilation provided to the external air for each set of apartments, the number of cubic feet of air-space allowed for each adult is 600 cubic feet, and for children, 300 cubic feet; but, when proper means for ventilation are provided, the number of cubic feet required is reduced to 400 for adults and 200 for children." [Tenement-House Act, of 1887. Chap. 84, Sec. 664.]

6. *Sunshine.*

It gives Sunshine in every Dwelling.

This differentiates this System from :— All dwellings which, from their position or plan, are deprived of sunshine in winter, or throughout the year.

The planning of the streets which radiate like the sticks of a fan from the open plaza in front of the South Gate, the Puerta del Sol, in Madrid, secures sunshine to those streets, in succession, throughout the day; but the sun's rays are thus so nearly in line with the flat fronts of the houses that but little sunshine gets beyond their thick walls into their windows; while behind the rooms having those windows, are other rooms and other dwellings, which have windows only on courts, into which the sun, in winter, when sunshine in Madrid is most desired, rarely penetrates very far owing to the height of the houses and the obliquity of the sun's rays at that season.

This suggests that planning not to shut out sunshine must be further followed, in order to catch sunshine, by placing the windows as nearly as possible at right angles to the sun's rays at the hour and season when sunshine in a dwelling is desired; and that, further, the depth of wall, or embrasure outside a window, not so at right angles, should for a like reason, be reduced as far as safe construction will allow. Still further, where balconies are introduced, the obliquity of the sun's rays in winter is taken advantage of, where their position and projection is just such that they do not shut out sunshine in winter from the windows of the dwellings below them, yet shade those windows from the hot sun of summer, when the sun's rays at noon are nearly vertical.

7. *No Overshadowing.*

It provides against Overshadowing from similar Buildings.

(See section on a Diagram illustrating this System in the *American Architect and Building News*, October 15, 1887.)

This differentiates this System from :— All systems of planning of groups of buildings in which the prevention of harmful overshadow from similar buildings is not considered and provided against.

Apartment-houses, in the newer parts of Paris, are very generally seven stories high (if we include both ground-floor and attic) and are usually without elevators. A few having elevators exceed this height. Except in public buildings space below the sidewalk is, or was until recently, rarely used in Paris, except for storing wine, fuel, etc. In London, private houses vary greatly in height; but five and six stories above the sidewalk are common, including the attics; and in addition they have a kitchen-floor nearly, or quite, below the sidewalk level. There are many hotels and a few apartment-houses in London which have elevators and are far higher than elevator buildings in Paris. In New York, five stories, not including a basement partly or wholly below the sidewalk level, are very common for buildings without elevators. While buildings with elevators are often more than double that height. The general introduction of elevators, between 1860 and 1870, put an end to the limit as to height before that put on most buildings used as dwellings, by the fatigue of mounting on foot. That limit removed renders uncertain the amount of overshadowing or deprivation of sunshine, which, at any time, one building may inflict on another unless restrained by legal enactment. This led to the studies resulting in the section shown on a Diagram published in the *American Architect and Building News*, October 15, 1887, founded on the inclination of the noon shadow on December 21, at New York, and supplemented by a table of the inclinations of a like shadow at other principal cities.

8. *Conformable to the Health Laws of New York.*

It conforms to the Health Laws of New York.

This differentiates this System from :— All plans which, however otherwise excellent, cannot be made to conform to the letter, as well as the spirit, of the Health Ordinances of New York.

The Health Laws of New York are necessarily founded on the street and lot system, said to be adopted in 1807, and now covering most of the area of the city; and are thus, an effort to combine the unexpected and inevitable results of that system with established principles of hygience by compulsory statute, so far as they can be combined; and to prohibit such results as cannot be so combined. A great and costly police task, following on hazardous solutions of delicate and difficult problems (not present in cities where such a system of arbitrary interference with freedom of exchange in land has not been thoughtlessly adopted), is thus made necessary. All land in the city not taken for streets is divided into lots, all of one size, *viz.:* twenty-five feet front, by one hundred feet deep. The lots stand in rows, and back to back so that entrance can only be had in front. It is said that it was expected that this would give not less than one lot to each family for a house and garden. Owners could not easily alter the depth of a lot, nor readily sell off a piece at either end as that would cut off access to the rear end. So lots were, and are divided in the only way thus left, and lots of all widths of front, from twelve-and-a-half feet, or less, to twenty-five feet are common; but all these remain of their original depth. Rooms under twenty feet deep are found, in all countries, usually more profitable than those deeper. Two such rooms, back to back, so that each may have light, one with windows on the street, the other

with windows toward the rear, are found in all countries the most convenient and profitable arrangement. But as a house, thus two such rooms deep, would leave more than half a lot one hundred feet deep vacant, a second house on the same lot, entered from a passageway through the first, soon came to be common in New York. And when, from motives of philanthropy, these rear buildings were discountenanced, because they shut out too much air from the rooms, the owners made the front house four such rooms, or more, deep; so that all but the front and rear rooms had no air or light whatever, except such as entered through the doorway. "Often there were as many as ten interior rooms, and sometimes twelve, on each floor, with no means for ventilation other than by doors leading to them from the outer rooms. At night when the rooms were occupied and privacy required the closing of the door, they were utterly dark and without means for ventilation." [Report, 1887, of President Bayles, of the New York Board of Health.]

COMFORT: —

9. *Privacy.*

It furthers the Privacy of each Dwelling by providing it with a private Dumb-waiter and, in connection, with it, two private Cellars (one for food and one for fuel), and a private clothes drying and bleaching space; by the absence of corridors; and by the prevention of overlooking from the windows of adjoining dwellings.

This differentiates this System from: — All dwellings which lack these, or compensating, aids to privacy; and differentiates it in proportion to such lack.

Most houses in Philadelphia and some other American cities, and many houses in London and elsewhere, have entrances both front and rear; the front entrance for visitors and for the principal members of the family, especially on ceremonious occasions. And the rear entrance for the taking in of supplies, the use of servants and others, and for the removal of ashes and garbage. Access to the latter is had usually from passages between the rear walls or fences of gardens and back yards, or from courts, alleys, or small streets which lie behind the larger streets on which the houses front. In New York, and with many houses in London and elsewhere, such back entrances, and passages or alleys to lead to them are unknown; and their place is usually taken by basement entrances under the main entrance of the house, and entered from a small area sunk a greater or less distance below the sidewalk level.

In the more expensive apartment-houses and flats in Paris, New York, and elsewhere, the apartments or dwellings on each floor have two entrances; access to their front entrances being given by a main staircase, and a second and smaller staircase giving access to their rear, or kitchen entrances. The less expensive apartments or flats, however, in Paris, and elsewhere, very generally have but one entrance, by which, and the staircase leading to it, all persons and supplies enter; and by this staircase all ashes and garbage must be carried out, unless, as in a very few instances in New York, a shaft or shoot is provided, down which ashes and garbage can be thrown into a common receptacle below, to which the janitor, or ash-man, has access, to carry it away.

In many New York flats a dumb-waiter takes the place of a second or service staircase, for bringing up fuel and other supplies, taking linen to and from the clothes-drying place on the roof, and for taking away ashes and garbage. A space considerably larger than is required for a good-sized dumb-waiter of this kind for the use of all the families in common, but smaller than is required for a service staircase, will give a small private dumb-waiter to each family, communicating from the dwelling with the cellars and basement, and with the clothes-drying floor, and arranged with shelves for different uses.

10. *Laundry Facilities.*

It gives private Laundry facilities to each Dwelling.

This differentiates this System from: — All dwellings which lack private facilities for washing, drying and bleaching.

The practice of washing clothing and linen in the shallow parts of rivers and in small streams, usual throughout Southern Europe, is well-known; and the lavatories of the larger cities, in which any person may, for a very trifling sum, hire the use of a little stall fitted with appliances for washing, have often been described. The publicity of the open air streams and having to wash bending over, while kneeling on the often wet soil, gravel, or stone, of the bank, or on boards or platforms laid or moored there, and the semi-publicity and sometimes rough company of the lavatories, confines the use of either mostly or entirely to poor women and professional washerwomen. Yet the best European hotels usually find it necessary to forbid ladies, who are their guests, washing and ironing in their rooms. In Paris and in many parts of the European Continent, the family washing is usually "put out." The convenience of this, for those who can afford it, is undeniable. The disadvantages — the inevitable using of the same water by successive washerwomen along a running stream, or the scant supply of water, at some seasons or on occasions, in the lavatories; the uncertainty as to contact with the clothing of others, and perhaps of diseased persons; the temptation to use chemicals which whiten but rot the linen; delay in receiving back laundry-work or the loss of some of it — are also evident and suggest providing, particulary for small and economical families, complete and private laundry facilities, even where they must be very limited in size.

In Paris, the plans, as a rule, of only a few of the most splendid private dwellings, show laundries, or laundry facilities of any kind. But the old palaces of Florence frequently show a clothes-drying loggia, under the roof, but open at the sides. Such in principle is the arrangement proposed for this System. Each family has a space divided from similar spaces by light louvre partitions that screen the view while admitting free passage of air, and can be further protected by wire netting, if required, and which are open at the end; where, too, a portion of the space is left open to the sky for bleaching. The nearly flat roofs of New York apartment and tenement houses are now very generally used for clothes-drying spaces; the different families of the house having exclusive use of the space on successive days. Civility and mutual accommodation, as well as honesty are the rule. But in bad weather, inconvenience is necessarily often felt. With small families living in small apartments, it may be often more convenient, especially where no servants are employed, to have always at command, a small well-screened private drying-loggia, and a private dumb-waiter by which the clothing and linen can be carried unseen to and from it.

The heat and other inconveniences of doing a large wash in a small tenement have led, in New York, to many of the new tenement-houses providing a laundry in common where the washing can be done. Such a laundry is readily combined with this System for those who prefer it. [See in this connection, plans for Tenement-houses by the author, described in the *New York Tribune*, December 3, 1866.]

[To be continued.]

STRAY THOUGHTS FOR YOUNG ARCHITECTS.[1]

IT is very gratifying to feel that the profession in this country was never more flourishing and promised a more satisfactory future than at the present time, and that our architecture is attracting, from all quarters of the globe, that deep interest and attention to which its great field of novelty entitles it. It is surprising how wonderfully rapidly it has advanced during the last quarter of a century.

Less than fifteen years ago we had but one purely architectural periodical published in the interest of architecture, as a stand-by to the profession. That same old periodical friend is still with us in the welcome pages of the *American Architect*, together with new and equally acceptable ones of acknowledged ability, all striving for the good and prosperity of the craft. Thirty-four years since, and the American Institute of Architects was organized with thirty-three members — for a long time, in fact until very recently, the only society of architects in this country. To-day there are many. And strong and enthusiastic should we feel with such good backing. Added to the list, coming in good array, cautiously, but resolute with confidence and hope, we celebrate the first special meeting of the new Department of Architecture of this old Brooklyn Institute.

Coming last it is expected we have learned something from the experience of others; and so we think we have. We have been gleaning all this time, that while there are many advantages in belonging to such societies as these, where men following the same vocation can enjoy the free interchange of thoughts which mould the structural beauty, and, by comparisons of appropriateness, give us courage and experience in the higher development of our art, that in order to draw still nearer to us and make more deeply interesting to the searcher after professional knowledge, the world of useful, noble things, which entwine strength with symmetry, and grace with utility, we have yet to make our efforts more practical by not overlooking those elements of our early teachings, *sine qua non* of practice,

Void over void,
Solid over solid —

An everlasting principle in building, which, when twisted into the every-day deviations of construction, is nevertheless a perversion of inherent truth and beauty.

And, again, every line we draw means something. Now, we should know what it is it means, before we make it. We gladly boast of our clever draughtsmen. We note the advancement of our art thereby. Artistically gratifying this is. But we are getting away from our usefulness, or else we are plunging into specialties. Out of the great number of young men who to-day are graduating in our polytechnic institutes, or from our offices, how few care to know how to build, how to lay out buildings, or direct their progress from trench to copings. We do not expect to find one person capable of excellence in all things, but we would like to see the pupil in architecture so taught that when his artistical pencil is portraying on paper, his practical judgment is weighing, balancing, and controlling it as well.

True nobility of character, aspiring for eminence in any profession, is never too proud to pay obeisance to the simple matter-of-fact rules which are the stepping-stones to success. Our famous men worked to win. They made their plans as well as they could,— perhaps were

[1] Paper read before the Brooklyn Institute, Department of Architecture January 22, 1890, by Walter Dickson, F. A. I. A., of New York.

assisted. But they never lost sight of the fabric which was to majestically arise from their plans. A building to them became a great yet permanent responsibility, and *they* rarely dreamt of getting around their buildings with swallow-tail coats and ponderous walking-sticks. They wanted to see — to know — for themselves, and they did, and pushed on, engrafting with their love for their art the thousand experiences obtained from a general knowledge of the many trades they acquired, which made them in time master of the situation as far as such a thing was possible.

Now, in the course to be pursued in this Department of Architecture: Do not let us stray too far away from these practical things, which, while we desire to cultivate the very highest order of designing, drawing, or planning, are so necessary to the useful architect. For where is there a more useful man than he who can plan and intelligently direct the construction of a great and magnificent building? Let the papers to be read be plain. Let our instruction be more from objects than anything else. Let the model or the stereopticon disclose to us, almost as we would see with our own eyes, all things useful, worthy of remembrance. There is no honor in knowing or doing as much as other men, but there is honor in knowing and doing more. We must work to improve, and improve that we may work. Most men born with the ordinary faculties and endowed with the power of reasoning and discrimination can, with application, succeed in the majority of professions.

Poverty is no longer any bar to advancement when there is indefatigability, but rather a stimulus to exertion. The study of building after the approved modes and requirements is not a mystery. The rules are based on common sense, easy of analysis. There is an invincible law in every portion, and that law is simplicity. Now, to begin right is half the battle won. Let us so strive to impart to others the possibility of attaining superiority only when we have become familiar with the structural first, so that if eminence ever overtakes us, we know we have achieved it on solid ground.

SPIRES, TOWERS AND DOMES.[1] — I.

FROM the earliest recorded times the greatness of man's mind in the material world has sought expression in lofty erections. In the futile endeavors of the descendants of Noah, 2247 B. C., to outwit the anticipated wrath of an awful Deity by the erection of Babel's tower, and in the more successful efforts of mankind in other lands and in later centuries, we are conscious of the existence of a sentiment that finds expression in the erection of buildings that point upwards and away from this worldly world. China, India, Asia Minor, Northern Egypt, the Moorish lands, Italy, France, Spain, Germany, our own country have reared many and glorious examples of spire and tower design, but, strange as it may seem, we turn to Greece, the fountain-head of architectural refinement, for an example, and we find it not. The Grecians, a race gifted beyond measure, intellectual to a degree, ultra-refined, almost divine in their artistic feelings, failed to rise above the worldly horizontality of architrave and cornice.

We have seen the campanile development of Italy, with all its wealth of detail. We are familiar with the solid, sturdy growth of Gothic tower architecture in Northern Europe. We are conscious of the beauties and delicacy of the French treatment. But, with all this knowledge, where can be found towers and spires to equal in boldness of conception, grace of outline and beauty of detail the Gothic, aye, and even many of the Classic towers and spires of this our own country? The sequential development of English architecture, as exemplified in the ancient ecclesiastical buildings of the Gothic style, is exceptionally marked by the development of spire and tower design.

In reviewing the history of spires our attention for strong reasons must be confined to English forms and English construction.

The simplest form of spire conceivable is the four-sided pyramid rising from the square tower with its sides parallel to those of the tower and overhanging them, forming slightly projecting eaves upon a corbel-table. Southwell Tower is an example. In the Romanesque period the spire has its first true conception. Thaon Church, Normandy, with a masonry pyramidal termination, in height about one and one-fourth diameters, and a steeper one at Valladolid, with a height of two and one-half diameters, undoubtedly embody the spire principle.

In the Early Gothic of this country spires obtained a firm hold on English church-builders, beginning with the octagonal pyramid and its attendant broaches of masonry springing from the angles of the usually square tower and butting against the splayed side of the octagon.

From the simple broached spire we turn to an important change: instead of the spire projecting slightly beyond the faces of its tower base, it sprung from a base area entirely within the edges of the tower. This modification opened up a wide field for elaboration, which was taken full advantage of during the Decorative period. Beginning with the parapet simply, followed by a combination of parapet and broaches; parapet and pinnacles; parapet, broach and pinnacles; parapets and angle turrets, elaborated again by double pinnacles; and, finally, by the introduction of miniature flying-butresses springing from the pinnacles or turrets, and abutting against the splayed sides of the spire. The mediæval builders in this period produced spires of complicated design and elaborate detail contrasting with the effective simplicity of the early broached spire in a very marked manner.

In the early part of the Perpendicular period, the spire had reached its highest state of development and elaboration; spires were constructed from a vertical polygonal drum standing upon a rectangular tower; the surface of the spire was in some instances enriched with cusped panelling. Crockets had free play on the minor turrets and pinnacles at the spire base and up the ribs of the spires themselves. Ornaments and features were crowded on until the zenith of spire-design was reached. Then the reaction came, and square towers were once again generally erected without the superincumbent spire. The decline did not occur, however, until some very beautiful examples of each of the different kinds here scheduled were left to tell their tale.

There are some unique combinations of spire and tower in the minor English mediæval parish-churches, among which may be mentioned an octagonal spire springing from a tower of octagonal plan from base to summit. The same accompanied with angle turrets springing directly from the ground, of which there are examples at Stanwich, Northamptonshire, and at Wickham Market, Suffolk.

It would be difficult, indeed, to specify the date of the erection of the earlier tower in Great Britain, and what were the exact reasons that prompted its erection. Reasoning upon probabilities, we may arrive at a tolerably reliable conclusion in the latter case.

The tower, rising as it does above the general height of the buildings reserved for the common use of mankind, possesses physical preeminence which naturally suggests its erection in those positions and amongst those buildings which require accentuation either to indicate their positions from afar or to testify to their public or private importance.

The towers of mediæval times in secular buildings served for a look-out, as a refuge, and as a place of vantage in troublous times. There are a few ecclesiastical towers having some quaint legends and curious histories associated with them. Of these the tower of Boston Church, Lincolnshire, (in itself a magnificent example) has been immortalized by the writings of Jean Ingelow: in romantic verse the poetess has told of the pealing forth of the bells in the church tower at a time of particular danger from floods. Many human beings were drowned who were not able to take advantage of the periodical warning rung out from the bells of the Boston tower.

There are numberless reasons given for the erection of towers in connection with ecclesiastical edifices. Archæologists assure us that the chief ground for erecting the tower was to procure a position for the hanging and ringing of bells. Now, it is asserted that bells of large size were not cast until a date long after large, massive and high towers had been in existence for a lengthy period. This fact rather destroys the idea of bell-raising being the prime cause for ecclesiastical tower-building. Certain it is there were many causes working together to justify the erection of towers for one or other of the purposes enumerated. Towers may form a valuable artistic addition to a fabric, and some may serve a purely utilitarian function. There is a further class, the claim of which to existence it is difficult to define.

As a nation's architecture is mostly measured by the standard of its ecclesiastical work, so must we turn for the best examples of tower-design to English and foreign minsters, priories and cathedrals. At the outset it will be well to notice the positions of the tower in regard to the body of a cathedral or minor edifice consecrated to divine worship.

In the southern countries of Europe the tower was frequently detached entirely from the main building — a notable instance being Pisa. It has been suggested that the fear of the vibration set up by bell-ringing in the tower prompted the arrangement. It is to a more powerful reason, however that we must look as the cause of so marked a feature in church planning. The builders of Italy, for instance, in erecting a tower, never appear to have been satisfied unless they produced walls ten feet thick and upwards. The excessive weight of such construction brought abnormal loads upon the foundations, producing subsidence, and it is to this fact (not fully appreciated then, nor has been properly understood since) that we must look as the reason for the isolation of the tower. A settlement (no uncommon thing) due to the great weight of the tower would have entailed disaster and ruin on the cathedral if the tower had conjoined with the general structure. A diagram on the walls with a little subsequent explanation will bear out this view.

The position over the crossing of a church, as the site of the tower, can scarcely be improved upon, combining, as it does, the

[1] A paper read by Mr. Sydney Beale before the Architectural Association, January 3.

essential advantages of a centralized position — all the component portions of the church leading the eye of the observer up to it when seen externally. In view of the modern tendency in church planning to reserve a large congregational area about the preacher, this central tower affords every facility for the effective lighting of a portion of the church usually in the dark.

Of the important English examples of this kind that occur to the mind are the cathedrals of Salisbury, Winchester, Norwich, Worcester, Gloucester and the Abbey of St. Albans.

Although the central position for the tower possesses many advantages over any other, to the unstable manner in which central towers have been constructed has been ascribed their removal to the west end of the nave in more modern instances.

We are assured by the architectural historians that the great inconvenience to worshippers entailed by the frequent works of reparation to the central tower brought about its removal to a position less contiguous to the area reserved for service. This fact may or may not explain the adoption of the western site as a very suitable one for a single tower; the principal point in which this paper is concerned is, that the ancient builders to whom, in other directions, we owe so much, did not erect their central towers with a sufficient regard to economy of material.

The western site, on the extremity of the longitudinal central line of the nave, is a very general position for the towers of the parish churches of England. The extremities of the aisles sometimes came right up to the front or west wall of the tower, thus flanking it on both sides one story high, and in other cases the tower stands clear of the main edifice, only joined thereto on the east side. It has been advanced that this latter is the proper arrangement for a single west tower, if it is to receive its full significance and importance.

There are other less-favored positions for the tower of an ecclesiastical building that may be noted. Of these, the least objectionable one is the transept site, north or south. Of the others, the position for a single tower to be most avoided is that to the north or south of the west front.

The otherwise fine tower of St. Mary Redcliff, Bristol, is to one side of the west front.

In England's cathedral towers are exhibited the respective values of each position. Chichester, with its central and detached tower; Ely, with its central and west tower; the two transept towers of Exeter; the three or more towers of Lincoln, Durham, Wells, York, Canterbury, Peterborough and Lichfield recur to the mind as showing combinations of towers that are peculiarly successful in their architectural grandeur.

The detailed consideration of tower-design in plan, in arrangement, in roofing and in its strict architectural treatment, cannot be done justice to on this occasion, and is therefore not attempted.

Each country has some peculiarity of arrangement: Italy, its circular and polygonal plans; Germany has the characteristic oblong plan — the towers, usually extending over the whole west end of the church, have been very aptly termed narthex towers; while of English towers the great majority are square, or very nearly so, in plan.

It is not perhaps just to bring the towers of various countries into review order for critical comparison, when it is remembered upon what widely differing agents their designers have relied to produce the architectural effect of the whole.

A tower that relies for effect upon the beauty and variety of the colored marbles used in its erection and embellishment cannot be criticised from exactly the same standpoint as the tower that relies upon its fenestration for its effect, or with the tower that appeals to the eye by reason of its exceeding beauty of outline.

The one when viewed as a distant object in the landscape may well suggest the pumping-tower of a water-works, and its beauty will not be appreciated without the aid of a telescope. This tower must be viewed from the area immediately around its base, while the beauty of the other towers may be seen miles away.

We may each have our own sympathies directed towards the tower-design of a particular age, style or country. But there are good grounds, patriotism aside, for maintaining that of the towers and spires remaining from the mediæval ages, in which may be seen grand conception with artistic detail, the erections of Northwest Europe, and particularly of our own country, must stand in the first rank.

Unfortunately, many a beautiful spire has been lost to us forever, their ruin and fall arising out of ignorant construction and misuse of material — an evil extending into later and even current times.

The Norman period of English architecture is in this country looked upon with peculiar reverence, due perhaps more to its romantic associations than to its incipient beauty. Now, whatever æsthetic value there may be wrapt up in the massive grouping and rude ornamentation of Norman work, certain it is that there was in this period, and later, an extraordinary prevalence of bad construction, to which is traceable the ruin of many a fine abbey. The evil effect of it is even felt in this century, and arises in some such manner as the following: Contemporary church architecture is not much valued in these days unless a precedent can be stated for each arrangement and each detail of it. It is rank heresy to some minds if the forms and modes of construction now adopted cannot be traced to by-gone times. But the designer who draws upon mediæval ages for the basis of his nineteenth-century churches must be capable of winnowing the husks from the golden grain.

Although no constructor would in these days build up the shafted piers of a church or cathedral with a thin casing of stone, of a thickness only sufficient to work its mouldings on, and then shoot in a loose rubble core, resting content with the idea that a pier had been obtained capable of sustaining the heavy superstructure of a central tower, with the thrusts from the contiguous nave-arching, still there are many peculiarities of Norman construction and constructive principles of later styles which are even now religiously followed, and which must subsequently be attended with no less disastrous results than those chronicled.

The evil prevalent in the building of many of England's fairest abbeys, cathedrals, parish and other churches, minsters and priories, has been the dangerous overloading of foundations and subsoil bottoms.

This is true of the general body of the cathedrals the author has investigated; the weight brought by nave walls onto the foundations approaching very nearly the supporting power of the soil as far as such strength can be accurately estimated. The evil of overweighted foundations is particularly marked in the locality of the towers, and most notably when the tower is over the crossing. Such an instance was the tower of St. David's, South Wales. This tower, forty feet square, and weighing over 4,000 tons, first failed by the bodily sinkage of its western side, crushing down portions of the nave, and generally upsetting the perpendicularity of its piers. The expenditure of 11,000*l*, remedied the want of constructive knowledge on the part of the original builders of this tower.

Failure not infrequently occurred at the west tower foundations, and it will be useful to inquire what are the agents generally at work endangering the stability of great towers. Such causes as badly selected materials (as in the case of St. Michael's, Coventry), of which there is a photo on the walls, taken before its restoration, is not now dealt with. First and foremost, the most destructive agent is the great weight of masonry in the tower itself cumbering the ground unduly; this overweight being sometimes further aggravated by a tall spire of heavy construction.

The presence of timber in the foundations, occurring as piles, is serving no useful purpose whatever, but subsequently decaying and endangering the superstructure. The tower of Ely Cathedral sank six inches from some such cause, occasioning, as can well be imagined, great ruin to the adjoining wings of the western transept, one of which was taken down and the other repaired. Although no actual mishap has occurred at York, a writer in 1846, remarking on the minster of that city, chronicled the fact that the tower stood upon very rotten foundations; they crumbled away at the touch, and could be easily probed with a crowbar. The consequence was that cracks appeared in the great tower.

To explain the constructive failure of so many of our fine cathedral towers, it has been said that the Normans erected their work upon the bad foundations of the pre-existing ecclesiastical buildings. This explanation shifts the blame from the Norman builders to their predecessors in these lands, whereas, investigation of the construction and detailed calculations show that enormous weights were piled upon a small area of foundation by the Norman builders, a conclusion which rather puts the boot upon the other leg.

It is, of course, possible to build very massive masonry to a great height on ordinary soil if the weight of such construction is evenly and sufficiently distributed over the soil. But what has been the method by which the great weight of many towers had been brought onto their foundations? It has been the almost universal rule to carry central towers upon isolated piers, these piers transmitting the many thousand tons' pressure upon usually four points of small area on the cathedral site, showing in some places a weight of five tons on the square foot, and in others twenty tons. The very nature of a central tower makes it necessary to carry the upper portion upon piers; but when this is done, the piers should be joined again into a continuous construction under the ground-level by the building of inverted arches of the same width as the upper tower walls, and further, they should be bedded in a wider base of concrete to sufficiently distribute the enormous pressure from the piers of a lantern tower. Some constructors go so far as to say that wherever an arch occurs in masonry or other work which tends to throw unequal weights upon foundations, an inverted arch should be built under the ground-line for each one in the wall above. In church work this system of inverted arches should be built between all the pier bases of the nave arcading, under the chancel arch, and in any other position in which a concentration of pressure is anticipated.

It has been remarked that failure not infrequently occurred at the west tower foundations. In this position, where one would think there was no reason preventing the carrying-down of the walls continuously onto the foundation, the walls in many cases are arched over and carried upon four piers at the angles of the tower, presumably with the idea of economizing the material that has been so lavishly bestowed up above, but with the sure result of precipitating the destruction of the fabric.

Bells have always been active agents in tower-destruction, both from their weight and from the strains set up by their movement and vibration. A rule has been published with reference to the necessary thickness of tower-walls intended to support bells, and it runs: The mean internal area of a tower should be one-half the external area, and then, if well-built and of good materials, the tower will safely bear as many bells as can be hung on one level. A calculation based upon this rule for a tower, say, of 40 feet side, produces

walls 6 feet thick, assuming its height at three or four diameters high, of which, with the weight of as many bells as can be hung on one level, will show a pressure of five tons on the square foot of soil. Add to this the possible weight of a spire, and such a pressure is put upon the foundation that it is little wonder failure ensues.

This particular rule takes no account whatever of the height to which the tower may be built.

Such rules commend themselves to the unwary by their simplicity, and yet the two or three minutes spent in a calculation of such a nature has brought about a world of anxiety, years of regret and, perhaps, professional ruin.

These errors of misjudged construction are not overrated in this paper. Examples known to the whole world testify to the truth. Whether it be the dome of St. Peter's, and the various modifications during erection that had to be made before a lantern was built to that edifice that could be relied upon not to bring the dome down with a run, the unfortunate cases of our own cathedrals or the many French and German collapses, they all point to the conclusion that the knowledge of and familiarity with the peculiarities, strength and capabilities of different materials in all the varying phases of construction is not on a par with the undoubted standard that has been attained in artistic architecture. The science of architectural construction is as far behind our excellence in æsthetic design as the medical knowledge is behind the surgical attainments of another profession.

The disparity arises in but one way. The student of architecture, either from want of guidance or from misdirection in his earliest years, attempts to produce drawings more or less artistic; he is tempted early to study the æsthetics of architecture; the study becomes engaging, even fascinating, until the whole soul is imbued with romantic tradition and architectural lore. It is easily understood how unromantic, even nauseous, the study of the science of construction and the strengths of materials, with their attendant calculations, must have become. A book of formulæ and figures is put aside with impatience, perhaps with disgust. The nourishment of practical knowledge is dropped for the narcotic of archæologism.

(To be continued.)

THE DIGHTON ROCK.

THE Royal Society of Northern Antiquaries of Copenhagen, through its Secretary, Sophus Miller, has deeded that ancient monument, Dighton Writing Rock, near Taunton, Mass., on east side of the Taunton River, in the town of Berkley, to the Old Colony Historical Society of Taunton. The deed has been formally recorded, and American savants and historians will look out for this world wonder, this tablet of fact, centuries hereafter.

Dighton Rock is of granite, 4 feet high above ground. Its length of surface is 5 feet 9 inches, its width 11 feet, and its weight ten tons. The lower part of the front of the stone is near the water. This side is covered with queer cabalistic marks and characters cut deeply, which many antiquarians and scholars believe to have been inscribed by the Norsemen under Thorfinn during their visit to America in 1008, nearly five hundred years before Columbus arrived here. In fact, this rock, of all the supposed relics of Norse origin furnishes in the estimation of the advocates of an early Scandinavian occupation of this country the best evidence in support of their claim. Many drawings of the inscriptions have been taken at various times, and some of them have been published in the most elaborate manner at Copenhagen in an elegant work on the "Antiquities of America."

The first very extended description of the rock appeared in the newspapers of America about 1807, when the traveller Kendall made a long investigation into its history. He decided then that the face of the rock toward the river was originally filled with sculptures, some of which had been worn away. The outlines were hollowed or cut in *intaglio*, and their breadth was generally less than an inch and their depth about half an inch. The whole general execution appeared to Mr. Kendall as barbarous. After viewing the rock and the sculptures, which, by the way, are so conspicuous that they were first seen from the deck of a passing vessel by the early colonists, Mr. Kendall found that the only solid history he could get concerning them was that they were found in their present place and condition by the earliest white settlers. But he found that although there was an absence of history there was not an absence of interesting conjectures, and that two opinions chiefly at that time divided the learned and the unlearned.

The unlearned believed that the rock was sculptured by the order of a pirate — "either Captain Kyd or Captain Blackbeard" — in order to mark the site of buried treasure, and the shore, the traveller found for more than a hundred fathoms on either side of the rock, had since been dug up in the hope of a discovery. The learned, Mr. Kendall wrote, are "attached to a Phœnician origin, and suspect that the Writing Rock may be a monument of the first navigators that passed the Pillars of Hercules. Indeed, they find the Pillars of Hercules among the sculptures."

Mr. Kendall at that time examined Professor Sewall's drawing of the rock, the second earliest made, and also saw the first, as well as others. He concluded that no perceptible decay had taken place in the rock for the last one hundred years, and this led him to decide that the sculptures were very ancient. He also rescued from oblivion the Indian tradition concerning the rock. This is, that in ages past a number of white men arrived in the river in a bird [boat]; that the white men took Indians into the bird as hostages; that they took fresh water for their consumption at a neighboring spring; that the Indians fell upon and slaughtered the white men at the spring; that during the fray thunder and lightning [discharge of cannon] was emitted from the bird; that the hostages escaped from the bird, and that the spring, now called White Spring, and from which there runs a brook called White Man's Brook, has its name from this event. Their inference from this tradition was that the rock, which is near the brook, is the monument of the adventure and of the slaughter of the white men of the bird.

When the Runic scholars saw the rock nearly one hundred and fifty years after Professor Sewall's first visit, they pronounced it a genuine relic. Professor Rafn, in the first flush of zealousness, gave to the world a translation of the antiquarian puzzle. He deciphered it thus:

> Thorfinn, with one hundred and fifty-one Norse seafaring men, took possession of this land.

The late Samuel Harris, a learned Orientalist, thought he found the Hebrew word Melek (King) in the characters on the rock. Colonel Vallancy, another scholarly man, considers the sculptures to be Scythian. Professor Magnussen supports Professor Rafn in the Runic theory.

An interesting allusion to the rock has been found in the Sloane manuscripts in the British Museum in London. In a letter to Sir Hans Sloane from Cambridge, Dec. 18, 1730, are drawings of the sculptures on the rock made by the Rev. Mr. Fisher and others, and also this statement: "There was a Tradition among ye Eldest Indians that there came a Wooden House (and men of another country in it) who fought ye Indians with mighty success. They slew their sachems. This shows that this monument was esteemed by ye Oldest Indians, not only very antique, but a work of a different nature from theirs." Advocates of the Norse theory of inscription regard this evidence as important, as it confirms their evidence, and shows that the opinion that the inscription upon the rock was not the work of Indians, was put forth more than a century before the Norse voyages to this country were discussed.

In 1857, while Ole Bull, the celebrated violinist, was in this country, Mr. Niels Arnzen of Fall River, had a long talk with him about the rock. Mr. Arnzen believed that its sculptures were made by his countrymen, the Norsemen, under Thorfinn 889 years before. He finally purchased the rock and land about it of Thomas F. Dean of Berkley for $50, for Ole Bull, who became much interested in the rock, but, not being an American citizen, could not legally hold property in this country. Subsequently Ole Bull died, and Mr. Arnzen conveyed the rock to the Royal Society of Northern Antiquaries of Copenhagen as a gift to his countrymen. In 1877 this society ceded the rock to the special charge of the Scandinavian Memorial Club of Boston, composed of antiquarians. Death decimated the last-named organization, and the few remaining members some time since recommended that the rock be conveyed to the Old Colony Historical Society, the location being within its jurisdictional limits. As a result of this recommendation, now comes the deed of final transfer from the Royal Society, accompanied by a letter from Mr. Arnzen "resigning to your care and keeping this antiquarian historic relic." The society has accepted the trust, and passed a standing vote of thanks to Mr. Arnzen.

Now the Dighton Rock is in American hands, and the attempts at the solution of its cabalistic characters will go on as before. The seamy and grim old monument, which has for so long battled with the tides of Taunton River, may yet be made to yield up to the Scandinavians its secret — may award to that race the glory of having discovered the Western Hemisphere. — *New York Times.*

SCHMIEDBARENGUSS. — Schmiedbarenguss is the inconveniently long name given to a new composite metal for which almost marvelous properties are claimed. It is composed of pig-iron, wrought-iron, copper, and aluminium bronze alloy and a flux. It is produced direct from the cupola without annealing, yet it can be welded and hammered like iron or steel and can be manufactured, it is claimed, at a less cost than malleable iron or steel castings. At a test made January 20, in Louisville, it is said to have endured a tensile strain of 18,000 pounds per square inch, that being the limit of that machine. The new composition is the discovery of Mr. Hatzfeldt, of Newport, Ky., who has made many experiments in producing aluminium. — *Chicago Times.*

PARIS PLASTERERS.[1]

In compliance with instructions, I visited the Paris Exhibition during the first two weeks in July for the purpose of examining and reporting upon the exhibits therein, and the methods of production generally in the French capital, in so far as they relate to plastering. The quality and extent of the work were to me a most agreeable surprise; for I found that in comparison with our own exhibitions, the art of plastering, and its very general application throughout the Paris Exhibition, forced on me the impression of a sudden and complete development of a hitherto unused, or, when used, a much abused craft, so far as our exhibitions were concerned. There may have been reasons dictated by finance to account for the meagre, raw, and even repellent aspect of the miserable shanties we erected to house the good things in arts and manufactures which we invited the producers to contribute to, and the whole world to come and see, but in the future these reasons should vanish in the presence of such grand and beautiful structures as those erected on the Champ de Mars to give habitation and a fitting setting to the world's arts, productions and manufactures. There are two features which stand pronounced in the buildings as peculiarly their main glories, and they are the extent to which plaster in the one case, and iron in the other, are employed. Of the latter, of course, I have nothing to say here; but of the former, my only regret is that I had not more time and fuller opportunities to examine minutely in detail the various palaces, châlets, and pavilions which house the fine and domestic arts and productions of so many peoples and lands; each one being an illustration of the style peculiar to the country represented, and all (with rare exceptions) worked out in plaster by plasterers to represent not merely the architectural outlines, but also the materials used, whether in light, dark, or red stone, or various colored bricks, which require a close and technical inspection to distinguish from the materials in old and original buildings. . . .

Of plastering generally, as executed in Paris by Frenchmen, I must say that, though their methods are, or seem to be, far behind our own, they, for all that, turn out fairly good work, but with a waste of material that would soon make an English employer bankrupt. For example, I was on a scaffold where four men were employed doing a ceiling about ten feet by twelve. It was a plain ceiling, and the process was somewhat as follows: The plaster was turned out in a loose heap on the floor; two laborers — or, as they call them, companions — supplied with boxes, which contain about two bushels, half-filled two of them with water, and then added sufficient plaster to mix to a proper consistence; these boxes were then placed on the scaffold, and the plasterers began to mix with the left hand and a trowel in the right. This trowel is made of brass, in the shape of a very wide gauging trowel, about five or six inches in width, and tapering to four inches, with a length of seven or eight inches; being cut off straight, it is adapted to fit the corners of the box, and leave it clean as soon as the material begins to set. When the plaster is gauged, and while still of a thin fluid consistence, they splash it on the part they mean to cover; by the time this is done, the material begins to thicken as it begins to set, and then they take it out with the gauging trowel on to a hawk of a peculiar construction: — it has a handle about nine inches long; the board is about eight inches long, with a width of eleven inches, and the longest edges are formed of two strips of hardwood flush with the board. Having placed sufficient stuff on this to conveniently manipulate, they press the material on it against the part to be plastered, and spread it about with the flat face of the hawk, using the hard edges backward and forward to bring the work to an even surface. Two men to each box soon empty it, and by this time the companions supply them with a fresh pair of boxes, and so on until they have covered the whole, flush with a narrow strip of screed, formed by filling to a straight-edge bearing on points of the required thickness. They then start to straighten the whole surface, by scraping off all the humps which are inevitable by their method of application. For this purpose they use an instrument constructed of a stout blade about eight inches long, toothed on one edge, while the reverse edge is straight, an iron bow fastened to each end of the blade, and a handle attached to the apex of the box. With this they scrape down the inequalities, using the toothed edge till they get a fair surface, by which time the scaffold is covered deep with plaster, in which they tread about till the companions shovel it down off the scaffold. Then they use the reverse edge of the tool, and so scrape the surface to a smooth face. Of course, it can be readily understood by any one having even an elementary knowledge of the methods adopted by English plasterers, that two men could do the work of these four with more certainty of being correct, and in less time, without the waste incurred by the French system. In our case, there is art scientifically applied; theirs may be art, but without science. Their method of doing mouldings is as ours, with mould and running rules, only they use all plaster; but for the mitres they have no notion of our system of taking off the stuff while in a plastic condition with the joint rule. They, on the contrary, fill the mitre with stuff, and, with a series of tools of a plane-like form, shave the stiff stuff off till they form the moulding to a mitre, much as a mason would do with a soft stone; and, indeed, most of the men who do plastering in Paris are masons, or have been closely allied to them in their training. So much is this the case, that they form one body for all general purposes, and at the Bourse-de-Travail, or Labor Exchange, they are recognized as one trade. This may in some measure account for the apparent similarity in their methods of doing work, but I think the material somewhat readily admits of this mode of treatment. It is plaster always, and nothing but plaster, except in rare instances; and plaster of a wholly different consistency from ours, for when gauged their ordinary plaster is of a loose, granular quality, and has a somewhat soapy character in working, which makes it easy to cut and scrape, without the fear of meeting peculiarly hard nodules in the operation. So far is plaster brought into use, that not only are the interiors done with it, but also large and imposing fronts with cornices, architraves, pediments, pilasters, columns, and all the other adornments that go to make classic architecture, or the expression of the architect's ideal in any style or combination. This was a discovery for which I was wholly unprepared, as, according to our insular notions, plaster would not stand exposure. I do not know why, but plasterers here, both past and present, would laugh the idea to scorn of using plaster for outside work; and yet I have never known it fairly tried in this country, while in Paris all the houses that are built of rubble-stone are done in plaster, and stand good for many years; and the material is so cheap that, if it does fail in any way, it can be easily and cheaply renewed. I saw an illustration of this in the somewhat important Rue Pasquier, a thoroughfare that leads to the Place de la Concorde: some large and stylish houses were being re-plastered outside, and though, so far as I could see, the fronts were only a little smoke-begrimed, yet they were stripped of the entire plastering, to be done afresh in the semblance of a nice soft white stone; no paint being applied annually or bi-annually to these fronts — so much as it would cost could be saved to re-plaster them, and thus have a new front for another series of years. Lime and hair with sand, as we use them, are unknown, or nearly so, but where it might be expected that the strain of the expanding plaster would lead to cracks, as over bracketing in cornices or the like, they use a large quantity of tow in the formation of the core, which they lay about and mix in with the plaster while in a plastic condition. This tow they also use largely in the production of fibrous plaster-castings, and it has the advantage over canvas in this, that it presents no smooth regular surface from which the plaster-face may scale off by vibration or other causes.

[1] Extracted from the "*Artisan's Report to the Mansion House Committee on the Paris Exhibition*, 1889," made by Mr. T. Smyth.

THE ILLUSTRATIONS

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

EPISCOPAL CHURCH, WEST MEDFORD, MASS. MR. H. H. RICHARDSON, ARCHITECT.

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

OLD IRON AND BRASS WORK AT PROVIDENCE, R. I.

HOUSE OF C. H. ELMENDORFF, ESQ., KEARNEY, NEB. MESSRS. FRANK, BAILEY & FARMER, ARCHITECTS, KEARNEY, NEB.

COTTAGE FOR DR. THOMAS H. WILLARD, JR., GREENVILLE, N. Y. MR. ADOLPH HAAK, ARCHITECT, NEW YORK, N. Y.

RENAISSANCE DOORWAYS, TOULOUSE, FRANCE.

This plate is copied from *L'Encyclopédie d' Architecture.*

NEW BAPTIST CHURCH, GARDINER, ME. MESSRS. STEVENS & COBB, ARCHITECTS, PORTLAND, ME.

TOWER OF ST. ETIENNE DU MONT, PARIS, FRANCE.

[Additional Illustrations in the International Edition.]

THE CLOISTER, POBLET, SPAIN.

[Gelatine Print.]

SECOND VIEW OF THE SAME.

[Gelatine Print.]

CHURCH OF ALL SAINTS, FALMOUTH, ENG. MR. J. D. SEDDING, ARCHITECT.

NEW PREMISES, HIGH CROSS, CHESTER, ENG. MR. THOMAS M. LOCKWOOD, F. R. I. B. A., ARCHITECT, CHESTER, ENG.

THESE buildings were erected last year for his Grace the Duke of Westminster and the Corporation of Chester (who were adjoining owners), and form the corner at the High Cross in the city of Chester, where the Rows from Eastgate Street and Bridge Street meet. They are carried out in the half-timbered style so much associated with the old work in the city.

THE CHURCH OF ST. JOHN THE BAPTIST, LOWER CAVERSHAM, READING, ENG. MR. E. PRIOLEAU WARREN, ARCHITECT, LONDON, ENGLAND.

THIS church was completed and opened in the autumn of 1888. It was designed originally as a mission church, but, as the ecclesiastical centre of a rapidly-growing suburb, it is now a district church. It consists of nave, chancel and two aisles, with one transept containing choir and clergy vestries, and the unusual feature of a schoolroom over them. The walls are faced externally with snapped flints from the Reading chalk-pits, the quoins and dressings being of Bath stone. The church will seat 450 people, and was built at a total cost of about 4,000*l.*

JOSEPH MORRELL WELLS.

THE sudden death of Mr. Joseph M. Wells in New York causes not only a feeling of personal loss to his many friends, but a more widespread feeling of an irreparable loss to architecture. Few, if any, men in the country could be so ill-spared at the present time. With an active mind, analytic but never formal in its methods, constantly self-critical and as constantly creative, and with a passion for his art, he was one of the few men to whom architecture was not only serious, but worthy of all effort. Ignoring the baser and more sordid cares of his profession, he devoted his thought to the highest possible expression of the art of architecture, and did so with a power of reasoning and delicacy of perception which were rare indeed. Pursuing an intellectual method, he became naturally a classicist, but a classicist bound to no school but basing his design upon the great laws of mass and proportions. With this, he was most critical of detail, and refined and re-refined everything he touched. Architecture was to him a creed, a religion. Working as he did for Messrs. McKim, Mead & White, his work is necessarily fused with that of Mr. McKim and of Mr. White, and it is difficult to separate and individualize Mr. Wells's own work, but three buildings owe much to his touch so far as their exteriors are concerned: the New Britain Building, the Villard House and the Century Club. Of these the last-named is in process of construction, and it is characteristic of Mr. Wells's careful analysis of his own work, that but a few days before his death he was studying the projection of the keystone over the arched entrance in its relation to the length of line from the ground to the spring of the arch, and the consequent impression of strength in the arch, a subtilty that would be appreciated but by few. The New Britain Building, first story of stone with brick above, is an admirably handled, dignified façade, with a fine, heavily projecting cornice.

The Villard House is one of the most scholarly buildings in America. It is so much superior to any of its contemporaries that it seems to belong to a nobler age. It is *proprio palazzo*. While suggestions of Renaissance Rome are in it, it is very far from being a plagiarism, and has in common with all of Mr. Wells's work a marked originality. He felt it to be his best work, and he criticised it less than any of his subsequent designs.

The loss of a man who worked with such a spirit of study and of restraint, and who by his convictions was influencing all around him at a period when architectural design is in a transition state between vulgarity, ostentation, ignorance and something better, is certainly irreparable. It is a loss that will be felt more and more as time goes on.

C. H. W.

SOCIETIES

BOSTON ARCHITECTURAL CLUB. — ANNUAL EXHIBITION OF ARCHITECTURAL WORK.

THE Boston Architectural Club proposes to hold an Exhibition of Architectural Work in Horticultural Hall for three weeks, beginning May 12, 1890, and contributions are requested from all those who are interested in art and architecture.

The exhibits will be grouped as follows:

Section I. Sketches. Including work in this country and abroad, sketches of historical buildings, details, decoration, etc.; also measured drawings of old work.

Sec. II. Architectural Designs. Drawings of buildings designed by the exhibitor, either projected, in process of construction or completed, including perspectives, working-drawings, studies, scale-drawings, interiors and details.

Sec. III. Photographs of executed work. [It is requested that a sketch-plan should accompany the photographs of each building.]

Sec. IV. Interior work. Designs for furniture, decorations, carvings, ornaments, etc.

Sec. V. Special Exhibits illustrative of the allied arts. Including examples of stained-glass, decoration, artistic iron-work, gas-fixtures, furniture, carvings, etc. [The articles illustrated in this section are to be selected by the Club.]

Sec. VI. Students' work. Including the work of the students in the leading schools of architecture and design, and the work of the classes of the Boston Architectural Club.

Sec. VII. Work of the Rotch Scholarship. *Envois* of Mr. Harry Bacon, competition drawings from the present year, and selections from previous work.

Drawings to be submitted for publication in the Illustrated Catalogue must be delivered at the Club-rooms, 6 Hamilton Place, before March 15, and other contributions should be sent in not later than April 15. All work will be subject to the approval of the Committee on Reception and Awards.

A full exhibition of the best English, French, Italian, German and Spanish work is expected, and it is hoped that every city in the United States may likewise be fully represented.

By order of the Executive Committee,

R. CLIPSTON STURGIS, *Secretary.*

NOTES AND CLIPPINGS

CRUMBLING NAPLES. — The rain which fell in Naples on December 27, says a correspondent of the *Daily News*, was the most lasting and copious since 1885, when a rain-register was instituted in this city in order to calculate the capacity of the new drainage system then just commenced. The downpour of September 25, last, which did so much damage to the Riviera di Chiaia and the slope on the hill above, amounted to 2.67 inches of rain in two hours, the greatest fall till then registered; but on December 27, 4.33 inches fell in twelve hours. At the height of the storm the rain fell at the rate of nearly two inches an hour. As may be imagined, more damage was done than in September, and near the Grand Hotel the Riviera di Chiaia is again blocked by a perfect avalanche of mud. Hundreds of hillocks of the fertile earth of the Vomero, as big as haystacks, lie all along the streets for a great distance, and the *portes-cochères* of many palaces are blocked. The tramway cannot proceed beyond the Piazza Umberto, and the passengers to Posilipo have to alight, walk round by another street, and re-enter a tram waiting at some distance. Naturally carriages and omnibuses have to make a detour also, and the beautiful Riviera is at that point a scene of desolation. The cellars of the houses are full of water, and, higher up, the Piedigrotta Street has fallen in for a space of thirty square feet, leaving a hole twelve feet deep, into which unfortunately four passengers fell and received severe injuries. The steam-tram to Pozzuoli had fortunately just passed along the street before it fell in, but, of course, the tram service is stopped. There has been no time since the last devastation to provide properly for the leading off of the rain from the Vomero; and the principal blame lies with the municipality, whose engineers certainly cannot have sufficiently examined the plans for the new quarter built by the Banca Tibernia on the top of the Vomero, nor insisted that (the old water-courses being destroyed) a proper system of drainage should be carried on simultaneously with the building of the new suburb. — *The Architect.*

A PNEUMATIC STREET RAILROAD. — A street railroad about one and one-half miles long, on an entirely new principle, is being constructed in Washington, by the Judson Pneumatic Railway Company of New York. In this system, power is to be transmitted by compressed air from a central station to a series of motors placed beneath the track at intervals of about 1,500 feet. In a conduit between the rails, similar in construction to a cable-railway conduit, revolves a smooth cylinder, or series of cylinders coupled together at the ends about six inches in diameter. These cylinders are to be kept in continuous rotation by the compressed-air motors. An adjustable blade or arm projecting from the bottom of the car, and passing through the narrow slot into the conduit, carries at its end a group of friction wheels, which may be pressed down forcibly upon the upper quarter of the revolving cylinder. The plane of revolution of these friction-wheels may be changed by an ingenious device controlled by a lever, to be operated by the driver of the car. While the friction-wheels revolve in the same plane as the cylinder, the frame supporting them is at rest, but the moment the axes of the wheels are thrown out of line with that of the cylinder, by a movement of the lever, the frame is driven along the cylinder by the diagonal travel of the wheels, which is similar to that of the travelling ink-distributer on some of the old-fashioned printing-presses. The speed of the car is regulated by the angle of inclination of the friction-wheel axles, the cylinder revolving continuously in one direction at a uniform speed. — *Engineering Journal.*

GREAT CONTRACTORS. — When the great works which we call railways and which are greater in the labor expended on them than all the pyramids ever built — were first projected it was seen that a new class of builder was required, men who could carry out scientific orders on a grand scale, who could manage rough workmen in armies, who could build by the mile instead of the yard, and who could be trusted never

to rest satisfied with unworkmanlike results. Properly speaking, according to the theorists, the work ought to have been done by coöperative clubs of navvies — workmen so called because the only great earthworks of the immediate past were canals, and those who cut them were nicknamed "navigators" — but the clubs did not exist, and, if they had existed, would not have possessed either adequate capital or sufficiently capable dictators. Committees cannot cut tunnels any more than they can command a ship. It was found, too, that little contractors wanted a big man over them. If one of them failed or proved incompetent, the entire great work was stopped; they were often almost insanely jealous of each other, and their aggregate profits were quite as heavy a burden as the fortune the big contractor might be expected to make. Shareholders are not idealists; they felt that they wanted big men as agents; and as soon as the demand became strong, big men came to the front. They came forward from every class in the country, except the highest — engineers, bridge-builders, canal-cutters, brick-makers, and a host of men even less accustomed to large work, but who felt the capacity to do it. Some succeeded and some failed, but among all the former there was, we have heard old engineers say, a strong family likeness. They were not, as a rule, what is called intellectual men, did not study books much, and did their thinking with a rapidity which nowadays would make critics doubt if they thought at all. They were not even like engineers, but more like the early Kings, or Generals of the pre-Prussian period, who knew how to make men obey, how to overcome obstacles, and how to get out of masses of laborers direct and positive results. That last, as all great engineers know, is a separate faculty, which, curiously enough, does not belong to all men who understand great works — which, for example, has not been displayed by the group of men, many of them quite exceptionally qualified in other respects, who have expended so many millions upon the Panama Canal. They were nearly all rough men, for they had to make themselves feared by multitudes to whom softness seemed a little contemptible; but they all, or at least all who succeeded, possessed two rare faculties — they could decide at once and irrevocably, and they could choose out men. — *The Spectator.*

Photographing Interiors. — Mr. G. Alpers says that gelatine plates should be exposed proportionately much longer than wet collodion ones. He had made the photograph of an interior with the aid of this last process, exposing for three hours, and he desired to reproduce this same interior on a gelatine plate which was from ten to fifteen times more sensitive. He supposed that an exposure of thirty minutes would be sufficient, but in developing he obtained almost nothing, and he was obliged to give an exposure of five hours. The author explains this singular fact as follows: Bromide of silver is much more sensitive than the iodide of the same metal to the intense rays, whilst it is not more sensitive than iodine to the very weak rays. This explains why the negative of portraits on gelatine are generally harder than those on collodion. To reproduce interiors having windows placed opposite the objective, the author covers them with red tissue paper, which he removes for a few seconds at the end of the exposure. — *Invention.*

The Proposed Mexican Congressional Palace. — Piacentini, the architect of the Palace of the Fine Arts, on the Via Nazionale, at Rome, has been commissioned by Mexico to build the Congressional Palace in Mexico City. His plan is Classical in general terms, offering galleries supported by colonnades, access to which is obtained through an entrance like an arch of triumph. The main entrance is considerably in advance of the façade of the building, where two smaller entrances, to the right and left, form with it a group bound together by large columns. — *Exchange.*

Ancient Bridges in China. — The Chinese suspension bridges, dating from the time of the Han dynasty (202 B. C. to 220 A. D.), furnish striking evidence of the early acquaintance of the Chinese with engineering science. According to the historical and geographical writers of China, it was Shang Lieng, the commander of the army under Kaen Tsu, who undertook the construction of the roads in the province of Shense, to the west of the capital, the high mountains and deep gorges of which made communication difficult, and which could be reached only by circuitous routes. At the head of an army of 10,000 workmen, Shang Lieng cut through mountains and filled up the valleys with the soil obtained from the excavations. Where, however, this was not sufficient to raise a road high enough, he built bridges resting upon abutments or projections. At other places, where the mountains were separated by deep gorges, he carried out a plan of throwing suspension-bridges stretching from one slope to the other. These bridges, appropriately called by the Chinese writers "flying" bridges, are sometimes so high as to inspire those who cross them with fear. At the present day there is still a bridge in existence in Shense 400 feet long, which stretches across a gorge of immense depth. Most of the bridges are only wide enough to allow of the passage of two mounted men, railings on both sides serving for the protection of travellers. It is not improbable that the missionaries who first reported on Chinese bridges two centuries ago gave the initiative to the construction of suspension bridges in the West. — *Iron.*

Who are the Pupils in the Training-Schools. — The statement is made that the sons of professional men are in the majority in the Philadelphia Public Manual Training-School. It is surprising to learn that while the children of artisans are striving to get into the ranks of the struggling and poorly-paid professions, the children of professional men are taking to mechanical pursuits. Prof. William L. Sayre, the principal of the school at Seventeenth and Wood Streets, states: "It is a curious fact that of the boys now in the training-school and learning the use of chisels and hammers and lathes, fully three-fourths are the sons of professional and business men. We have many sons of doctors and ministers and lawyers." Of the seventy-seven occupations recorded of parents of boys now in the middle class, fifty-four are those of professional or business men and twenty-three those of men engaged in other pursuits, of whom only fourteen are artisans. — *Pittsburgh Dispatch.*

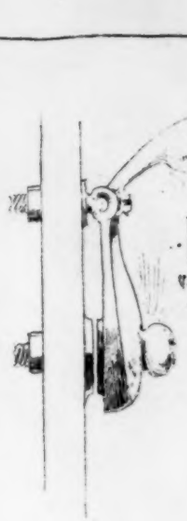
TRADE SURVEYS

The employers' solution of the threatened difficulty with wage-workers — at least so far as the building trades are concerned — is payment by the hour. A spirit of determined opposition to the granting of demands for shorter hours at present pay has been manifested by employers in many industries, and it is safe to say that all demands for shorter hours at present pay will be determinedly met. What the outcome will be it is not easy to forecast. The labor organizations have very few leaders who control the confidence of the membership. The toilers have seen one after another of their leaders defeated and thrown aside; they have witnessed the failure of strikes where every condition seemed to assure success; they have found places which were relinquished quickly taken up at old wages, and they are now conscious of the fact that there is a very widespread indifference in their ranks with relation to the probability of success next May. The fact that wages are high, that occupation is constant, that the cost of living is declining, that the condition of the wage-worker is gradually improving and that new opportunities are rapidly developing, all help to weaken the force of a movement for a reduction of the hours of labor. The wage-workers are discovering and recognizing the fact that other influences than mere organization and organized effort are bringing about the gradual improvement which they feel and see. This eight-hour craze, however, is a pet theory and scheme with tens of thousands. The ten-hour day was barely established when labor organizers began to dream of an eight-hour day, and for two decades it has been preached and talked about until it has become a part and parcel of the laborer's creed. Meanwhile, times have been improving, pay advancing, conditions have been bettered, and the hopes and anticipations of the toilers have been realized. Notwithstanding all this a more or less general strike will be inaugurated, and no doubt a vast deal of inconvenience will be experienced by builders, contractors and employers generally. The industrial situation throughout the United States, at the opening of February, is certainly a subject for congratulation on all sides. The open winter has made employment more general. House and mill building has been undertaken upon a large scale. In New York City and throughout the State building is in a more forward state than ever before at this season. In Philadelphia 402 dwellings have been started since the opening of the year, and building sites have been purchased for brick and mortar operations far in excess of any former year. In Baltimore builders, after a year's lassitude due to previous over-activity, are once more finding a demand for house and shop space, and in addition to this schemes are bruited about, which, according to rumor, will involve the expenditure of some twenty odd million dollars for construction, the purchase of property and for damages. In Philadelphia the Reading Company expects to win its long fight for its Twelfth and Market Streets terminal station, and this means an enormous demand for iron and steel, brick, cement and general building material. In Pittsburgh a revival — if it can be so termed — is setting-in in house-building and in the enlargement of manufacturing capacity. Throughout the region where natural-gas is, or is likely to be, used as a fuel, there are also great preparations in progress in the way of building manufacturing establishments for iron, steel, glass and machinery-making.

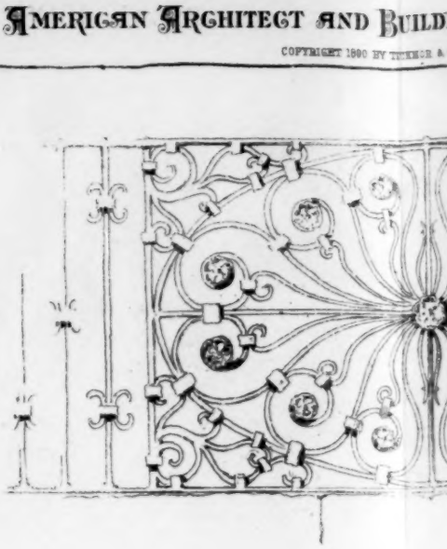
The makers of shafting and of machinery are now surrounded with work that will call for three months' production. There is an extraordinary demand for boilers and engines of small capacity, for gas-engines also and for artificial-fuel manufacturing apparatus. There is also an unusual demand for mining machinery, and this demand will probably increase, as a great deal of new mining property has been prospected during the past year. The increase in the yield of precious metals, amounting to some $14,000,000 last year over 1888, is a fair measure of the increasing activity in that direction. Besides this, there are engineering schemes almost without number. New York is getting in fighting trim for the World's Fair. It proposes to surprise the world with engineering feats in bridge-building, as well as in the perfection of rapid-transit facilites, which will anticipate public requirements by half a generation. Western cities are not far behind in these respects. The commercial features are all of a reassuring nature. If there is a scarcity of money, good financial management prevents it from showing itself. Within the past month or two there have been numerous complaints from agricultural localities concerning the difficulty of promptly obtaining loans, but this is, perhaps, more due to the unwillingness of lenders to increase loans in that direction when there are so many other more inviting opportunities. The Western railroads traversing the corn belt have been called upon with shrieks and threats to make special corn rates, so that immense stocks of that product can be emptied into the East, where there is supposed to be a market for it. It must be admitted that, from some cause or other, there is a growing discontent among large numbers of agriculturists in the Western States. In spite of the reduced freight rates and the enlarging Eastern and foreign markets for Western agricultural products, it is claimed that the struggle for existence is more bitter, and that manufacturing demand is sensibly affected; but all these statements are in the nature of allegations as yet, for which the clear proof is wanting. The growth of the agricultural interests has been rapid; vast areas have been reduced to cultivation: the product per acre has been increased; the cost of production has been decreased, and, because the market does not correspondingly expand, bitter complaints are made at the rapacity of Eastern money-lenders, at the over-charges of Western railroads, which can barely pay dividends, at Eastern manufacturing interests, which are blamed with extraordinary margins through high tariffs, and so on. These evils, if they are such, will no doubt regulate themselves, and the justice and injustice in the allegations, whatever they are, will be eliminated from the sweeping charges of corporate money-lending and manufacturing unfairness. To summarize the commercial situation: Last month, 77 railroads earned 13 per cent more than for January, 1889. The clearings of 50 cities for January showed an increase of 8 per cent in the volume of business over January, 1889. The New York banks report money easier, and the demand for commercial paper active. The export trade is phenomenally large, and the domestic trade is gaining every week.

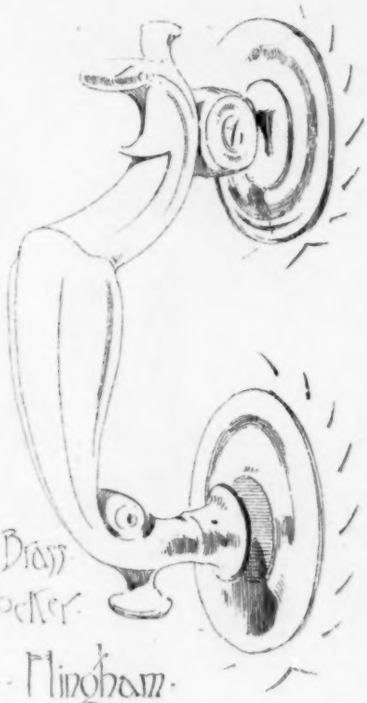
S. J. Parkhill & Co., Printers, Boston.

Hanging Lantern.



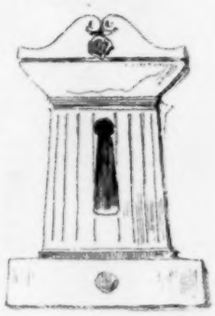
Iron "Rapper."





Brass Knocker. Mingham.

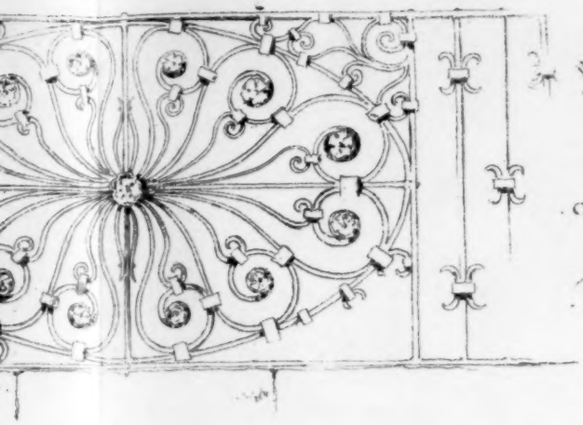
Escutcheon.



Old Houses. North Main

Old Iron & Br

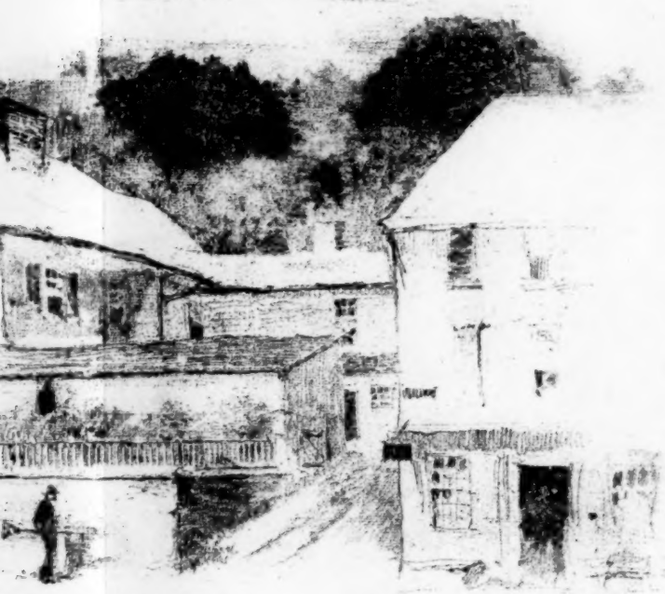
Providen

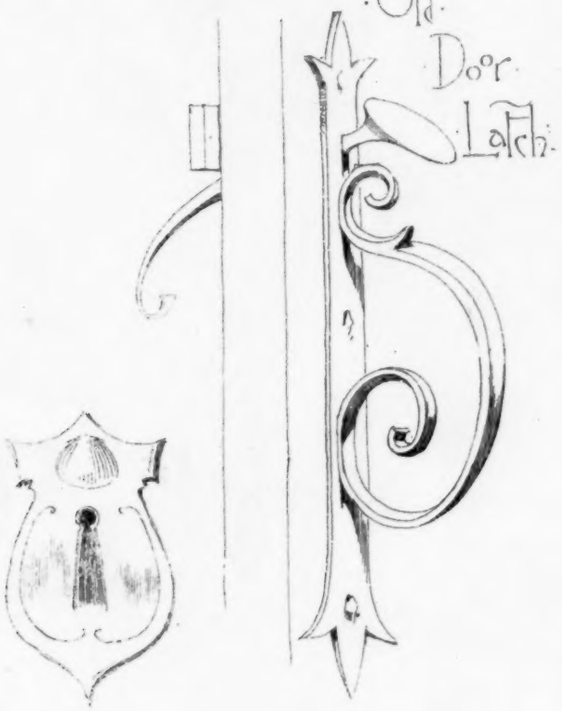


Wrot iron railing on Front door steps Providence

Hanging Lantern

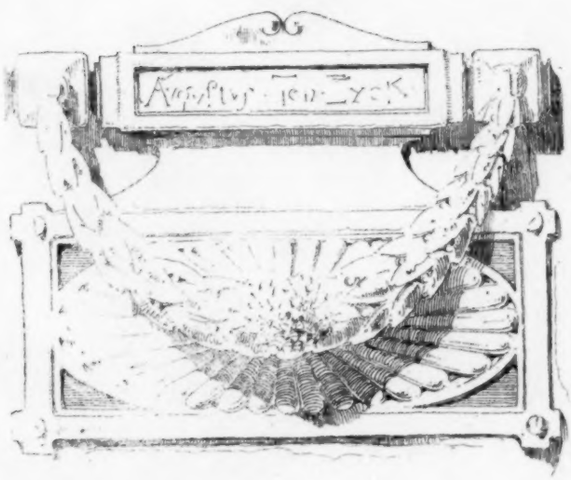
Old Door Latch



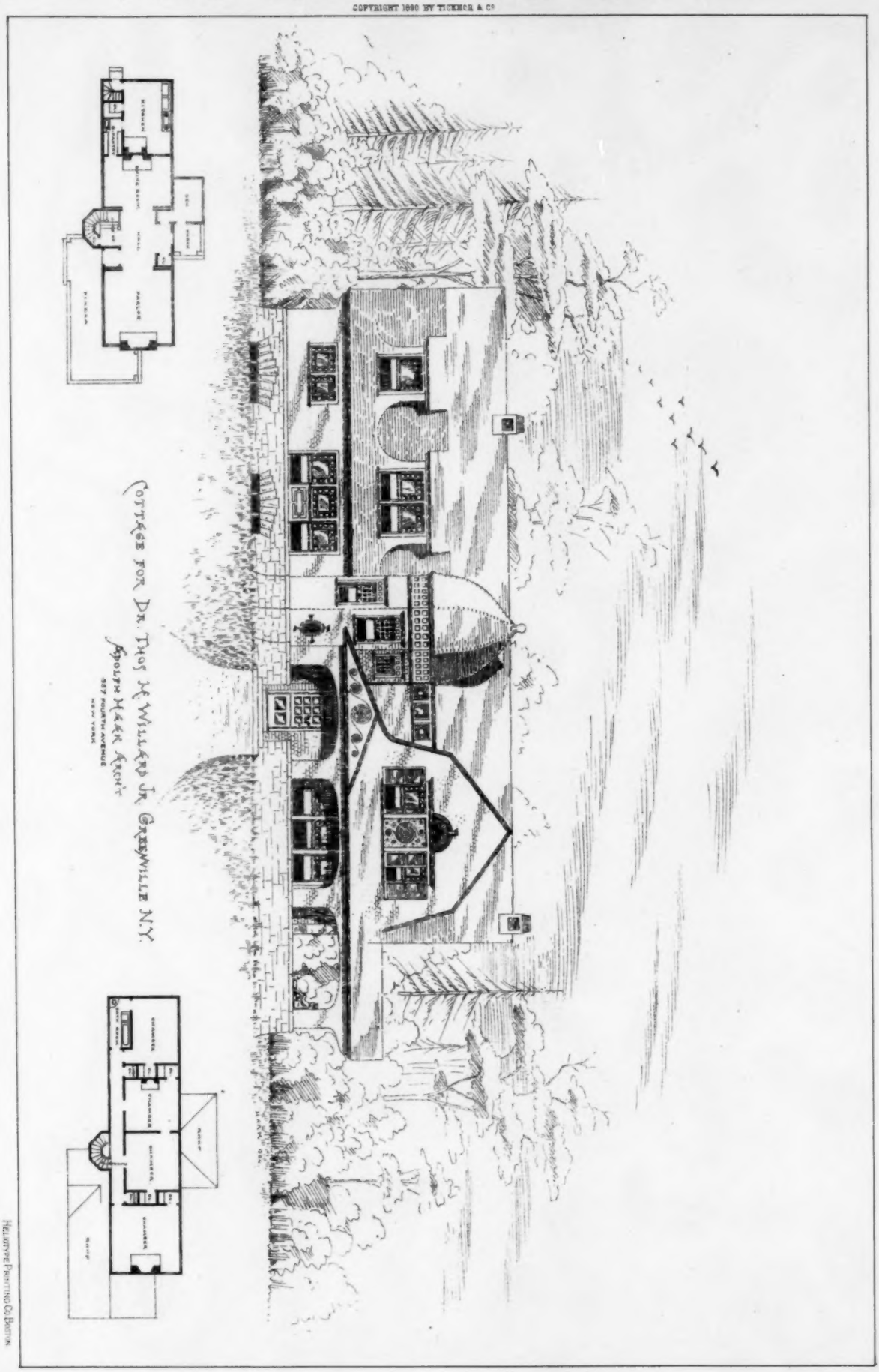


Main St. Providence

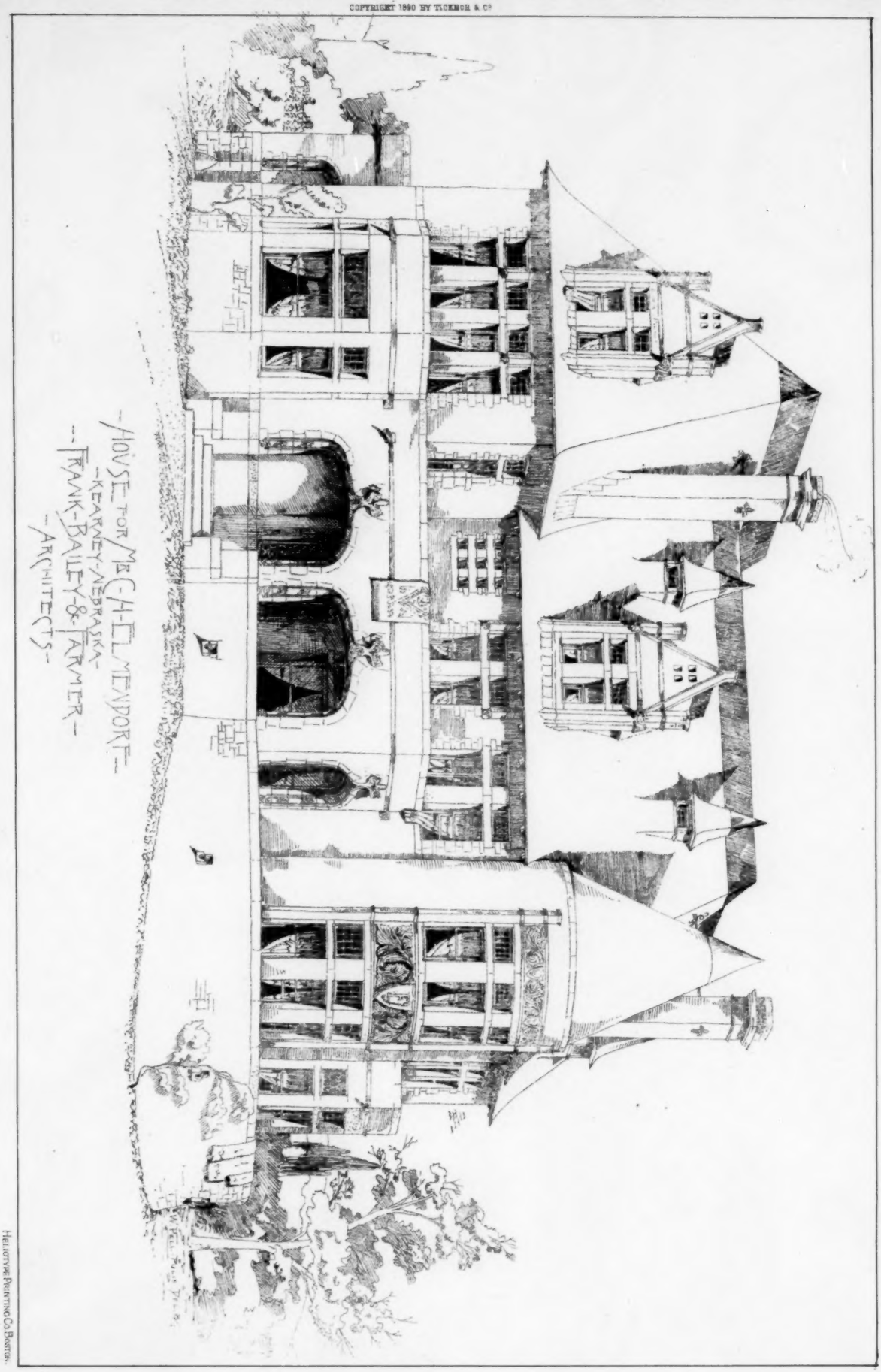
Brass work from Providence & Elsewhere



HELIOTYPE PRINTING CO. BOSTON.

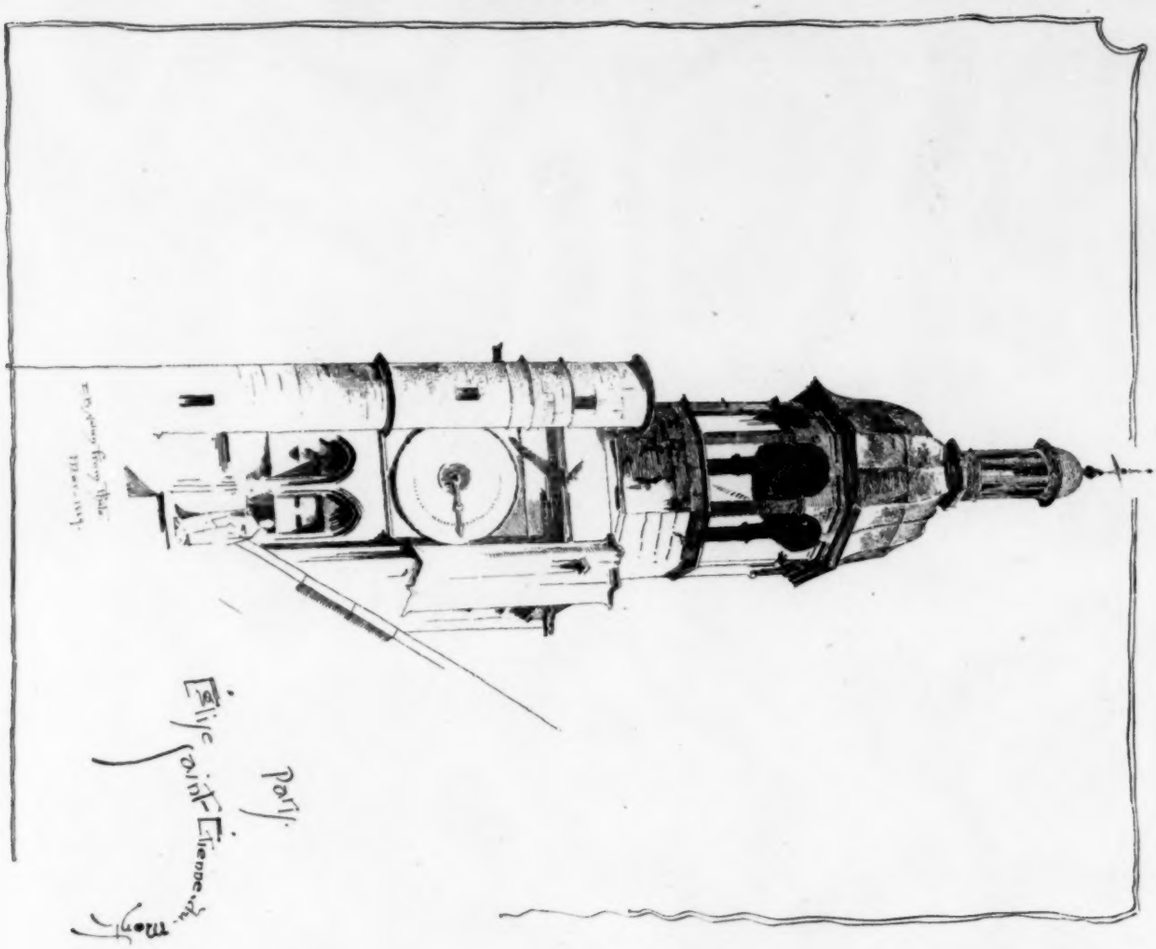


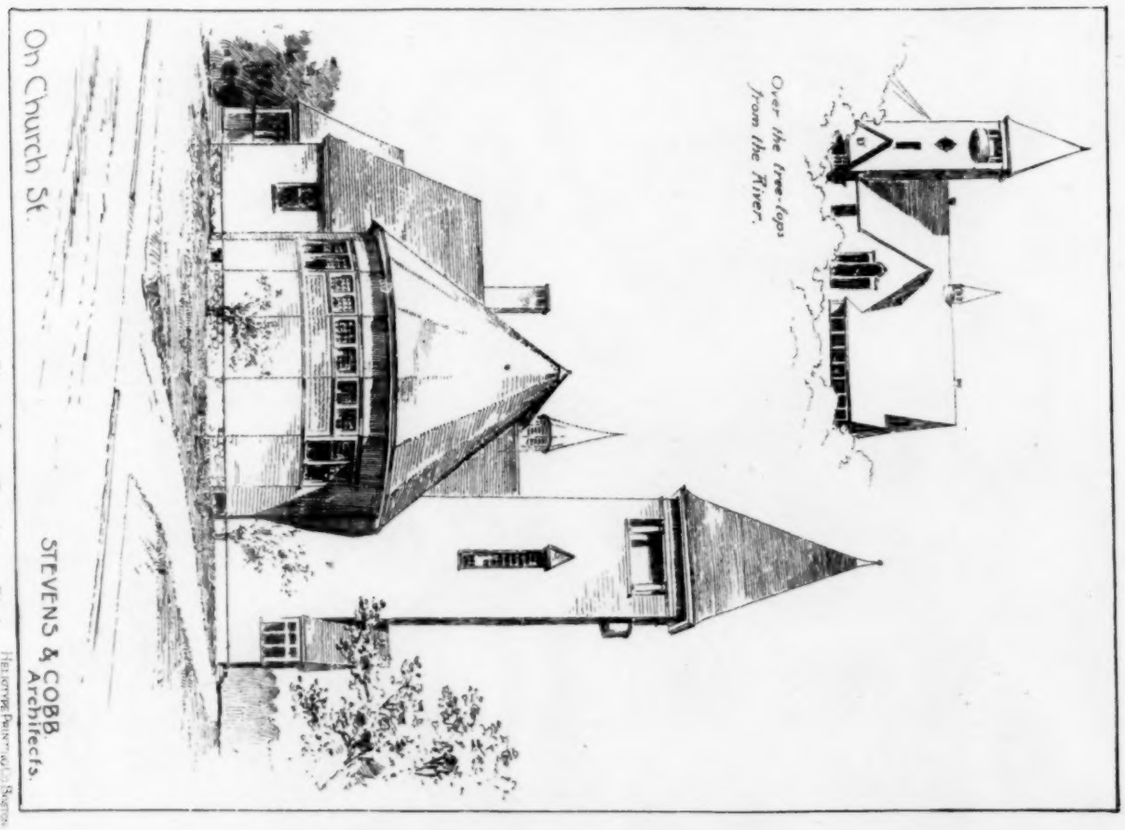
HELIOTYPE PRINTING CO. BOSTON



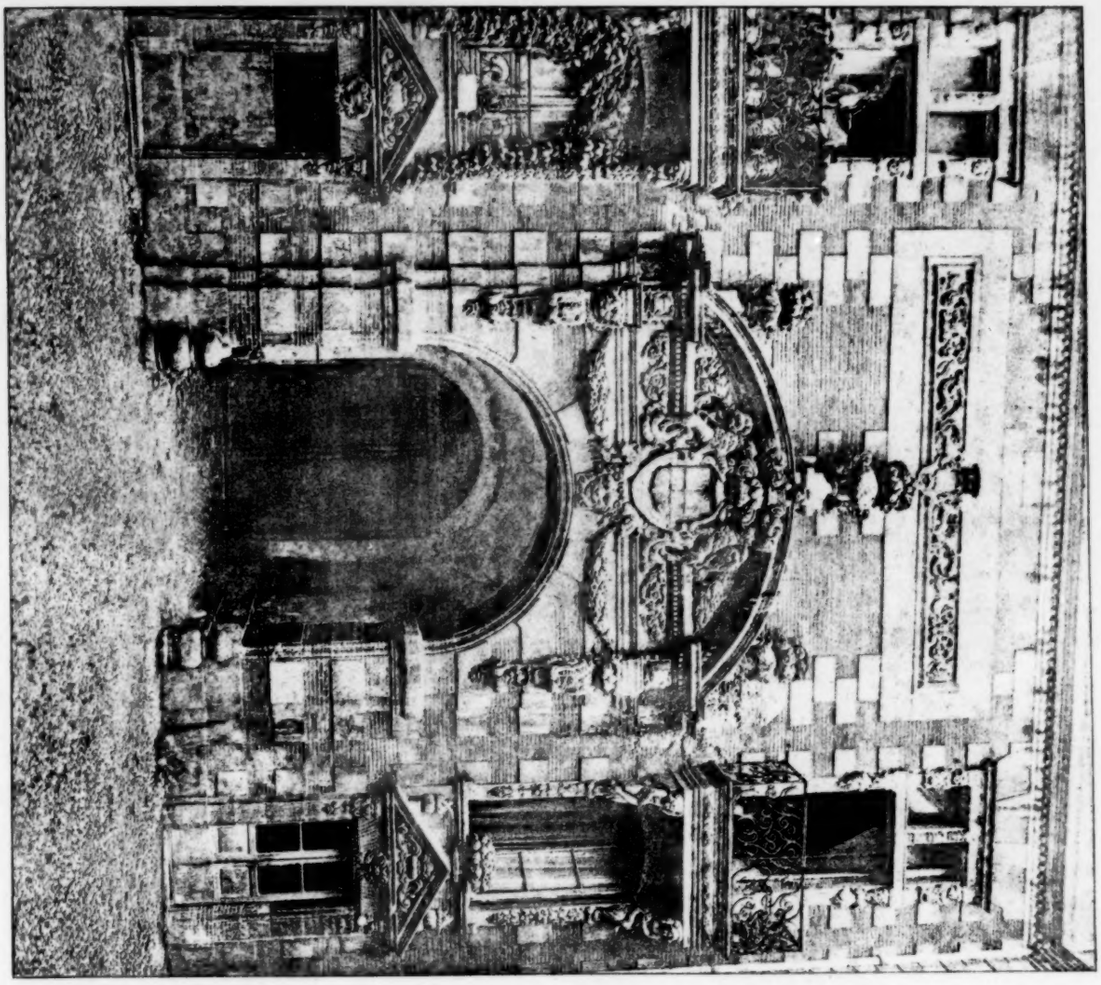
HOUSE FOR MR C H ELMENDORF
KEARNEY NEBRASKA
FRANK BAILEY & FARMER
ARCHITECTS

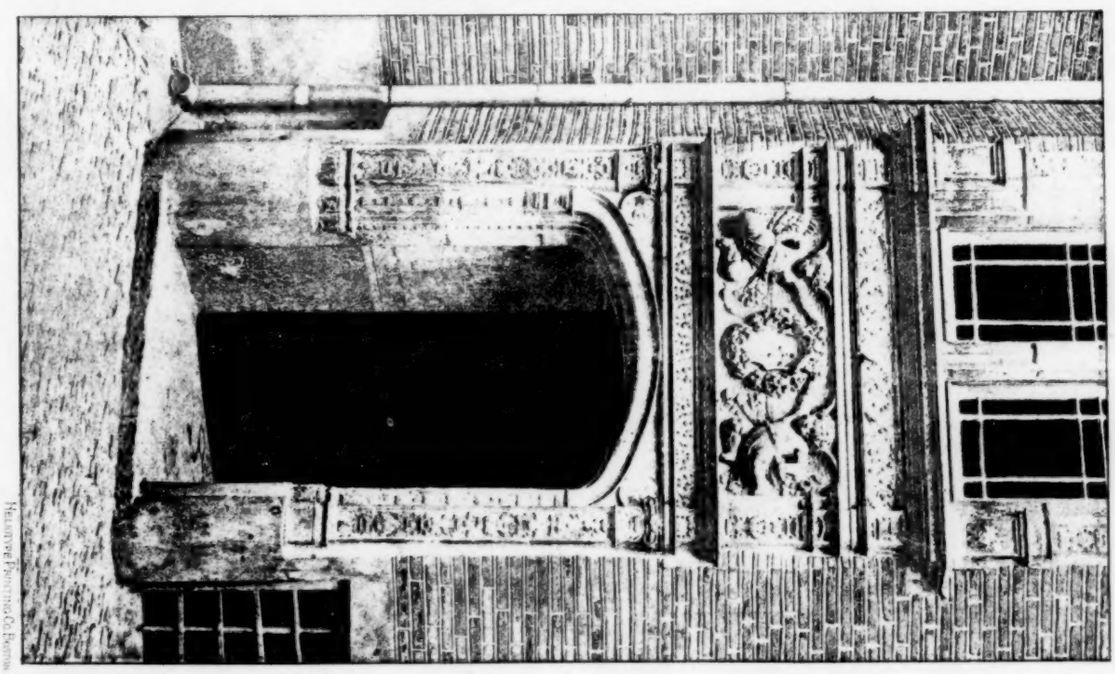
HELIOTYPE PRINTING CO. BOSTON.





New Baptist Church — Gardiner, Maine





RENAISSANCE DOORWAYS : TOULOUSE, FRANCE.