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JANUARY 18, 1890.



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EVERY one will be sorry to hear of the death of John McArthur, Jr., of Philadelphia, the distinguished architect of the Public Buildings of that city and of many other important works, who expired last week, after a long illness. Mr. McArthur was born in Scotland in 1823, but was brought to Philadelphia when only ten years of age. He went to school until old enough to learn a trade, and was then apprenticed to a carpenter. He served the full term of his indenture, but occupied his evenings in studying drawing and architecture, both by himself and at a night-school. In 1848 he competed for the House of Refuge, and his design was not only placed first, but he was entrusted with its execution. In 1849 and 1850 he did his last work as a mechanic, serving first as foreman for his uncle, the contractor for the erection of the Pennsylvania Hospital, and afterwards as superintendent of construction, on the part of the Trustees, during the completion of the east wing of the same building. After this he devoted himself entirely to architecture, and soon gained a large practice. Among other works in Philadelphia, he designed the Continental Hotel and the Girard House; the *Public Ledger* building, and a city as well as a country mansion for Mr. George W. Childs; the First National Bank, the Assembly Building and the Broad Street Presbyterian Church; and, outside of the city, he built several hospitals, churches and other important buildings. About twenty years ago, he was selected as architect of the vast and costly Philadelphia Public Building, and had, at the time of his death, carried this great work nearly to completion. Personally, Mr. McArthur was a man who at once inspired confidence, and his straightforwardness and energy won him innumerable friends, who, in the good old Philadelphia way, continued faithful to him through life. Among architects, his virtue and ability, together with his zeal in the defence of professional rights, made him greatly regarded, and the older people in Philadelphia, among whom "John McArthur" was a sort of oracle in regard to building matters, as well as his professional brethren, old and young, will long miss his friendly wisdom.

AS might have been expected the many employes whose service is required in the preparation of this journal have not escaped the disorganizing attack of the prevailing epidemic, and though we have worked double tides and done all that could be done during the past three weeks to keep things straight, every mail brings us proof that in some

particular our efforts have been unavailing. If our subscribers and correspondents will have a little more patience with us than usual, they will find that questions are answered and errors rectified without unnecessary delay or a repetition of complaint on their part.

AN address was recently delivered before the Master Plumbers' Association, of New York, by Mr. Mackay, on hot-water heating, which contained a good many technical points of interest. Mr. Mackay is an earnest partisan of hot-water heating, but also a man of great practical experience. One of his observations, which architects should bear in mind, is that a cheap hot-water heater is an unsatisfactory investment. If the heater is of wrought-iron, as, for instance, in the case of the pipe-boilers frequently used, he finds that it will rust out, while he has known a good and heavy cast-iron heater to work as well twenty years after it was put in as when it was new. As to the comparative cost of steam and hot-water systems, his experience is that a good hot-water apparatus, complete with radiators, costs about ten per cent more, for the same efficiency, than what is known as a two-pipe steam apparatus, where the steam enters the radiators at one end, and the condensed water runs out of them at the other, with a valve on each pipe; and about thirty per cent more than a "one-pipe" steam apparatus, such as is sometimes put into houses, where the radiators have only one valve, and the condensed water runs back through the same pipe that brings the steam in. It is, however, hardly necessary to say to architects that the hot-water heating is far more agreeable, from the ease with which it can be regulated to any temperature, from thirty-two to two hundred degrees, than that by steam, where the practicable range of temperature in the radiators is only a very few degrees, from two hundred and twelve to about two hundred and thirty in most cases. Mr. Mackay thought that steam gave a "dry heat," and hot-water a moist one, which, of course, is a fallacy, but for some reason, possibly through the force of imagination, he finds that a steam-heated room at seventy degrees is "more oppressive" than a water-heated one at eighty. As to the comparative extent of radiating surface required for steam and hot-water, he mentioned that hot-water radiators should seldom be above one hundred and ninety degrees, while steam radiators, with steam at five-pounds pressure, will be at two hundred and twenty-eight degrees, so that in calculating heating-surface at least one-fifth more should be allowed for hot-water than for steam, and, we may add, it is prudent in practice to allow more than this, especially in the lower stories of a house, where the radiators are seldom at the maximum temperature. In regard to the care of the apparatus, he gives a much-needed warning against the very common practice of draining the water out of all the pipes and radiators as soon as the fires are allowed to go out in the spring, and leaving them empty until cold weather in the fall. This is an infallible method of rusting out and destroying the whole system. If it is desirable to empty the pipes and boiler, as is sometimes the case, where a building is to be left to itself in cold weather, a quantity of kerosene, one to ten or twelve gallons, should be first poured into the expansion tank at the top of the system, on top of the water. Then the cock at the bottom of the boiler may be opened and the water all drawn out. The oil will follow the water through the pipes, and give them a coating which will to some extent prevent rusting. Except in this case, however, the pipes should remain full of water winter and summer, and so long as they are full of water which has once been heated nearly or quite to the boiling point, they will not rust on the inside. Just before starting the fire in the fall, it is desirable to draw off the sediment which may have collected, and this may be done by opening the lowest cock on the boiler. If desired, all the water may be drawn off, and the system immediately filled through the expansion-tank at the top, with fresh water, but in a small and simple apparatus the water will often run clear after a few gallons have been drawn below, and in that case it is better to stop then, and merely replace the loss with fresh water.

THE competition for the Sheffield Municipal Buildings affords a good illustration of the way in which competitions for public buildings must now be arranged, if it is desired to interest many architects of the better class in them. In the first place, a well-known architect was appointed assessor to examine the designs submitted, and report upon them. This

is an indispensable preliminary to any public competition in England, as nearly all the architects in Great Britain have agreed in writing to have nothing to do with any public competition in which the designs are not to be submitted to an architect known to the profession, for his judgment upon them. Secondly, the drawings asked for were few in number, and at a small scale—one-sixteenth of an inch to a foot; so that architects could compete with credit to themselves, without incurring a ruinous expense in making huge plans, which would be no better, for enabling the professional assessor to make up his mind, than the small ones, and would really serve no purpose except to impose upon uninstructed spectators. The consequence of thus inviting architects to compete with their talent and skill, before a judge capable of appreciating both, instead of expecting them to vie with each other in turning out gorgeously-rendered plans, to catch the eye of unskilled persons, was that one hundred and eighty designs were received, among which the Corporation of Sheffield ought to be able to find a satisfactory one. The *British Architect*, in commenting upon the affair, congratulates the profession and the public that so much progress has been made in the methods of conducting competitions, and says that in England it is "practically no longer possible for a competition to be won by money instead of brains." We wish something of the sort could be said of this country, but we are only slowly emerging from a condition similar to that which existed in England years ago, when, as the *British Architect* says, it has known fifteen hundred dollars spent on the competition-drawings for a building to cost only thirty thousand dollars. In this case the fifteen-hundred dollar design won the competition, "solely," as it says, "by the elaborate and sumptuous character of the drawings." How an architect, who spent the whole of his five per cent fees on the sketches which secured him the commission, expected to get paid for his working-drawings, specifications, details and superintendence, we will not try to guess, but even in less extreme cases, altogether too much money is spent among us in showy competition pictures. People outside the profession, who understand the childish way in which our architects often manage such matters, often amuse themselves, particularly in private competitions, by exciting the sensitive imaginations of the competitors, going about from one to another, and dropping hints of the "magnificent plans" that Mr. So-and-so is getting up, and so on. They think that this is legitimate sport, as it nerves the competitors to outdo themselves in the production of costly drawings, but it is death to the architects, and the sooner the profession can come to an understanding about the line where fair competition of designs ends, and dishonest claptrap, in the shape of showy drawings and frames, begins, the better off architects will be.

THE present mild winter, the third successive season of the kind, has, it is said, alarmed the ice companies, who fear that their crop of ice, always a precarious as well as a valuable one, will fail. Very few people realize the importance of the ice harvest in this country, or the value of a good ice-pond, advantageously situated for getting the ice to market. In ordinary seasons, the ice on the ponds in New England often reaches twenty inches in thickness, and two or three crops are generally taken off during the winter. At twenty inches thick, the ice formed over a square foot of water surface will weigh not far from ninety pounds, giving a production of nearly two thousand tons to the acre. The gathering and storing of the crop is not an expensive operation, but, supposing it to cost a dollar a ton, and the ice to be sold at two dollars a ton, the net value of the harvest, supposing only one crop to be secured, would be a thousand dollars an acre, while, under the usual conditions, where two or three crops are obtained, the net return will be about two thousand dollars an acre. Compared with wheat, which must be sown and cultivated, as well as reaped, to return fifteen or twenty dollars to the acre, ice certainly occupies an enviable position as an agricultural product, and it is not strange that the city of Cambridge, in Massachusetts, once had to take legal measures against an ice company, which gathered so much ice off the lake on which it depended for its water-supply as to reduce the supply below the requirements of the city. Unfortunately, the large and clear ponds are mostly monopolized by great companies, and small, irresponsible dealers gather ice where they can, often from pools of surface-water, draining from the most objectionable sources. Many serious outbreaks of typhoid fever have been traced to the use of such ice, and, unless a

rigorous inspection of natural ice is instituted, they are likely to increase in number and seriousness, as the villages in the neighborhood of the large cities fill with settlers. In Europe, the condition of the ponds is generally such that good natural ice cannot be taken from them, even if the climate of the Continent were cold enough to produce the thick, transparent sheets with which we are familiar, but a great deal of muddy ice, in small pieces, is gathered and sold. Some ice is brought, particularly to England, from the Norway lakes, and Paris has been supplied with the peculiar crystalline glacier ice from Switzerland, but natural ice is now being rapidly superseded by the artificial ice, made with the well-known ammonia machines. This ice is said sometimes to taste of ammonia, so that it cannot always be put directly into water, as ice is generally used here, but the best machines profess to be entirely free from leakage, and, as distilled water is used, the ice is very solid and clear. The business of manufacturing it is now carried on at a vast scale. A single factory in Paris, using an improved apparatus recently invented, turns out a hundred tons of ice a day, and ice-making establishments exist in all the large towns from the North Sea to the Straits of Gibraltar.

THE Belgian Government has the amiable habit of holding a Prize of Rome competition every year, at which some artist, painter or sculptor or architect receives appointment as official student, with a liberal income, for four years. This year it is the turn of the architects to compete for the prize, and Belgians, either native or naturalized, are invited to take part in the contest. No one is allowed to enter who will be thirty years old or more before the opening of the competition, and all candidates must present a certificate of having passed satisfactorily the general scientific and literary examination held at stated intervals under Government authority. Candidates prepared in this way are admitted to a preparatory examination, which is to be held at the Royal Academy of Arts, in Antwerp, May 12. The six candidates who pass with most credit the preparatory examination are admitted to the final examination, which takes place immediately afterwards, and the best of the six receives the appointment, with a pension of eight hundred dollars a year for four years. The second in rank receives a gold medal, and the third an honorable mention.

BELGIUM is, of all others, the country of prizes and honors. A Government Commission, using the income from a fund bequeathed for the purpose, distributes every year valuable medals for the best work in artistic history and executed specimens. This year, the essays in the history of art are to be in the form of answers to four questions. The first of these is: What was the instrumental composition of the bands of musicians employed by town officials, princes and chiefs of guilds, particularly in the Belgian provinces, from the fifteenth century to the end of the Spanish domination? What sort of music did they play, and why have the compositions written for them almost entirely disappeared? The second question calls for a history of ceramic arts in Belgium from the fifteenth to the end of the eighteenth century; and the third asks what influence have Belgian sculptors had upon French art since the fourteenth century. The fourth question is architectural, and requires the analysis, with sketches, of Flemish architecture of the sixteenth century. Obviously, to answer any of these questions properly, will require a good deal of study and original research, but the prizes offered are worth taking some trouble for; a gold medal, of the value of two hundred dollars, being given for the best answer to each of the first three questions, while the author of the best reply to the third question receives a gold medal of the value of one hundred and sixty dollars. In the competitions for executed work, one hundred and twenty dollars in money is offered for the best design for a diploma, to be presented to the prize-winners; and the same amount for the best model, in wax or plaster, for a medal to commemorate the assumption by the King of Belgium of the sovereignty of the Congo State.

THE Fourth Annual Convention of the National Association of Master Builders will be held in St. Paul, Minn., on the 27th, 28th and 29th of this month. The previous Conventions of the Association have done much to cultivate a good understanding among builders, and to promote the solution of the long-standing problems which individual builders have hitherto been unable to deal with, and the next one will probably be no exception to the rule.

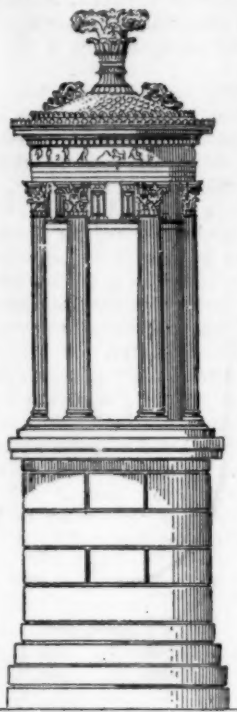
CIVIL AND DOMESTIC ARCHITECTURE.¹—II.

Fig. 1. Elevation of the Monument of Lysicrates.

WE must enter Greece to discover the germs of democratic government. There, after a long period of groping, were laid the foundations of that popular rule which, with the aid of the laws of Lycurgus, of Draco and of Solon, was destined to develop the national character to a high degree. The Greek cities, assured of peace for a certain period after their defeat of the Persians, devoted themselves to the cultivation of the sciences, letters, art and philosophy. In time, by the side of their temples they built agoras adorned with rich colonnades, within which justice was dispensed and private and state affairs were discussed; they erected stone theatres where the people saw depicted the chief events of their history; they founded gymnasia where the youth could exercise their bodies, and where they could train their minds in listening to the teachings of philosophers.

In the golden days of Hellas, art was essentially a thing of politics, it played no part in private life. It was fostered to enhance the honor and glory of cities and not to minister to the *amour propre* of any individual. For this reason, though the public edifices were built and embellished with much magnificence, private dwellings were for a long time of the most modest order. It required the advent of Macedonian rule, which loosened the union of the various Grecian cities; it required a great extension of the money coinage, which led to an unequal distribution of the public wealth, for art to become subservient to riches, and, abandoning the construction of temples, to turn to the flattery of rulers by dedicating honorary monuments to them. Then men of affluence had their palaces, and the people, grown indolent and greedy for amusements, demanded new theatres and porticos where they could parade their idleness.

The earliest inhabitants of Greece, the Pelasgians, built on elevated sites whence they could more readily repel the attacks of their neighbors. They fortified their town with Cyclopean walls, which were constructed without towers and were probably embattled. Running around the fortifications, and formed in the thickness of the walls, were galleries, remains of which still exist in the ruins of Tiryns and Delos. The houses were set with no regard to order. A square was laid out in the centre of the town as an assembling-place for the citizens; around it were stone seats appropriated to the chief men. The Pelasgians also had wells and cisterns. A temple dedicated to the guardian deity of the city always dominated their fortifications. They erected structures used for storing grain, like the one discovered at Missolonghi. They built others, called treasuries, to receive the public money and valuables, as for example, those at Orchomenus and Mycenæ. These served also as tombs and were constructed of horizontal courses laid as corbels and forming a vault.

As for the palaces of the primitive heroes of Greece, we must turn to the tales of Homer for a description of them. Though situated within the city walls they were, nevertheless, enclosed by fortifications. The stables, chariot-houses and store-houses all opened on an outer court; around the principal court, which was adorned with porticos, came first the great hall where strangers and friends of the family were received, then the men's apartments, the baths, and the rooms where the women gathered to work; the women's private apartments were in an upper story.

There was a marked resemblance between the ancient Greek palaces and those of the Asiatic and Egyptian princes. In both there were spacious halls reserved for public uses, and around these were rooms for the domestic life and for the service. In both there were distinct apartments for the men and the women,

with but few openings on the street. The same peculiarities are to be noticed to-day in the modern seraglios of Oriental countries. At a later period, in Greece itself, the separation of the men's and women's quarters was more and more sharply defined, until they finally formed different buildings.

In time the dwellings of the wealthy came to comprise two divisions, one for the men, called the *andronitis*, the other, occupied by the women, and known as the *gynæceum*; both were disposed on the same floor around a colonnaded court. In general, the houses were only one story high, and they were always roofed with a flat roof, surrounded by a balustrade. These roofs were formed of layers of broken pottery mixed with lime, with a course of tiles on the top. The rooms were also paved with much care.

At the period when these costly structures were erected, Greek society had already been long organized. The cities had developed. They did not now, as in the days of the Pelasgians, occupy the hill-tops; on the contrary, they were scattered through the plains and along the shores of the sea, and at the foot of the mountains; at the highest point they were fortified with a citadel, the acropolis. They were traversed by well-paved roads, and in the sections bounded by these broad streets, the houses were separated by narrower ways.

According to Vitruvius, in maritime cities the agora was of necessity close to the port, while it was always situated in the centre of inland towns. In early times this public square was crossed by several streets, but it was afterward enclosed by porticos with flat roofs. Temples and commemorative monuments were erected in it. The magistrates dispensed justice there, and there the people assembled to discuss the weighty affairs of State. It was of the highest importance that the citizens should have well-built, well-knit frames, and to secure this the Greeks gave great attention to the physical training of their youth: they honored the memory of their heroes with games, and some place was needed for the practice of these sports, which included running, shooting with the bow, throwing the javelin and wrestling. To supply the want gymnasia were opened, with a stadium for running, spaces for wrestling, leaping and other games, and hot and cold baths; and along with this equipment for physical development provision was made for the cultivation of the mind, by the addition of halls where the philosophers of the time gave public lessons. The whole was surrounded by porches, or porticos where these lessons could be continued in the shape of simple talks.

Stadia also existed independently of the gymnasias, as well as hippodromes for chariot races. But there were poetical and musical contests connected with these games, which were instituted to celebrate the burial anniversaries of certain Greek heroes. Among the ancient Greeks it was the custom, too, in the Dionysia to have hymns sung in honor of Bacchus. This was the origin of the theatre. The Athenians were at first satisfied with temporary theatrical structures, but after one of these had fallen, and at the instigation of the poet Æschylus, they determined to build a stone edifice. They chose for its site the foot of the Acropolis, and a part of the seats reserved for the spectators were cut into the flank of the hill, which was a hemicycle in shape and rose like an amphitheatre. The disposition of this theatre at Athens seems to have supplied the model for other Greek structures of the kind, and it was imitated later on by the Etruscans and Romans.

The Greek theatre comprised three essential parts: the stage, the orchestra and the seats for the spectators. The orchestra, reserved for the choruses, and semicircular in form, occupied the centre of the hemicycle and separated the seats from the scene, or rather from the proscenium, or stage proper. The stage, which was broader than the orchestra, was rectangular in shape, and the wall back of it (the scene) was pierced by three doors.

Another kind of theatre, designed more especially for concerts, was known under the name of odeum. The odeum had a roof supported by rows of columns.

Theatrical performances possessed, in Greece, the character of a religious and national institution. A choragus directed the formation of the choruses, and when his company carried off a victory he received a bronze tripod as a reward. These tripods were afterwards placed on a column bearing an inscription, or at the top of an *edicula* in the form of a temple. A great number of these *ediculæ* were to be seen in Athens. But the most celebrated is the choragic monument raised by Lysicrates, 335 B. C. It consists of a quadrangular basement, or podium, surmounted by a cyclostyle of six engaged columns of Corinthian order, and covered by a richly ornamented tholus or dome

¹ From the French of G. Guilestre, in "Encyclopédie de l'Architecture et de la Construction." Continued from No. 733, page 21.

terminating in a foliated and heliced acroterium (Figures 1, 2 and 3).

There is still in existence at Athens another species of monument, one of public utility; we mean the famous Tower of the Winds, which ministered to different needs of Greek life. It stood not far from the agora, and served at the same time as a town-clock and weather-vane. Its plan is octagonal, and its vertical walls were adorned with sculptures or accessories in harmony with the purposes for which it was designed. A triton, moving on a pivot and indicating the direction of the wind, was fastened to the apex of the roof. In the interior there was a water-clock (Figures 4, 5, 6).

From this simple résumé we can see to how many new purposes civil architecture was applied by the Greeks. The

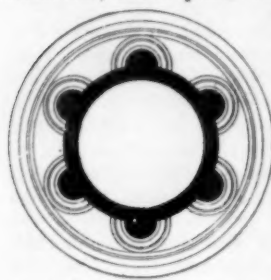


Fig. 2. Plan of the Monument of Lysicratus.



Fig. 3. Details of the Monument of Lysicratus.



Fig. 4. Elevation and Plan of the Tower of the Winds.

positive and eminently administrative character of the Romans was destined to give additional impulse to it.

We will pass hurriedly over Etruria, on account of the lack of wholly authentic records of its monuments. The oldest

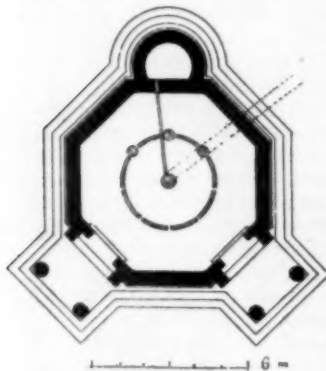


Fig. 5. Elevation and Plan of the Tower of the Winds.

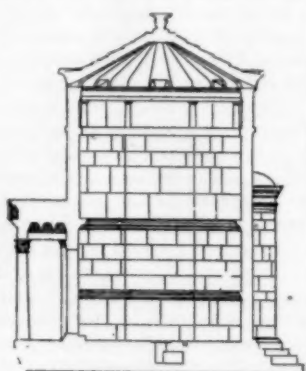


Fig. 6. Section of the Tower of the Winds.

structures found there are works of defence. Nevertheless, its sepulchral architecture is better known. For the Etruscans, as well as for all other peoples of antiquity, death was not the end of man; there remained something material of him, the *shade*, which retained his traits and his habits, and which demanded to be surrounded by all that had been dear to him on earth. The tomb became thus the image of the dwelling.

This dwelling contained, at first, one rectangular room, with a roof sloping in four directions and open at the apex, to allow the smoke to escape. The wealthy Tuscans added other apartments to this primitive room. These all opened on a small half-covered court called the *atrium*.

The Etruscan house served as a model for the Roman houses until near the close of the Republic. But in the time of Augustus, when the Roman had become habituated to ease and comfort, when he had discovered richer and more spacious dwellings in Greece, his former habitation ceased to satisfy his needs. Still he did not give it up wholly; he lodged his servants and stored his provisions in it, and there he received his clients and attended to his business affairs; in fact, it became the public part of his house. He merely added to it, for his own comfort and use, suites of apartments opening on a second court; this court, surrounded by a colonnade, was adorned with flowers and with a fountain of running-water in the centre.

The Roman house, like the Greek, had but few openings on the public street. Certain dwellings, as in Pompeii, were limited to the ground-floor; others, like those in Rome, were several stories high, and Augustus promulgated a decree fixing the maximum height at seventy feet. Nothing is very accurately known regarding the arrangement of Roman cities. There seem to have been no definite rules concerning their form, the direction of the streets, or the situation of the public

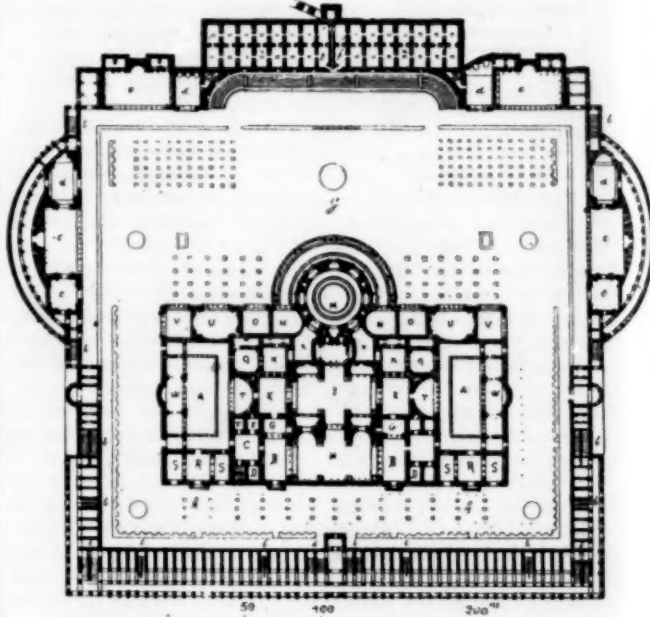


Fig. 7. Plan of the Baths of Caracalla. A Open Peristyles.—B Entrance Peristyle.—C Apodyteria.—D Capsa.—E Elaothesia.—F Conisteria.—G Rooms for Social Gatherings.—H, O, V Frigidarium.—I Central Hall.—K Spectators.—L, N, P Tepidarium.—M Caldarium.—Q Sudatorium.—R Vestibule.—S, T Exedra.—U Exercise Rooms.—X Courts.—W Epheba.—b Stairways.—c Disputation Halls.—d Academic Rooms.—e Palaestra.—f Reservoirs.—g Xyste.—h Garden.

edifices. They were walled and the gates had generally a single arched entrance. There were gates, however, as that at Herculaneum, with one large and two smaller arched openings.

The roads were an especial object of attention among the Romans. Who does not know how much importance they attached to all works of public utility! They were never baffled by any obstacle, and it is noticeable that the interests that were most neglected in Greece, the aqueducts, sewers and highways, were the ones which were most sedulously looked after in Rome, by the ediles.

The great roads, near the cities, were lined with tombs, temples and villas; they were adorned with triumphal arches; there were inns for the comfort of travellers, and men were stationed along the ways whose business it was to examine passports. Every thousand paces, columns (from five to eight feet high) were erected to indicate the distances, and there was always an inscription on each one giving the name of the director and the repairer of the road.

Wherever the Romans pushed their conquests, in France, in Spain, in Greece, in Asia, in Africa, at the same time that they built roads they attended to the water-supply of the country. They tapped the most abundant springs, wherever they were situated, and conducted the water in artificial channels to the

city where it was needed. These channels were made of stone or brick, and vaulted or covered with a paving. When mountains were to be crossed, the conduit was run through a subterranean gallery; it was carried over valleys in solid walls of masonry, or on series of arcades, the piers of which were more or less raised according to the unevenness of the ground. In cases of necessity, two or three ranges of arches were constructed, one above the other.

The aqueduct emptied into a reservoir or *castellum*, from which the water was distributed through the town by means of lead or terra-cotta, or even wooden pipes. It went to supply the public fountains, of which, in Rome itself, there were great numbers; it furnished the *thermæ*, and a part of it was reserved for private uses.

Under the Empire, in the reign of Nerva, the aqueducts of Rome numbered nine. Among those which the Romans constructed in the conquered provinces, the grandest and the boldest is the celebrated Pont du Gard, built for the city of Nîmes. It comprises two rows of large and one row of small arches, all semicircular. There is also another very beautiful aqueduct at Segovia, in Spain. Water was likewise stored in cisterns; at Pompeii, every house had its small cistern fed by the rains, and most Roman cities were well supplied with these reservoirs.

Grottos in which there was running water were often decorated with porches and statues. Such structures were called *nymphææ*, because the Greeks, from whom the custom of building them was borrowed, dedicated similar spots to the nymphs. They were much frequented and became, at last, resorts for pleasure and debauchery.

The sewerage of Roman towns was carried off in subterranean vaulted conduits, called *cloacæ*, which ran under all the streets and communicated with one principal channel. In Rome this principal channel, the Cloaca Maxima, emptied the filth of the city into the Tiber. This sewer, which offers the oldest example of a semicircular vault built of voussoirs, dates back to the time of Tarquin the Elder. The Romans may be said to have achieved perfection at the outset in all these works, and to have bequeathed them to posterity in an entirely finished state.

Their first bridges were of wood. Some were afterward rebuilt with stone, like the Pons Sublicius. Trajan constructed one across the Danube having stone piers and wooden arcades. The bridge of Alcantara, in Spain, still in existence, was wholly of stone, with six large arches. A triumphal arch rises in the centre of it. Another bridge was thrown over the Tiber by the Emperor Adrian, in front of his mausoleum. It is of stone, and presents three large arches made of *voussoirs* comprised between two small ones. The piers are so built as to oppose an angle to the current of the stream. The entrances slope down over the two small arches. There are remains of other bridges at Rome constructed on the same principle.

We have said that a portion of the water which was carried to such distances in the aqueducts was destined to supply the *thermæ*. *Thermæ*, or public baths, existed in great numbers in Rome from the days of the Republic. The use of the baths was a daily necessity to the plebeian as well as to the patrician. But Agrippa was the first to open them to the common people, and to introduce a public establishment for the especial accommodation of this class.

The construction of *thermæ* became a means of currying popular favor as soon as the Romans had converted what was at first one of their pleasures into a hygienic measure; and distinguished men, even emperors, as Nero, Vespasian, Antoninus, Caracalla, Titus, Diocletian and Constantine, erected magnificent ones, which still retain the names of their projectors.

The most complete *thermæ* were built on the model of the Greek gymnasia. There was an outer enclosure, comprising porticos, halls for the athletes and *exedra*, where the philosophers gave their lessons. In the second enclosure were the baths, properly so-called; these had nearly always essentially the same arrangement: the tepid bath (*cella tepidaria*), the hot bath (*cella calidaria*), the cold bath (*cella frigidaria*), the vapor-bath (*laconicum*), the massage-room (*unctorium*), and around these were other rooms, proportioned in number to the importance of the establishment (waiting-rooms, dressing-rooms, restaurants, reading-rooms, libraries, promenades). The space between the two principal groups of structures was occupied by gardens, *stadia* and *palaestra*, and sometimes, also, there were fountains of cold water.

(To be continued.)

THE ART OF THE VIKINGS.—I.



1 real size.

Fig. 785.—Double-edged sword-hilt, inlaid with silver and bronze, with broken blade. In a tumulus with an axe, a spear-head cut and bent, three shield-bosses, two horses' bits, two stirrups, a hammer, the end of a chain, a piece of a two-edged sword, &c.—Norway.

IT is an interesting fact that by far the larger part of the remains of any people of pre-historic or historic times is artistic. This is so, very likely, because those objects which have some ornamentation were taken better care of than those either devoid of decoration or more roughly and therefore less lastingly made. A decorated article, whether it was personal apparel, a weapon, a piece of furniture or what not, was a source of pleasure to the owner, and an indication of his wealth and position. Therefore it was that in earlier times when men carried this world's goods into the next, or at least thought they did, they were buried with them. It is fortunate for modern research that this custom was well-nigh universal in certain periods of history, for it has been the means of preserving for us a multitude of articles that must otherwise have perished, and has given us an insight into manners and customs of which we have no other knowledge.

The materials of ancient Scandinavian art are not wholly dependent on the relics obtained from graves, but are composed of an abundance of finds that have been rescued from numerous sources, as often the most unexpected as not. Like Egyptian art, that of the Vikings has, apparently, no beginnings. Not that at one time it was not very crude, but the larger part of the specimens that have come down to us exhibit a taste and skill of technique of a very high order and of a very fair average degree of excellence. Such work as was inferior or belonged to a less advanced period has been swept away or lost in the mass of work left by the more civilized people. There are, indeed, relics of an earlier time, of the stone, bronze and iron ages, but these exhibit very similar characteristics to those of the later period, and the difference between them is more a matter of technique than an evolution of art-forms. The absence of any definite chronology and the consequent inability to refer any one work to a particular date is another element that hinders the tracing of any accurate development.

Within its own lines Viking art—using the expression as a convenient means of designating the art of the early Scandinavian—made rapid and successful progress, but whatever may have been the relation of these people to our own English ancestry their art has certainly not affected ours or that of central Europe. English art, in common with that of all western Europe, owes its origin to southern influences, being the outcome of Greek art, which, in its turn, either came directly from the Egyptian or was largely influenced by it. Doubtless there are here and there to be found various ancient English forms which have a Scandinavian cast, but they are not sufficient to indicate any marked influence. The forms of Scandinavian art are so very different from those of other people that it may be questioned if it was ever in any way related to southern art. Interesting as is the study, however, it is not necessary for a correct appreciation of the art of the Vikings to raise the question of its origin or its relation to allied forms: it is sufficient for the present purpose to accept it as it is, and study its results as best we may from existing remains.

The Vikings were a seafaring race, and their skill as architects was, therefore, better shown in their ships than in their houses. These last were, however, of pretentious design in many instances, and, if we may believe tradition, were not without the comforts which make life tolerable. The ancient writings, as is so generally the case, have little to tell us of the common folk, and our knowledge of Viking architecture is, therefore, limited to the palaces and dwellings of the kings and important men. These were sufficiently luxurious to indicate the wealth and power of the owner. Each chief lived in his own house with his family, retainers and servants. The house was a collection of dwellings or rooms built around a quadrangle, an open space in front and the whole surrounded by a fence through which access was had by means of a gate or gateways. Each part of the group of buildings had its own name. Some apartments were used as sleeping-rooms, and here the women spent most of their time, though there were also parts devoted exclusively to them where the men were not permitted to enter. At times a loft was built over the lower portion and was used as a bedroom. This had an external balcony and staircase on one side. They were not, however, always desirable places to sleep in, for it is related that when one Fjolner, "assisted King Frodi in Denmark, he was given a loft-room as a

¹ "The Viking Age" by Paul B. du Chaillu. New York: Charles Scribner's Sons. 1889. 2 Vols. 8vo. \$7.50.

sleeping-apartment; in an adjoining loft-room the flooring had been removed, in order to fill the large mead-vat standing in the *undir skemma* (lower floor). During the night Fjolner went out, and as he had to return along the *sealir* (balcony) to his room, he made a mistake as to the door, and fell into the mead-vat." The windows or light-holes were usually covered with the after-birth membrane enclosing the fetus of the cow, which, when dried, became almost as transparent as glass. There were no chimneys, and the smoke covered the roofs—for there were also no ceilings—with soot.

The most important edifices erected in the country were the halls, which were built only by the kings, chiefs or jarls. They were used for feasts, and were built east and west, with the longer walls running north and south. There were two doors, one for men and one for women, and the walls were usually decorated with carvings or with tapestry; sometimes they were almost entirely covered with the shields of the guests, hung close together. Benches were placed

excellent in this beautiful work and reached a degree of perfection that has seldom been obtained by any artists. Wood is the most readily carved of all substances, and the presence of large quantities of the finest timber unquestionably gave the impetus to the art. It is interesting to notice in certain early English churches, that those built in a woody district, exhibit more carved decoration, even in stone, than those of the same era built in places where timber is scarce, and where the necessary preliminary training in wood could not have been had. The Viking artists seem to have confined themselves chiefly to wood, as there are but few stone specimens to be found. It is fortunate for us that such was the case, for, while their designs do not in any way indicate the material, it is not probable that such a characteristic art would have been developed had they made use of more varied substances. The designs were chiefly carved in relief, and were intended to ornament surfaces rather than to stand alone. They were composed principally of exquisite twist-



Fig. 1091.—Carved doorway, Saund's Church, Thelemarken. Height, 13 feet; width, 7½ feet; height of door, 7½ feet; width of door, 2½ feet.

along the longer walls, and in the centre of each row was the seat of honor or "high-seat," as it was termed. The one on the north was reserved for the master, and that on the south for the most distinguished guest. Cross-benches were sometimes placed in the hall and were reserved for women.

The Vikings built temples, but while the Sagas frequently mention their gorgeous decorations, the absence of any remains or any definite description renders a detailed account of them impossible. Some of them seem to have been built in two parts, an inner sacred place where the image was kept, and an outer part for the public. What were called "high-seat pillars" were placed inside the principal door of the temple. They were carried by the different families when they emigrated to Iceland, and cast into the sea as they approached the land. The place where they came ashore was then selected as the site for the new homestead.

Carving in wood was the art *par excellence* of the Vikings. They



Fig. 1123.



Fig. 1124.

Door-jambs, Hyllestad Church, Satersdal; 7 feet high, 1½ feet wide.

ings and intertwinings of lines, with conventional foliage and a few animal forms, also conventional. The human figure was sometimes introduced, and at times in quite complicated groups, but they never reached the same success in this work as they did in line-designs. Some relics of early times show bolder attempts at the human figure than can be found in the best work of the later period. A handle of a knife which may be referred to the bronze age, is in the form of a man, while another shows the bust only. A tombstone from the Kivik grave, one of the most interesting relics of the same time, shows no less than twelve small figures in outline, evidently representing a scene of some kind. But these examples appear to be exceptional, and such work is of rare occurrence.

The doorways of the Viking buildings were a unique and characteristic feature. The jambs were elaborately carved with ornament sometimes five feet or more in width, composed of an elaborate combination of curved lines. Human figures are occasionally introduced, chiefly in representing scenes from the old legends. In one doorway

seven episodes from the Volsunga Saga were represented, including Regin forging a sword, Sigurd trying it, Sigurd piercing the snake Fafnir, Sigurd roasting the heart of Fafnir, Sigurd's horse Gran, Sigurd slaying Regin, Gunnar in the snake-pit playing the harp with his toes. This doorway, which is from the Hyllested Church, Soetersdal, is an exception in the large number of scenes depicted, but the slaying of the serpent Fafnir was of frequent occurrence. The dragon was, in fact, the favorite animal form used by the Vikings, and is put to all sorts of artistic uses.

Almost everything of wood that the Vikings used was more or less carved. The door-jambs were a thoroughly characteristic instance, because nothing like them is to be found in the whole history of art. Other peoples did, indeed, design decorations for their doorways which were quite as beautiful in their way as the Viking ornament is in its, but nothing just like it was ever produced elsewhere. The doors were elaborately carved, though never to the extent of the jambs, and a few exist on which the ornamentation is in wrought-iron. Chairs and benches and tables were all beautifully decorated in the same manner. The designs, while chiefly conventional, included at times scenes from the Sagas. Viking furniture

dragon-heads were on it, but the sails were of two-fold *pell* [a species of velvet] most splendidly woven. This ship was painted with red, purple and gold, as well as the beaks of the dragon-heads; inside these were valiant men dressed in costly garments and *pell*." While

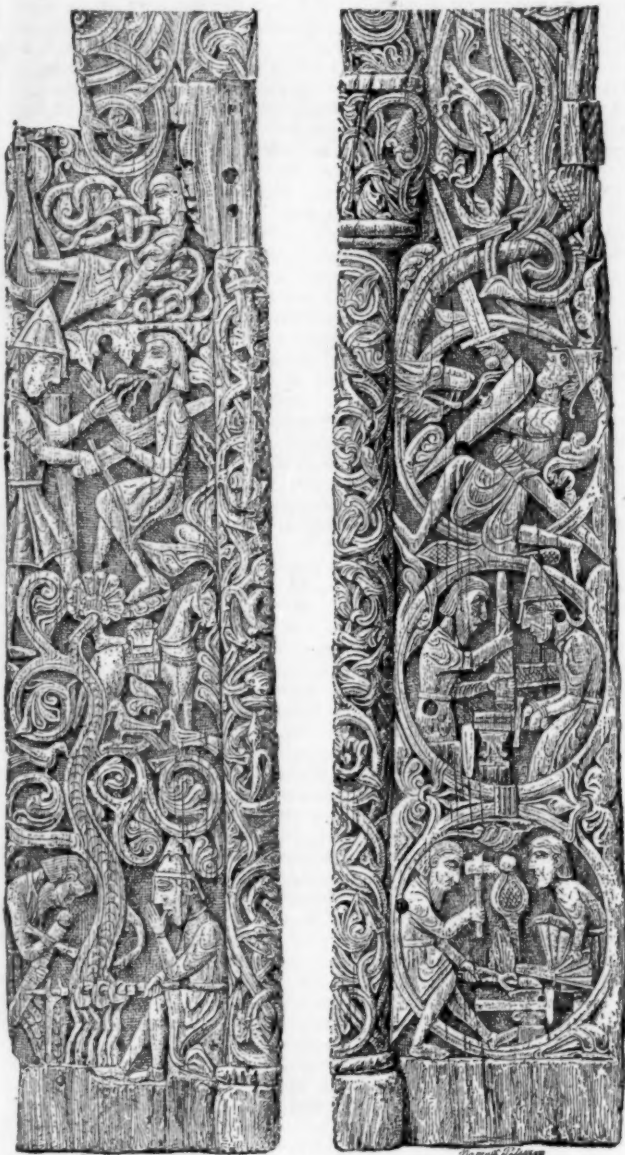


Fig. 1115.

Fig. 1116.

Door-jambs of Hyllestad Church, Soetersdal. Height, 7 feet; width, 1½ feet. Representation of seven episodes from the Volsunga Saga — Regin forging a sword; Sigurd trying it; Sigurd piercing the snake Fafnir; Sigurd roasting the heart of Fafnir; Sigurd's horse *Gran*; Sigurd slaying Regin; and Gunnar in the snake-pit playing the harp with his toes.

does not appear to have been very plentiful, but they made good artistic use of what they had. As is to be expected of a seafaring race which took such ample care of the decorations of their dwellings, they exercised an equal skill in ornamenting their ships and boats. In fact, almost every part of their vessels was decorated either with carvings or with paint. The general appearance of a decorated vessel is graphically described by an ancient writer: "King Magnus the Good saw one day a ship sailing eastward off the land. It was ornamented all over with gold above the water, and fine

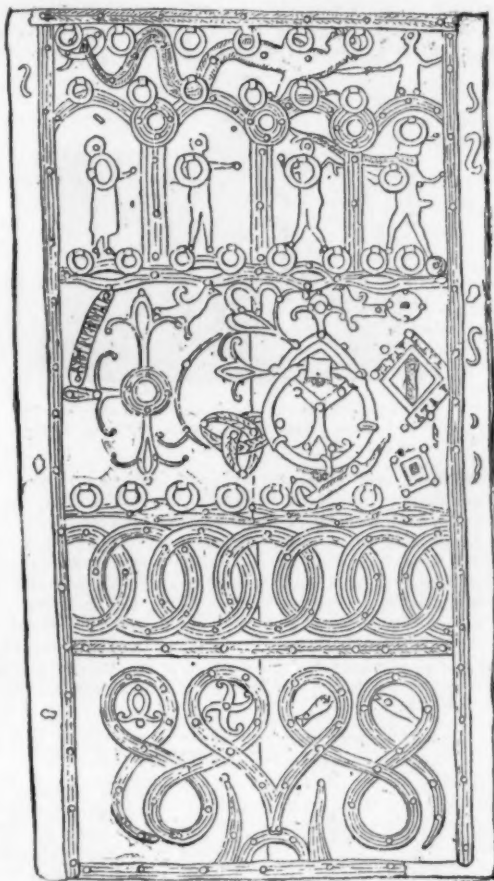


Fig. 1092.—The Church-door of Verås, Vestergötland. Representation of Sigurd slaying the serpent Fafnir: Runic inscription, *Asmútr Kärthi Dyrr* = Asmund made the door; and svastika.

the Vikings may be said to have excelled as carvers of wood, they were equally proficient in other branches of art. They were skilled

Fig. 864.—Axe inlaid with metal, of silver mixed with gold. Bjerringhoj mound at Mammen, near Viborg.



workers in metal, in bronze, in iron, in silver, in gold. Their weapons were chiefly of iron, though both wood and bronze were used. Bronze was frequently used for trimming wooden weapons or parts of weapons, as scabbards, and as mountings for quivers and similar purposes. Some of these designs are quite elaborate, and show considerable familiarity in working the material.

The sword — its hilt, its scabbard, its trimmings — was a favorite

subject of decoration, and afforded opportunities for much beautiful work. Very frequently the ornamented parts were inlaid with gold and silver, while precious stones were also used on some of the more costly weapons. One sword shows a hilt of iron decorated with carved and raised notches, the one of bronze, the other of silver. In the matter of sword ornaments the artist gave himself most freedom. Here he was not hampered by any questions of utility, but let his fancy carry him where it willed. Buckles, pommels, belts, were



Fig. 809.—Ornament of gold for mouth of scabbard; real size.—Vestre Slidre, Norway. Weight, nearly 2½ oz.

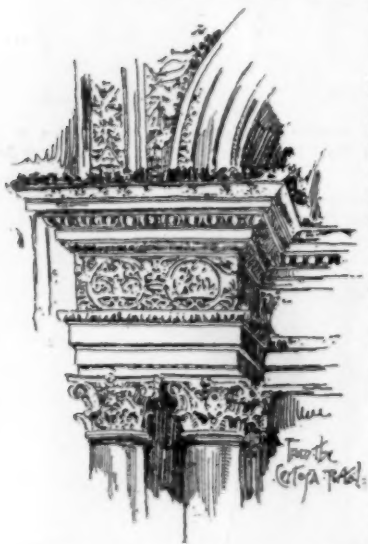
designed in the most elaborate style and finished with exquisite care. Gold ornaments that served as mouths for scabbards are of frequent occurrence, and were worked in most complicated designs. Even spear-heads and axes were ornamented, though probably such weapons were intended for decorative purposes or as rewards in martial contests rather than for actual use. Shields were also decorated with much skill, a favorite method being the insertion of bosses, often of precious metal and more or less delicately finished.

BARR FERREE.

[We desire to acknowledge the courtesy of the Messrs. Scribner which has enabled us to illustrate this paper with electrotypes from the original blocks. — Eds.]

[To be continued.]

THE LEAGUE EXHIBITION. — I.



WE suppose that the Cincinnati Exhibition of November must have detracted somewhat from the League show, for the latter is hardly as full as usual. We cannot call it less interesting, for the collection of cathedral designs makes it in some respects the most remarkable yet held, but we miss something of the number and variety of sketches, from all sorts of hands, which have hitherto made the League exhibition the best annual exponent of the progress of American art to be seen anywhere. In saying this, however, we would not suggest that the value of the exhibition shows signs of declining, on the contrary, the earnest and admirably written introduction to the catalogue shows

that the League understands better than ever its mission as the promoter and exponent of the application of fine art to American life, and it can but proceed always more energetically and effectively as it finds the path which its efforts can best take more clearly defined before it.

First to attract the attention of the visitor, as well as first in importance from any point of view, are the competitive designs for the New York cathedral, which hang all about the ante-room. The four designs selected for the second competition, naturally enough, are not shown, and some others, which we should have liked to see, are missing, but thirty-six or thirty-seven plans, with accompanying elevations and perspectives, give us an excellent idea, not only of the interest which the competition excited in the profession, but the success with which our architects solved the problem. We must say, as a preliminary, that the architects seem to have spent more thought on the subject than the Trustees, for few important competitions take place, and none ought ever to take place, in which the competitors seem to have been so entirely at sea as to the kind of drawings required of them. One would have supposed that the competition programme, which specified that the plans, elevations and perspective should be at a scale of one-sixteenth inch to a foot, was definite enough, but we find plans of all sizes, the smallest of which would not cover one-fourth the area of the larger ones. The perspectives are even

worse, and all idea of scale seems to have been laid aside by some of the draughtsmen. Still more strange, however, is the interpretation put by many of the competitors on the stipulation that the drawings should be all in black-and-white line, without brush-work or shading. Several of the designs are shown, plan included, by drawings in brown, while Messrs. Cady & Company's and Mr. Congdon's perspectives shine in all the glories of full and elaborate water-color, and one or two others are daubed with what appears to be intended as a sketchy color effect. Even among the pen-and-ink perspectives, many are fully rendered, and the shadows cast, while a few, only a minority of the whole, keep strictly to the pure line-work required. It must be confessed that the last, the conscientious ones, are the best. Architects know well enough that an effective drawing in pure outline involves more skill and care than a shaded one, and generally take great pleasure in a successful piece of work of the kind, but laymen do not understand drawings in the same way, and in a mixed collection, only the highly-rendered ones, which jump from their frames at the beholder, have much chance of attracting non-professional attention, so that it was really, as well as technically, unfair and improper, to admit any shaded or colored drawings whatever to the competition. So far as we can see, the instructions distinctly excluded everything of the kind, and even the blacking of the windows, about which there is often a question, but which was indulged in by at least half the competitors, was, as we were informed by an official letter from the Trustees, forbidden. We suppose that the Trustees would be surprised to have a demand made upon them by all the competitors who adhered to the conditions, for the value of the work upon their drawings, as damages for the violation of the contract of competition by the admission of designs not rendered as the conditions stipulated, and no one would think of making such a poor return for the Trustees' unselfish and well-intended efforts, but such a demand would have a tolerable chance of success.

Laying aside this question, which we hope may never be brought up, we will devote ourselves to the designs themselves. As a rule, these are certainly highly creditable to the profession in America. It is to be regretted that the English and French competitive drawings were not shown, for comparison with ours, but we doubt very much whether the English designs were more refined and scholarly than that of Mr. Withers, or whether any of the French ones surpassed in interest and architectural quality that of Messrs. Carrère & Hastings.

This last, out of all the designs shown, must certainly be placed first as a work of art, although we cannot avoid a certain astonishment that any New York architects should have imagined that such an arrangement would commend itself to the Trustees of a Protestant Episcopal Church in this country. The very plan, so masterly in the skill with which a complex group of parts is combined into what appears to be a simple, though rich and artistic scheme, is redolent of incense, and, to the architect, the rows of lateral chapels, and the imposing arrangement of the choir, suggest the clusters of sparkling candles, and the varied life and color of a great Roman Catholic Church, far more than Protestant rectitude and sobriety.

What is the brilliant designer's loss is, perhaps the profession's gain, and we may well rejoice that so splendid a piece of work can be freely shown for our edification. As with most of the best designs, the drawings conform strictly to the terms of the competition circular, but they are marvels of pure outline rendering. Mr. Schladermundt is said to have been the draughtsman, and not even from Mr. Richardson's famous office do we remember a more magnificent piece of work.

The "mosaic" of the plan, in ink of exactly the right depth, forming patterns lovely in themselves, suitable in scale, and combining to perfection with the "poché" solids, is a model which young designers will do well to study, but even this is, to our mind, almost surpassed by the light-ink rendering in the section, whose wonderful beauty and delicacy must be seen to be appreciated.

Next to the splendid work of Messrs. Carrère & Hastings we are inclined to place Mr. Gibson's cathedral design, shown by a perspective view and section, and a very good and interesting plan. The perspective is fully rendered in pen-and-ink, and the shadows cast, rather to the disadvantage of the design, we think, although the drawing is, of course, thus much more conspicuous. The style is French Gothic, late in type, but not obtrusively flamboyant, and the outline and details are studied with a care and knowledge which is very charming; one could not help thinking that the projecting west porch, designating it in conformity with the usual orientation, beautifully studied as it is, injured the outline, and that a more solid treatment of that portion would have added greatly to the expression of a very noble, as well as picturesque mass. In a different style, but equally refined and scholarly, is Mr. Withers's design, shown only by a front elevation and a perspective, in pure English Gothic, immediately recalling Mr. Pearson's work, and similar in many respects to the new Truro Cathedral. Mr. Hazlett has also a well-studied Gothic design, very satisfactory in the correctness of the detail and proportions, though perhaps a little cold. One of the sets of drawings to which we turn with the highest anticipation is that of Messrs. Peabody & Stearns, whose drawings, a little inconspicuous, though the faithfulness with which they have kept to the contract in regard to rendering, show a design less highly flavored with incense than some of the others, but which presents a large Episcopal Church, most skilfully and conveniently planned, and with a graceful and dignified exterior. To the church is attached a clergy-house, which forms a charming addition to the perspective.

Among the Romanesque designs, one of the best is that by Mr.

Glenn Brown, whose perspective only needs two western spires, as good in their way as his central tower, to be a very noble conception. Mr. Warren has also a good set of Romanesque drawings, with a particularly successful central dome, one of the best things in the room. Messrs. Cady & Company also show a plan with a dome in a Romanesque, or perhaps better, an indeterminate style, covered with row upon row of interlacing arcades, which are rather monotonous applied as decoration to so large a surface, and, when they come to be bent over on their backs in the upper portions of the dome, are positively disagreeable to the architectural instinct. This design, by the way, is shown in a highly colored perspective, rendered by Mr. Hughson Hawley, and forms one of the most conspicuous objects in the room, although the brilliancy of the coloring does not, to the expert eye, conceal a certain poverty of detail, and it positively increases the paltry, model-like look which an excess of foreground, and a bad arrangement of horizon and vanishing-points, give to the representation of the building. Messrs. Cady & Company's floor-plan is unobjectionable, although one entrance, however spacious, is hardly enough for the audience end of so large a church.

Two floor-plans, which attract attention by their beauty, and by their rendering in brown ink, are tolerably faithful reproductions, rendering and all, of Mr. Richardson's plan for the Albany Cathedral, but are accompanied by elevations hardly so successful as his. One of these, in Romanesque, well rendered, but heavy, is by Messrs. Cram & Wentworth, of Boston, who have an alternative scheme, made up of an aggregation of parts, like a country's carpenter's plan for a house, with hardly an attempt at the most rudimentary disposition, and as different as possible from the masterly handling of the Richardsonian plan. The other admirer of the Albany design, Mr. John Lyman Faxon, also joins with his floor-plan a Romanesque elevation, a little massive, and too hastily studied, but interesting, and worthy of being shown by a better arranged perspective.

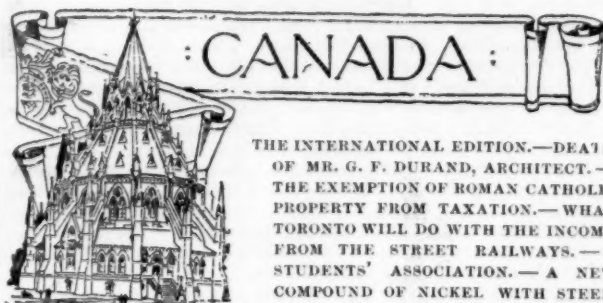
Thus far, the artists whom we have mentioned have shown what some people call a slavish and un-American adherence to precedent in designing the details of at least their elevations, but there are some who have exhibited a freer spirit, and have exhibited designs the like of which no man ever saw before. Prominent among these is an architect of New York, who has conceived the idea of covering the nave of his cathedral with two invisible domes, which are duly indicated on the plan, with the supporting cross-arches and pendentives, but do not appear through the roof in the perspective, although the roof is so flat, and the cornice so low, that any dome with a rise equal to that of a saucer must project through it. The attention of the uncritical is, however, on looking at the perspective, diverted from its lack of correspondence with the plan by the colossal dimensions of the clearstory arches, which have a span of about ninety feet, and contain each a single window. Of course, we know that it is mere prejudice which makes us dislike to see two bays where the slavish imitators of medievalism would put ten, but it cannot be denied that the novel arrangement is unfavorable to the scale, as well as the interest of the building, and the lack of the latter element is not satisfactorily supplied by a sickly yellow dome, as round and bare as a turnip, which rises, or, more properly, bulges, from the crossing of nave and transepts. In regard to rendering, the author of the design seems to have begun his perspective in line, and to have got the outlines inked-in, when it occurred to him to use color, which he apparently applied in about two minutes, on top of the ink, leaving all the different tints, together with the ink, to mix themselves in a friendly puddle as seemed to them best.

Another original design is that of Mr. Jennings, of New York, to whom it has occurred to illuminate his church chiefly by means of vast mullioned windows, which are scattered all over it, from the tops of the towers downward, while the convenience of the congregation is promoted by no less than nine spacious portals at or near the west end.

There are still other eccentricities in the way of design, as well as many good and interesting plans, in Gothic, Romanesque and Renaissance, which we have not mentioned, but we will neglect these, to make room for a little of the moralizing suggested to us by the comparison of the drawings. In the first place, a large part of the competitors did not half try. Many, in fact most of the designs would have been enormously improved, both in plan and elevation, by further study, not always by a few hours more of sleepy brooding over the drawings, but by the active, wideawake comparison of executed buildings, the accumulation of ideas from all possible sources, and the patient labor with tracing-paper and India rubber, by which a great architectural design on paper grows into shape. Even where the ground-plan had been digested until the crude inequalities of spacing, and angular collision of lines, which mark a raw plan, had disappeared, the execution of the drawings was often feeble and student-like, or coarse and slashing, to the great detriment of the effect. In this case, the singular diversity of rendering made comparison more difficult, but even among the pure line-drawings there were few that exhibited all the resources of the art. In the second place, it was certainly unfortunate that the programme of competition did not give some idea of the intended cost of the building. Those competitors who were of a practical turn of mind probably at once assumed a sum for themselves, as the probable limit of the amount that could be raised in the next twenty or thirty years for the erection of the building, leaving the decoration to be paid for by the next generation. Probably this estimate varied greatly, according to the enthusiasm of the person who made it, but as St.

Patrick's Cathedral in New York cost, we suppose, about four million dollars, and took nearly thirty years to build, it is likely that most of the architects who thought anything about it assumed that three millions would be a reasonable sum for the very much smaller body of Episcopalians to raise in the same period, and as they would certainly wish to use solid materials throughout, instead of the lath-and-plaster of the interior of St. Patrick's, they would naturally form the conception of a simpler, although larger building. This reasoning inevitably placed a distinct boundary between the designs of those who used it, and those of the architects who, for once, threw estimates to the winds, and allowed their imagination free run. With some of these, it is hardly too much to say that twenty millions would not suffice to carry their ideas into execution. Compared with some of the plans, Mr. Richardson's design for the Albany Cathedral is small and simple, yet the cost of this is said to have been actually estimated at five millions. We know that the New York Episcopalians are rich and generous, but we remember also that it is about twenty-three years since the cathedral project was so seriously talked about that Mr. Richardson himself was consulted in regard to the plan. During the subsequent period, nearly a quarter of a century, the Wolfe bequest is the first substantial contribution which has been received toward the building; and, at the same rate of progress, it will be some centuries before money enough has been raised to finish and decorate the entire structure.

[To be continued.]



THE INTERNATIONAL EDITION.—DEATH OF MR. G. F. DURAND, ARCHITECT.—THE EXEMPTION OF ROMAN CATHOLIC PROPERTY FROM TAXATION.—WHAT TORONTO WILL DO WITH THE INCOME FROM THE STREET RAILWAYS.—A STUDENTS' ASSOCIATION.—A NEW COMPOUND OF NICKEL WITH STEEL.

I THINK that I cannot begin my first letter this year without a tribute to the very enterprising spirit of this journal. Many architects are waiting with great interest to see the first copy of the new departure, the International Edition, and the fact that its existence is owing to the promised subscriptions of a large body of architects, who recognizing the value of such a journal, rely upon the word of the editors as to its character and promise their support, ought to reassure the more timid members of the profession that it is in their interest also to make it a thorough success. At the time of writing the first copy is probably in the press, and, as it emerges therefrom, I am sure it will be received with applause.

The local press greets with satisfaction the work of the Ontario Association of Architects in reference to the better safeguarding of the public against such evils as arise through the ignorance of uneducated and only so-called architects. But, in describing the work of an architect of the present day, the leading Toronto paper has an article on "style," which, if it is to be taken as a sample of knowledge of the general public on the subject, is so lamentable that the amusement it first arouses is speedily changed into a sigh of regret. The architect of the day "must be able to give us a design that shall combine within itself the simple grandeur of the Classic, the airy grace of the most perfect Gothic, the calm repose of the choicest Italian, with a dash of Queen Anne or Modern Bizarre indescribable thrown in, if necessary, to please the jaded taste of these degenerate days." Alas! that in such an age of education as ours is, one could be found to perpetrate such nonsense! It is to be hoped that some philanthropist will take this poor wretch in hand and show him the error of his ways.

"In life remember death." In the midst of the satisfaction indulged in by the Ontario Association of Architects since the first convention held in November, on account of its success, they have to deplore the almost sudden decease of one of their re-elected Vice-Presidents, Mr. George Durand, of London, Ontario. Mr. Durand was taken ill early in December, and died within a fortnight. The principal work he was engaged upon at the time of his death was the new building for the Upper Canada college in Toronto.

The movement to put an end to the exemption of Roman Catholic property in Montreal from taxation is beginning to take definite shape. The Roman Catholic aldermen of the city are taking a leading part in the matter, and through their means a bill will soon be introduced into the Quebec Parliament with this object in view. It was first reported that this exempted property was valued at not less than nineteen millions of dollars. The actual figures are not quite so high, being \$17,921,665, or nearly one-sixth of the total value of the property in Montreal. The Seminary of Montreal holds the greatest proportion of this property, and is reported to be richer than the Bank of Montreal, with its \$12,000,000 capital. It enjoys all the privileges of the city, and yet it does not pay one cent of the taxes. The Seminary obtained the seignory of the island of Montreal for the purpose of providing education, and while to a great extent

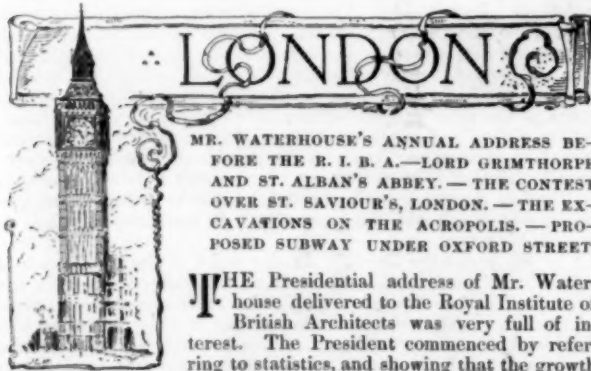
this work is over, they still retain their privileges. The charter provides that it shall expend its revenues for the benefit of the city, and make reports thereon, but for the last forty years the Seminary has withheld its reports, and considerable sums are expended out of the country. The Government has to pay from \$80 to \$100 for each orphan cared for by the Seminary, which moreover, refuses to take in any child unpaid for. This is a question of the greatest importance to the Province of Quebec, and upon the solution will depend in a great measure the earlier or later "Anglicizing" (pardon the word) of the Province. The real estate of Montreal is assessed at \$109,456,000, while that of Toronto is assessed at \$122,651,000.

The city of Toronto has just reached that period of existence, common to all colonial cities, when after an era of utilitarianism, its inhabitants have awakened to the fact that it is to their own personal advantage to set about the adornment of their city. In a couple of years' time an income of about \$20,000 will become the property of the city, on account of the termination of the Street Railway Company's Charter. Public spirit is beginning to assert itself beyond individual interests, and as a result a movement is on foot to bring about the preservation forever of such open grounds and spaces which at present beautify the city but which may any time be taxed and consequently sold for building purposes. The grounds round the Cathedral, the old parliament-house, Queen's Park and other places are particularly aimed at in this scheme, and it is proposed to lay out these grounds, erect statues to prominent men of the Province, and to build museums and start an art collection. Such an opportunity as this is not to be lost. The \$20,000 must be expended somehow, and it is very doubtful whether there is any way in which it could be laid out that would result in greater benefit to Toronto.

The students in Toronto have at last set about the establishment of an "Architectural Club" which is to take the form of a "students' association," but enlarged to include practising architects. The intention is to have a room where the youths can meet and see the journals and discuss subjects in connection with their work; to have classes for drawing, monthly competitions, lectures and so on, for they have at last been aroused to the fact that there is a great deal for them to learn outside their employers' offices. Drawing-classes will be commenced at once in a room temporarily provided. There is no reason why if the students are only energetic and earnest enough there should not be a first-rate students' association there.

A discovery that may be truly described as wonderful, in its probable results, has been made at Sudbury, Ontario. Copper mines have been worked there for a good while and platinum is found in the same mines, but the metal nickel is also found there in an enormous quantity, so great that it is said one month's output would supply a year's demand from all parts of the world. But this is not all: in preparation of the alloys, it is found that certain proportions of nickel and steel produce a compound with characteristics that will in all probability revolutionize the steel interest. Nickel is not an expensive metal and this compound of nickel and steel can be produced at a far less cost than best Bessemer steel, while it is not only suitable for every use to which that metal is applied, but is very superior to it.

The sum of one million dollars has recently been voted in Montreal for the improvements of the quay and landing-stages and wharves,—for the widening of approaches, and for the construction of permanent works to protect the city from the floods.



A very real fact, despite the ill-advised attacks that are from time to time being made upon it by a certain section of the profession. Referring briefly to the want of recognition which architecture received from the State, he then went on to quote the following most interesting extract from the work of the eminent German, Dr. Reichenperger: "The well-known aversion of the English to bureaucratic over-governmentation exhibits itself even in the domain of art, especially in that of architecture. There is on the other side of the Channel no hierarchically classified and betitled band of architectural officials; neither do we meet in England with establishments founded and supported by the State for the education of architectural students, nor with governmental examinations, nor with official diplomas thereupon granted. Nevertheless, the English continue to execute architectural works of all kinds, not only in no respect inferior to our own, but, in my estimation, actually superior from an

aesthetic point-of-view." This tribute to English work was received with great applause.

Two or three minor matters having received the President's attention, he next considered an attack which had recently been made on the scope of the Institute examinations by the Professor of Architecture at the Royal Academy. The Professor, as you may remember, has given utterance to views in which he expresses the opinion that all historical and strictly archaeological questions should be cut out from the examination, which should simply test the student's capabilities as a building constructor. Mr. Waterhouse said that, though he disagreed with the Professor to this extent, that he thought it would be most desirable for every architect to know a little about the styles which have brought architecture to its present position, it was most important that the examinations should never have anything about them likely to fetter the student in any way; and he thought that, under the present system, the utmost freedom was allowed their students in all that concerned the inventive side of their art. It was better to encourage independent judgment and invention in devising means to a prescribed end than any slavish conformity to ancient precedents. But they would be very unwise to refuse to take advantage of the accumulated experiences of the past, or to completely sever that tie of tradition which made the acquisition of architectural knowledge partly a study of history, and connected from age to age with the life of a nation. The Paris Exhibition and the London County Council having received a due share of attention, Mr. Waterhouse turned to the subject, "annually becoming more urgent and irrepressible," of professional education, in which Mr. Stokes's Presidential address to the Architectural Association came in for a full share of attention. The Association itself was very highly praised. Its method of teaching "had had remarkable results." "The Architectural Association," said Mr. Waterhouse, "had been a great success, and it was still so much a success that he hoped every one of the non-metropolitan societies allied to the Institute would soon have connected with it an association of juniors, similarly constituted, and doing equally beneficial work. Without such teaching bodies to feed a professional society, not only education languishes, but the society itself might die of inanition." But Mr. Waterhouse was not content with fair words. He also gave an intimation that an appeal for pecuniary help would not be allowed to pass unheeded, and said that he believed that the senior and representative body of the architectural profession would do wisely, if the way could be made clear, to give substantial help to those who, during a long and prosperous period, had shown an earnest determination to help themselves. A note of warning was, however, addressed to those who are agitating for a more academical method of teaching architecture, and of either abolishing pupillage or modifying it out of all recognition. If a college of architecture, heavily endowed, were to descend upon them from the skies, he was not certain that it would be an unmixed blessing. Thoughtful critics among their Continental brethren appeared to agree that there was something in the freedom of English study and practice which was at the bottom of the good results they had been willing to signalize. Let them not, therefore, hastily throw away their birthright. Let them examine the student to ascertain whether he possessed at least a minimum of technical education—that he was able to make a respectable drawing, and to design a fit and convenient building. When that has been ascertained, the sooner the student was left to his own devices the sooner he would develop his inventive faculty and his artistic judgment. At present, in England, the students came under different influences, and were early thrown to a certain extent on their own resources. They did not all drink at one fountain, as would be the case if they had a Heaven-descended college; and, in consequence, there was more individuality about English work than could be found generally in the modern architecture of France and other Continental countries long in possession of that home of architectural learning for which some of them sighed. Mr. Waterhouse, on a more careful consideration of the question, might, perhaps, have found cause to modify some of his opinions, but they were expressed in a manner almost faultless, except, perhaps, the adjective "Heaven-descended."

The address was continued by a return to the President's first love, the shortcomings of the State, and a general congratulation on the progress of the profession, morally and artistically, formed a graceful termination to a careful and very considerate and thoughtful Presidential address.

An important decision has been given with respect to St. Alban's Abbey and its rival restorers, Lord Grimthorpe and Mr. H. H. Gibbs. To make this dispute more clear, I will give you a brief account of the history of this restoration of St. Alban's Abbey. In the year 1875 the bishopric of St. Alban's was set up, but the Abbey Church assigned to be the seat of the bishop's chair was in a state of profound decay—almost in ruins. Of course, this state of things could not go on, and in 1877 a committee, of which certain clerical authorities and Lord Grimthorpe (then Sir Edmund Beckett, Q. C.) were members, received a faculty to "restore, repair and refit." This word "faculty," I may explain, is a term given to a legal authorization which it is necessary to obtain in England before making any alteration to the material fabric of an ecclesiastical edifice, and to make such alterations without this faculty exposes the offender to a severe legal penalty. This restoration-committee went on with the work fairly well till 1880, when funds failed and the work flagged. Now my Lord Grimthorpe saw his opportunity.

He came forward with an offer of undoubted generosity, to bear the whole expense of restoring the Abbey, but he made one condition: if his offer to complete the work were accepted, it must be done in his own way. He was not going to be trammelled by the views of this or that committee. The restoration-committee were, consequently, in a great dilemma. It was a case of "*aut Caesar, aut nihil*," and the committee chose Caesar. So Lord Grimthorpe obtained his faculty, which continued in him the authority given to the defunct committee. My lord no sooner finding himself in power than he began to use his authority in a very arbitrary way. He began by decidedly objecting to all architects, and by setting up Lord Grimthorpe to reign in their stead. But alas! the new king far exceeded the wickedness of the old ones, and consequently dreadful have been the monstrosities with which his lordship has defaced the Abbey. Protests and threats have alike been in vain, and my lord has gone on from bad to worse, till there is little of the old Abbey which has escaped the hands of the destroyer. Some time ago, however, Mr. H. H. Gibbs appeared on the scene and took in hand the altar-screen, which he restored very carefully under the direction of Sir Arthur Blomfield. This finished, he proposed to continue his good work in the Lady Chapel, but Lord Grimthorpe stared aghast at any one presuming to intrude so far on his domain. It really could not be permitted. So Mr. Gibbs appealed to the court, arguing that a Lady Chapel did not come under the faculty granted in respect of a whole abbey. The decision of the court was in favor of my Lord Grimthorpe, and so it seems that, under our English laws, the work of destruction will go merrily on, despite the protests of bishop, rector, church-wardens and, I suppose, nearly every person of eminence in England's artistic coteries, for the term of my Lord Grimthorpe's natural life.

An interesting venture into the dubious field of "profit-sharing" has been recently made by the contractors to the new Cane Hill Asylum, Messrs. Peto Bros. They have issued a circular, in which they propose to give the men one-quarter of the whole net profits on the contract in addition to their ordinary wages. They reserve the right to withdraw this concession from any man (1) who has earned less than £5 in their employ; (2) who, by strikes, careless work or neglect of duties, tends to diminish the profits on the job; (3) who by any means damages the character of the firm for good and honest work. This is a purely tentative scheme on Messrs. Peto Bros.' part, but they intend to adopt it on all their works if it prove successful. Of course, it is not possible to foresee the issue of the proposal. A somewhat similar one emanating from one of the largest of the metropolitan gas-companies has caused the great strike of which you have doubtless heard through the daily papers, on the ground that it removes the men's present right of striking, which a British workman dearly cherishes. To a just mind, however, the attempt seems warmly commendable, and I quite hope it will prove successful, and so lead to that community of interest between labor and capital which we are all so anxious to see established.

The important church of S. Saviour's, Southwark, just on the south side of London Bridge, is about to be restored under the direction of Sir Arthur Blomfield at an estimated cost of £35,000. The choir of this church, buried among the markets and warehouses of "The Borough" is one of the most exquisite examples of early English architecture in this country. It is very pure and delicate and of beautiful proportion. The nave, however, of the old church was destroyed in 1839 by the Goths and Vandals who held sway over English art, and a hideous structure, about as ugly I suppose as it is possible for the ingenuity of man to conceive, was erected in its place, every detail the beautiful old work being wantonly destroyed. Worse than this: under one of those curious anomalies which are so frequent in the Anglican Church, the nave of the building belonged to one incumbent and the choir to another. The relations between these two gentlemen being strained, the nave was made a sort of opposition building. The level of the floor was raised many feet and a heavy wall was built cutting off all connection with the choir. An edifying spectacle! The matter now has been taken in hand by the Bishop of Rochester, who is working in his usual vigorous style, and there is every hope that the work will be begun in a short time, and that South London will have a Cathedral, rich in historic memories and second to none in architectural interest, and which will rank with many of our finest buildings.

The students' work at the Academy was exhibited in the early part of December. The work of the architectural students was very poor in character and several of the more important prizes were not awarded for lack of satisfactory competitors. This seems to argue a very unsatisfactory state of things at the Academy so far as regards the architectural students, but as a matter-of-fact the painters on the governing body entirely overrule the objections of the small number of architects who hold a position thereon, with, I need not say, a lamentable result.

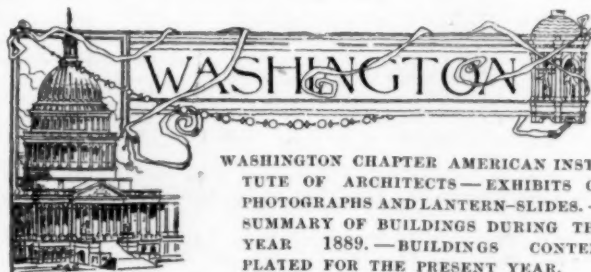
Two interesting papers have been read recently at the Royal Institute of British Architects, one by Mr. R. Elsey Smith, the Greek Travelling Student, and the other by Mr. David McGibbon. Mr. Smith's paper dealt with the recent discoveries of the British and German excavators on the Acropolis. He gave some interesting theories by Dr. Dörpfeldt on the intentions of Muesicles with regard to the Propylea, and went very fully into the Greek Theatres of Dionysos and Epidaurios, establishing the fact that the stage was originally not raised above the level of the orchestra. His excavations at Cyprus occupied a considerable portion of his paper, but his remarks

were chiefly archaeological. Mr. McGibbon investigated the interesting subject of Provençal architecture. Premising his remarks by a reference to the Phœnician and Greek influences which had probably been brought to bear on Provençal work, he took up in detail the Roman influence which is so strongly evidenced in the porches of Notre Dame at Avignon, S. Trophime at Arles and others. He then traced the gradual supersession of this by a native style which grew into luxuriance, was in its turn influenced by the ascetical Cistercian movement and then was choked, so to say, by the northern French Gothic. Both lectures were largely illustrated by means of lime-light views, which are not so much used in British architectural lectures as they deserve to be, and each may be termed an important addition to our existing historical knowledge.

A very sad thing has happened with regard to the new engineer to the London County Council, Mr. Joseph Gordon. He was only appointed a few months back, and gave up a lucrative position at Leicester for the appointment. One morning as he was in his usual omnibus going to the Council, he was seized with sudden illness and died immediately. The sudden nature of the event has given great pain to all his many friends. Mr. Clement Dunscombe has, after a lot of unseemly wrangling, been appointed to the position.

Among the schemes for submission to Parliament next session is a Central London subway, to extend, under the whole length of Oxford Street and Holborn to King William Street. A somewhat similar bill was promoted last session, but it was not passed as the occupiers on the line of route objected on the ground that the excavations would probably permit their houses to settle. This difficulty has been superseded by a proposal to bore the tunnel through the solid clay some 40 feet below the surface, which, it is thought, will be cheaper and far more satisfactory than the former proposition. The new bill is however being opposed strenuously by the tradesmen of Oxford Street as its passing will probably seriously diminish the traffic. Another bill is being promoted by the London County Council for the purpose of constructing subways under the main arteries of traffic, for the purpose of containing the underground pipes and wires, which are now the cause of a continual and most annoying disturbance of the streets' surfaces.

The Sheffield competition which I told you of last month, has attracted 179 competitors, and two other competitions have recently been announced on almost precisely the same terms. The satisfaction which this competition has given to all concerned is most refreshing. In strange contrast, however, is the action of the Richmond Vestry, who in a recent competition actually took upon themselves to upset the decision of an eminent assessor, who had been appointed to decide upon the drawings, and gave the job to a man altogether unknown to the world and whose design though not bad, was certainly very far from the best.



WASHINGTON CHAPTER AMERICAN INSTITUTE OF ARCHITECTS—EXHIBITS OF PHOTOGRAPHS AND LANTERN-SLIDES.—SUMMARY OF BUILDINGS DURING THE YEAR 1889.—BUILDINGS CONTEMPLATED FOR THE PRESENT YEAR.

THE last meeting of the Washington Chapter was one of special interest, because of the arrangements made by the committee for entertaining the members who were present. Many readers will remember reproductions made in the *English Building News*, of photographs taken during the annual excursion of a body of architects, with descriptions and sketches from the same source. The amateur photographer of the party was Mr. John L. Robinson, A. R. H. A., an architect and of course a member of the association. Some three hundred of these photographs, made during the excursions of 1888 and 1889, were loaned to the Washington Chapter for exhibition. They were remarkably clear and sharp, and more interesting to architects than ones made by a professional photographer would have been, as best points-of-view and the most interesting and picturesque bits of detail were taken in. Technically, they were equal to any professional photographer's work that I have seen. Among the most interesting ones I might enumerate several views from Haddon Hall, Wollaton Hall, Sudbury Mansion, Lichfield, Ely, and Peterborough Cathedrals, Houghton Hall, Sandringham, and Oxburg Hall, Castle Acre Priory, and many others.

The architects were evidently out for pleasure as well as art, as we saw them grouped in the foreground of many of the photographs, their faces and attitudes always showing them full of, we might say, pranks and good humor. In one view they had made of themselves living statuary with which to fill the vacant niches in one of the old cathedrals.

The tariff on works of art (I do not know whether photographs would come under this head or not) was brought forcibly to our notice when these views arrived in this country. To get them through the Custom House, it was necessary for the Chapter to give bond in

Baltimore to take and return them in a specified time. It was easier to pay the duty than to go through the red tape necessary to get them out free of duty. This is a good example of the short-sightedness of Congressional legislation: throwing all the obstacles possible in the way of its own citizens when they wish to increase their knowledge and refine their artistic taste. I hope that the association who have recently taken the steps towards obtaining the necessary legislation for abolishing the tariff on works of art, may soon be successful in this much needed reform.

After a view and discussion of the photographs there was an exhibition of lantern-slides, loaned by the Columbia College architectural department. The slides were selected so as to illustrate the round-arch architecture as shown in Southern Europe and the East. Two exterior and several interior views of Saint Sophia were cast upon the screen; Pisa and other Italian buildings; the porch of the church at Arles, and St. Giles, with other numerous examples, some sixty in all.

The Chapter then discussed and appointed a committee to wait on the District Commission and recommend that a new clause of the building regulations in reference to solid balustrades on front porches be changed so as to allow such a balustrade, provided it and the porch do not exceed seven feet in height, and do not project from the building line more than five feet. The commissioners seemed inclined to modify the regulations in accordance with this action.

There were a larger number of buildings erected during the year 1889 than during the year 1888, but the amount of money invested was larger in the previous year. The numerous large business buildings and handsome residences which were a feature of the year 1888 are lacking during the past year.

There were more six, seven, eight, and nine room houses built last year, than at any time in the history of the city. The largest number of these houses have been built in Northeast and Southeast Washington. In this section the ground has been cheap, compared with ground in the Northwest, so people with limited means and investors who believe in small houses have been turning their attention in that direction for the last few years.

Of course, improvements in the way of houses also bring improvements in the way of sidewalks, and all the improvements are making the Hill, or East Washington, take on a new aspect. There were over two hundred houses more built last year than in the year 1888. Below is a comparative list of dwellings for the two years.

	1889.	1888.
January.....	109	89
February.....	246	106
March.....	227	200
April.....	185	250
May.....	318	194
June.....	197	185
July.....	184	180
August.....	224	212
September.....	141	137
October.....	132	197
November.....	86	96
December.....	106	88

A little over a hundred of these cost more than ten thousand dollars, some twenty-five exceeding twenty-five thousand dollars in cost.

The larger class of business buildings have also been less conspicuous than during the year 1888. Among the more prominent ones are the Inter-Ocean office-building, in process of erection, to cost about \$75,000, J. L. Smithmeyer, architect; Henry Strong's stores, \$50,000, W. Bruce Gray, architect; Ruppert's office-building, \$30,000, A. G. Meyers, architect. Among the public buildings [not Government] is the Columbia Athletic Club, \$16,000, J. W. Wagner, architect; the Baptist Church on 16th Street, \$70,000, Gray, architect; House of the Good Shepherd, \$40,000; Car and Power House, \$60,000.

The real-estate market seems to hold its own, as prices are firm, the owners evidently being able and willing to hold on. Washington, according to a real-estate man, is not subject to what may be called regular "booms," or to their antitheses "slumps," as there is too much property in the market to admit of boom prices: when prices get too high in one section, it is allowed to rest by investors, while they put their money in property in other localities. Suburban property acts as a check upon city property, and property in the Northeast keeps down extravagant prices in the Northwest. High prices on Capitol Hill drove investors Northwest some years ago, now high prices Northwest seems to be having the opposite tendency.

The coming year much is expected in the building line. Two Loan and Trust Companies have been organized with capitals of about one million dollars each, the stock of which has been rapidly bought up. They are both expected to build large buildings during the coming year. One has bought the corner of 9th and F Streets, giving two hundred thousand dollars for the ground, and their intention is to build a ten-story building, according to rumor. I have just heard that Mr. J. G. Hill is making the plans: cost to be \$300,000. The National Union Insurance Company recently bought a lot on F Street, for \$46,000, which they intend to improve by the erection of

a fireproof building for offices. Mr. Glenn Brown is the architect. Work is expected to commence on this building early in February.

It looks very much as if Washington would this year get its United States Post-office Building. This post-office, handling as it does all the Government mail, is one of the most important in the country, yet it is bandied about from one place to another; now its quarters are in a miserable dilapidated old building, erected originally for a hotel. It was ordered into the court of the Pension Building last year, but the order was never executed. First, because the inaugural must be held therein, and second, the new post-office officials did not consider the place suitable. The Supreme Court is crying for a new building. Then there are the new buildings necessary for the Zoological Park.

The United States Government is renting buildings without number in all sections of the city. It seems a shortsighted policy to be paying rental on poor buildings, double what the interest would be on a good building, when it is hard to know what to do with the surplus, which is idle in the treasury. The architects and builders all seem to anticipate a prosperous year in 1890.

ELECTRICAL TERMS.



THE Boston Transcript has been at the pains to bring together the appended definitions of electrical terms:

Accumulator.—Storage or secondary battery, in which electricity has been carried and has been converted into chemical energy, being retransformed into electricity when the battery is put to use for the purpose of furnishing energy or light.

Ampere.—The unit of the strength of the current per second. It represents, perhaps, the volume of electricity, and its value is the quantity of the fluid which flows per second through one ohm of resistance when impelled by one volt of electro-motive force.

Anode.—The positive pole of a battery.

Arc.—The space between the points of the carbons in an electric light or lamp which is bridged by the current represented by the flame.

Armature.—The revolving arm of an electric generator.

Battery.—A primary-battery is one in which electricity is obtained through the decomposition of metals in chemical solutions. Zinc and copper may be the metals and sulphuric acid the chemical. Gold, silver, platinum, iron or tin may also be used as the metals and sal-ammoniac, bi-chromate of potash, nitric acid and sulphate of copper may also be used as the chemicals. The storage-battery is a cell of acidulated water, containing, for example, plates of lead. This arrangement has an electric current directed into it, which it will give back in almost an equal quantity when the energy is wanted. There are various methods and ways of making both primary and secondary or storage-batteries, but the above are the general principles governing their construction.

Brush.—The copper string which connects with the commutator of a dynamo and gathers the electricity for the conductors.

Candle.—Our unit of illuminating-power.

Carbons.—Rods of carbon are used in arc-lights for first establishing the current, and then, when withdrawn, form the arc over which the electric flame leaps. They are made of powdered coke by a secret process.

Cell.—The vessel in which chemical actions produces electricity.

Circuit.—The path along which an electric current travels.

Commutator.—The collector of the electricity generated, and from which the fluid is taken by the brushes.

Condenser.—An arrangement for collecting a large quantity of electricity on a small surface.

Conductivity.—The comparative ability of a substance to convey a current of electricity.

Conductor.—Conveyers of the electric current, silver being the best, and copper next, in conductivity.

Core.—The iron that becomes magnetized in an electro-magnet. In helix, this iron is of the softest kind.

Coulomb.—The unit of dynamic quantity represented by one ampère of current.

Current.—The flow of electricity along a conductor. Its strength in ampères is found by dividing the electro-motive force in volts by the resistance in ohms.

Dynamo.—Machine for converting mechanical power into electrical energy.

Electrode.—A pole of a battery.

Electro-motive Force.—The power that constitutes or moves electricity.

Electro-magnet.—The soft iron core around which insulated wire is wound. It becomes highly magnetized when the current is sent through the coil, and is much more powerful than a permanent magnet, but its magnetism is lost when the current is broken.

Ferad.—The unit of electrical capacity.

Galvanometer.—An instrument for measuring an electric current and for detecting the presence of electricity.

Horse-power, Electrical.—A unit of power equalling 746 watts of electrical energy. A current of one ampère and 746 volts is an electrical horse-power.

Induction.—The property by which one body having electrical, galvanic or magnetic polarity causes it or induces it in another body without having actual contact. In other words, an impress of molecular force or conditions from one body on another without direct contact. An electric current in a wire induces currents in conductors parallel to it.

Insulators.—Substances possessing high resistance, such as glass, vulcanized rubber, paraffine, etc. When covering a wire along which an electric current is passing it prevents loss of power by induction, and makes the wires heavily charged safer for handling.

Jule.—The union of heat and work which is expended in forcing one coulomb through one ohm. It equals .7373 foot-pound.

Magnet.—A magnetized piece of iron or steel, capable of attracting iron or steel bodies, and of inducing electric currents.

Negative.—The terminal of a generator, where the positive current returns after traversing its circuit. Negative electricity is an amount less than the substance would naturally contain.

Ohm.—The unit of resistance represented by the resistance through which one ampère of current will flow at a pressure of one volt electro-motive force.

Polarity.—A magnet suspended so that its movements are unrestricted in any direction will turn one point to the North, the other to the South. Hence the North and South poles of the magnet.

Pole.—The terminal of a generator.

Positive.—The point of a generator where the positive current leaves it.

Potential.—Applicable electro-motive force corresponding to pressure or head in hydraulics.

Power.—The rate of doing work.

Resistance.—The opposition that a current meets in traversing a conductor.

Volt.—The unit of electro-motive force. One volt will force one ampère of current through one ohm of resistance.

Watt.—The units of electrical power represented by one volt multiplied by one ampère.

The unit of electrical-power, etc., are symbolized as follows:

Electric motive force or volt.....	E. M. F. or
Current or ampère.....	C.
Resistance or ohm.....	R.
Quantity or coulomb.....	Q.
Capacity or ferad.....	R.
Energy or joule.....	W.
Power or watt.....	P.



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

"A FOUNTAIN OF ST. GEORGE," AFTER AN ETCHING BY AXEL H. HAIG.

[Photogravure on Japan paper.]

THIS plate is issued as a supplement to subscribers who have fulfilled the conditions announced in our issue of November 9 last. In our announcements we have followed the example of the leading print-sellers and called this print "The Fountain of St. George at Lubeck," but Mr. Haig writes us under date of December 26: "The subject is not to be found at Lubeck at all or in any North German town. The work is a composition partially founded on a scene in an old Bavarian town, but, being so very much an invention, I cannot give a locality to it."

UNITED STATES TRUST COMPANY'S BUILDING, WALL STREET, NEW YORK, N. Y. MR. R. W. GIBSON, ARCHITECT, NEW YORK, N. Y.

[Helio-chrome issued only with the International and Imperial Editions.]

TWO SHEETS OF SKETCHES BY A ROTCH TRAVELLING-SCHOLAR, MR. E. A. JOSSELYN.

[Issued only with the International and Imperial Editions.]

ST. REGULUS'S CHURCH AND TOWER, ST. ANDREWS, SCOTLAND.¹

[Issued only with the International and Imperial Editions.]

"CLOSE to the vast fragments of the Metropolitan Cathedral of Scotland stand the ruins—if so a building can be termed of which the stonework is still nearly entire—of the more ancient Church of St. Regulus. Beside the red crumbling remains of the great fabric, this small simple church, so nearly complete, would, to a person, who saw them both for the first time, without any guides from history or the progress of architecture, convey a distinct idea that it is a more modern building than its majestic companion, which, built no one can tell precisely how many years later, has advanced much farther in decay, and may perhaps be level with the earth when the small relic of an older and simpler ecclesiastical system shall still subsist, to show how substantially, yet how simply, early Christianity took root in Scotland. It is a disputed question whether the Culdees, for whom the Church of St. Regulus is reported to have served as a place of worship, were under a hierarchical or a Presbyterian polity; but if architectural analogies were allowed to influence such an inquiry, whoever looked upon this old church would pronounce that the simplest forms of worship alone were pursued within its walls; and he might thus perhaps find a common simplicity, if not meagreness, characterizing alike the structures which preceded and those which followed the ages during which Gothic architecture and the Roman Catholic Church together triumphed.

"This building, which with all its plainness is singularly interesting, contrasts in every way with the cathedral. It is built with a cold gray stone, while the latter consists of a warm red. The walls of the cathedral have been massive, but ill-built, of rubble-work; those of the old church are thin, but remarkably well built, with courses of square hewn stone. The cathedral exhibits some scanty traces of ornaments; the old church retains all the decorations it seems to have ever possessed, and they are of the simplest and most unpretending character. The superior style of the mason-work accounts for the state of preservation in which this edifice has reached us. The body of the church is a simple parallelogram, with neither transept nor aisle. It has a wide arch over the doorway—simply circular, but without the massiveness of the Norman, and possessing a slightly nearer approach to the character of the pure Roman. It has been lighted by very small round-arched windows, which, probably having been unglazed, are pitched high in the wall, to prevent as much as possible the sufferings of the congregation from the cold east winds which seldom cease to blow on this exposed rock. The whole imparts, in the thinness of the walls, the want of ornament, and even the clean, regular character of the masonry, a cold and comfortless sensation, very different from the mingled feelings of solemnity and mysterious awe usually experienced within Gothic ecclesiastical edifices. Yet every lover of antiquity must feel gratified that this valuable relic has been allowed to remain in its present state; and that a dread, some time ago entertained, of the possibility of its being fitted up within in modern comfortable style was not realized.

"The square tower, fully represented in the plate, is a very conspicuous feature of this building, and its disproportioned size adds by contrast to the thinness and meagreness of the body of the church. Like the rest of the edifice, it is built in courses of finely hewn stone; and in this feature, along with some other details, it resembles the celebrated round towers of Scotland and Ireland, and at the same time has a good deal in common with those towers which in England are generally supposed to be of Saxon origin. The small windows, divided by shafts, have considerable resemblance to some like details in the round tower at Abernethy; and it is difficult to compare the two together without feeling the likelihood that they belong to the same age and class of architecture. Like the round towers, it was constructed without any internal stair or means of ascent—a want common also to the Saxon towers; but a substantial flight of stone steps has lately been made within the Tower of St. Regulus, from the top of which a noble view of the ancient archiepiscopal city and the surrounding country may be enjoyed.

"Like that of its circular brethren, the age of the foundation of this tower and the accompanying church, is matter of pure conjecture. Its legendary history, which has been embodied in the monkish chronicles, is, that in the year 307, Regulus, a monk of Achaia, being warned in a dream or vision that the Emperor Constantine intended to translate the relics of St. Andrew the Martyr, then deposited in Patrae, to Constantinople, removed a portion of them, with which he sailed westward, until he landed and found shelter on the barren rocks of the east coast of Scotland, where the metropolitan city subsequently reared her towers and spires. Between the cathedral and

¹ It should always be kept in mind that these illustrations from the "Baronial and Ecclesiastical Antiquities of Scotland," by R. W. Billings, are republished very largely for the sake of giving instruction in one manner of the rendering of architectural drawings.

the castle there is a cave, entered from the sea, which has either been made or altered artificially, containing on one side a rude altar, and on the other an opening to an inner cavity. This was the first place of the saint's refuge, and subsequently became an object of pilgrimage, as described by Scott, in his "Marmion":

"But I have solemn vows to pay,
And may not linger by the way,
To fair St. Andrews bound;
Within the ocean-cave to pray,
Where good St. Rule his holy lay,
From midnight to the dawn of day,
Sung to the billows' sound."

"The legend, in continuation, imports that Regulus built the tower and church, now known by his name.¹ This account takes the date of the edifice to a period probably 400 years earlier than that of any building in Scotland of which the age is satisfactorily ascertained. There are no early authentic memorials of this church; but there is all reason to believe that it was the cathedral of the early bishops, until a sufficient portion of the greater edifice, begun in the middle of the twelfth century, was completed for public worship."

ST. SALVATOR'S CHURCH, ST. ANDREWS, SCOTLAND.

[Issued only with the International and Imperial Editions.]

"The Church of St. Salvator, or the Holy Saviour, more generally known as the College Church, runs along the north side of the main street of St. Andrews, having at its west end a tall square tower, surmounted by a hexagonal spire resembling that of Glasgow, but smaller and simpler, and at the east end an oriel of three lights. Though kept in a serviceable condition, it is a sad wreck of what it must at one time have been. The stone mullions of the windows, which, from the character of some of the remaining details of other parts, we may suppose to have been rich and beautiful, are all gone, and the arches are filled with panes of glass, held together by narrow wooden sockets, according to the practice of domestic architecture. Some niches and mouldings along the southern side still show defaced remains of old richness and beauty."

"The great progress which architecture had achieved in the western States of Europe, beyond all the other arts, which—after the work of the mason had come to a state of perfection vainly attempted to be imitated in later times—were merely struggling into existence and shape, gave the forms of architectural objects and devices a natural predominance in the other branches of textile art. The shape to which the edifice owed its strength and its surpassing beauty, was thus naturally adapted to many other purposes. The statue of the saint was surmounted by miniature emblems of the same pillars and groined arches which covered the lofty choir, and sculpture never appeared without being nearly buried in architecture, of which it was but a mere adjunct. On the sepulchral monuments, and on the founts and other ecclesiastical utensils, the same forms were repeated. The devices were adapted to shrines, to gold and silver plate, to jewels, and other ornaments of attire—to chairs and tables, and other domestic furniture; and the illuminator of hour-books or saints' legends, having no better choice, transferred the tracery, by which he was on all sides surrounded, in gold and bright colors to his parchment."

"Besides their share of damage at the Reformation, the bishop's church and mausoleum suffered from an untoward incident, little more than eighty [125] years ago. From the massive character of the roof, some wise people began to dread that it would fall by its own weight, and proposed to anticipate such a catastrophe by taking it down. They found, however, after it was too late to preserve it, that it was too compact to be taken to pieces, and they were compelled, by severing its juncture with the wall-plates, to let it fall in one mass. The effect on the monument, and all the interior decorations, can easily be conceived.²"

ANNISTON CITY LAND COMPANY'S BUILDING, ANNISTON, ALA.
MESSRS. CHISHOLM & GREEN, ARCHITECTS, ANNISTON, ALA.

DESIGN FOR AN OFFICE-BUILDING, BOSTON, MASS. MR. C. H.
BLACKALL, ARCHITECT, BOSTON, MASS.

HOUSE FOR C. DE LACEY EVAN, ESQ., RUXTON, MD. MR. E. G.
W. DIETRICH, ARCHITECT, NEW YORK, N. Y.

SKETCH FOR A HOTEL, NORTON, VA. MR. GEORGE T. PEARSON,
ARCHITECT, PHILADELPHIA, PA.

[ADDITIONAL ILLUSTRATIONS IN THE INTERNATIONAL EDITION.]

INTERIOR OF THE CATHEDRAL, ALBI, FRANCE.

[Gelatine Plate.]

INTERIOR OF ST. PAUL EXTRA MUROS, ROME, ITALY.

[Gel. tine Plate.]

¹ Martine, "Reliquie Diei Andree," 18. Lyon's "Hist. of St. Andrews," i. 17.
² Lyon's "History of St. Andrews," ii. 195.

HOUSE OF MRS. CONSINO, SANTIAGO, CHILI.

OFFICIAL RESIDENCE OF THE INTENDENTE OF THE PROVINCE,
SANTIAGO, CHILI.

COOMBE WARREN, KINGSTON, ENGLAND.—THE DINING-ROOM.
THE LATE GEORGE DEVEY, ARCHITECT.

COOMBE WARREN, KINGSTON, ENGLAND.—THE GARDEN. THE
LATE GEORGE DEVEY, ARCHITECT.

ITALIAN SKETCHES.

WESLEYAN CHAPEL, HEADINGLY, LEEDS, ENG. MR. T. BUTLER
WILSON, ARCHITECT.

IN connection with the general alterations of this building, a new choir has been added, with minister's and choir vestry in the rear, with new porch to south transept. The choir-floor is laid with red church tiles; the communion floor is in Italian marble mosaic; the steps are in red Belgian marble. The base of pulpit has moulded plinth in blue Bolton Wood stone, polished alabaster shafts, with carved Caen caps. The upper part of pulpit and choir stalls are of wainscot oak throughout, with solid ebony shafts, cusped and moulded panels and richly-carved finishings of Late Decorated period.



MISSOURI STATE ASSOCIATION OF ARCHITECTS.

IN order to secure a large attendance of the members of the Missouri State Association of Architects, and to hear from the Committee on formation of Chapter of the A. I. A., who are now in session in New York City, it has been decided by the Board of Trustees of the Missouri State Association of Architects to postpone the Annual Meeting (notices of which have already been sent out), from January 14 to Tuesday, February 11, 1890.

By order of Board of Trustees.

JAS. OLIVER HOGG, Secretary.
E. F. FASSETT, President.

PHILADELPHIA CHAPTER, A. I. A.

A MEETING of the Chapter was held on the evening of December 17, 1889, the members present being the following:

Professionals, Messrs. Balderston, Boyden, Brown, Chandler, Hazlehurst, Mason, Prichett and Pursell.

Juniors, Milligan, Moss, Munoz and Zilenziger.

The Secretary's report of the last meeting was approved and the Chapter voted that the Secretary be instructed to tender to the Publishers of the *Builder*, *Decorator* and *Wood-Worker* the thanks of the Chapter, for the gratuitous printing of the minutes of the last meeting.

The Education Committee reported progress, and spent thirty minutes in discussion of the subject of education as voted at the last meeting.

The President suggested a series of classes in the Chapter rooms in branches closely allied to architectural study or practice, and on an informal basis; students to purchase tickets at twenty-five cents each, to be good for a lesson in any branch or course established. After some discussion as to the best way to organize these classes it was voted, on motion of Mr. Balderston, to refer the matter to the Executive Committee with instructions to act at once in the matter in connection with a committee of three to be appointed by the President.

The President appointed three Junior members, Messrs. Moss, Munoz and Milligan, to act respectively as President, Secretary and Treasurer, of the Junior Class Committee. It was decided to begin with a water-color class at once, to be open to any draughtsmen or architects, whether members of the Chapter or not.

To meet preliminary expenses the eight practising members present subscribed five dollars each and the four Junior members one dollar each for tickets.

In accordance with a vote at the last meeting, the President then delivered the following address.

GENTLEMEN of the Philadelphia Chapter of the American Institute of Architects:—There are in this city to-day more than one hundred and twenty practising architects; above one-fourth of this number are members of our Chapter and the few here to-night represent the active element of this organization.

This city alone—not including the country around it—spends upwards of thirty millions annually in the construction of small houses, factories, churches, banks, hotels and mercantile buildings—all work that should engage the services of responsible architects, but of which not one-third at present comes under the proper guidance, in design or expenditure, of our profession. Two thirds of the work is left to chance—perhaps a copy of what has been done, and

to an endless repetition of poor construction and monotonous design—and on this account our city is now held in ridicule by the growing places of the North and West.

To combat this, the Chapter is now taking an active part. The future charm and beauty of this city depends very much upon the little band gathered here to-night. Such an opportunity has perhaps never happened in the history of the world before—when the expenditure of thirty millions yearly could be so easily directed for a good purpose, in pure and refined design, from the humblest dwelling to the stateliest monument of wealth and power. We can infuse this spirit, not only into buildings, but into all manufactures, more easily than any other group of designers—and give our city a name for design second to none in this or the old world.

We now complain that we have no National School, no opportunity for proper study; that our young men grow up in offices and plunge as soon as chance offers into active work where their time, we may think, is too interrupted to give proper attention to design. We must remember that the foremost architect of forty years ago was not equipped as well as a young knight of the T-Square is to-day—with photographs of all that the world possesses, papers that give good advice, and examples of pure work both old and new, easy communication with the great cities, and an abundance of means for the proper construction of his buildings. He already begins to wonder where it will end, and glimpses of a noble future are before his view.

If we wish to have a National School, it should be the object of the Chapter to do all it can to improve the designs of its members. Not only the junior members but all of us should ask for advice from each other. We are very sensitive, but is it not better to have our buildings criticised and even cruelly treated while on paper, than to construct them with their faults and leave monuments to our inability and a disgrace to the country.

Let the members of this Chapter design more together, let us try and forget the little faults or the possible infringement of rights by each other; try and cultivate a friendly criticism in our search for pure and noble design and we will be a great benefit and blessing to our city.

At the conclusion of the address, on motion of Mr. Mason, a resolution was passed thanking the President for the address and requesting a copy of same for insertion in the minutes of this meeting and for publication.

Mr. Edward Hurst Brown gave an interesting talk on a recent trip through Hereford, Shrewsbury, Truro and other English towns, illustrated by many Kodak views of scenery and architecture, and on motion of Mr. Mason the Chapter passed a vote of thanks for the entertainment thus afforded.



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

THE INCOMES OF ARCHITECTS.

ST. LOUIS, MO., January 10, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—Apropos of your recent editorial upon the *New York Herald's* veracious testimony concerning the professional income of architects, the subjoined letter may be of interest. It was written to the *Herald* immediately after the appearance of the article referred to. It is, perhaps, hardly necessary to add that the reply asked for is still being awaited with more patience than confidence.

COPY.

ST. LOUIS, MO., December 18, 1889.

TO THE EDITORS OF THE NEW YORK HERALD.

Dear Sirs,—The *St. Louis Globe Democrat* of this morning, prints the inclosed clipping in which the *New York Herald* says, "It is perfectly safe to say that there are in the City of New York at least ten architects whose annual net income is in excess of \$100,000, while in Philadelphia, Chicago, Boston and St. Louis there are quite as many who can spend a like amount of money every year without overdrawing their bank accounts."

Presuming that the *Herald* will not lend its high authority to statements it is not prepared to substantiate, also that this article means, what it appears to say, that the incomes named are derived from architectural fees, not from inherited wealth, real estate ventures or other outside sources, will the *Herald* in its columns or otherwise favor me with the names of the ten New York architects, whose practice yields them an "annual net income in excess of \$100,000?" Will the *Herald* name ten New York architects whose gross professional income has exceeded or reached \$100,000, per annum, for any ten or for any five consecutive years? Can it name such by adding Brooklyn and Jersey City to New York? Can it name ten architects in the whole United States whose annual net income from professional fees has been in excess of \$100,000, or of \$50,000 for any five years in succession?

The *Herald* says "there are quite as many in Philadelphia, Boston, Chicago and St. Louis who can spend a like amount of money every year." Will the *Herald* name to me a single architect in St. Louis, who at any time derived from his practice a revenue of \$100,000, per annum, or of half that amount? Will it name any ten or any five architects in Chicago or in Boston or in Philadelphia, who have earned \$100,000, per annum, net income for three years in succession?

This letter is written in no controversial spirit, but in the persuasion that an attempt to procure the names asked will satisfy the *Herald* that it has been misinformed for once, and will lead to a correction in its columns of an article likely to create public odium against a severely over-worked and under-paid profession. Should these inquiries be answered affirmatively, I will undertake to have the reply published in the leading architectural journals of the country.

Very respectfully, C. E. ILLSLEY.

CEMETERY VAULTS.

JERSEY CITY, N. J., January 3, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—Will you please mention one or more publications upon the best methods of constructing cemetery vaults, and oblige, SUBSCRIBER.

[M. GATEUIL's "*Recueil pratique de Marbrerie et de Monuments funéraires de tous Styles*," or Brindley & Weatherley's "*Sepulchral Monuments*," or César Daly's "*L'Architecture funéraire contemporaine*," may contain the information you seek.—EDS. AMERICAN ARCHITECT.]



PROPOSED HIGH-LEVEL BRIDGE FOR AMSTERDAM.—A short time ago the *Sun* described a curious bridge to be built on the Isle of Man, where, on account of the lay of the land, it was impossible to build the ordinary long and gradually ascending approach to one tower. To overcome the difficulty the tower of Babel idea was adopted. There is a curious adaptation of the same idea, under different circumstances, proposed at Amsterdam. This city lies in the form of a half circle on one side of the North Sea Canal. The growth of the city has been like that of New York, in that it has spread out in one direction. The people have objected to crossing the canal there, just as they objected to crossing North River here, on account of the delays in ferry travel. They talked about the building of a bridge for a time, but the shipping using the canal objected, especially as the land on each side of the canal was very low. A bridge lying low down, as the Third Avenue bridge does over the Harlem, would be an intolerable nuisance to shipping because it would have to be swung every time a tug came along. It would be of little benefit to land traffic also, because of the delays incident to an open draw, as those who have had occasion to cross Chicago's canal very well know. It was reserved for Mr. Gerard W. Schimmel to devise an acceptable plan. It includes two circular stone and steel towers, with a roadway winding about each until a sufficient height is reached. This roadway has a sidewalk eight feet wide, a wagon road nineteen feet eight inches, and a tram-car road-bed sixteen feet three inches wide. The tram-cars run in next to the tower, and the sidewalk is outside of all. Connecting the two towers is a common steel swing bridge, resting on a stone tower. The opening for boats is ninety-one feet wide and the swing bridge is forty-eight feet nine inches above the water. Winding once about the tower, which is 143 feet in diameter, gives a rise of thirteen feet nine inches. The towers are provided with elevators for those who do not wish to walk up. There is a waiting-room in each for passengers who are delayed when a big ship comes in. It is proposed also to utilize the space in the towers for stores of various kinds.—*New York Sun*.

A REMARKABLE WATER-POWER.—One of the most remarkable instances of electrical transmission of power has only recently been accomplished in the State of Nevada, on the world-famous Comstock Lode and the almost equally famous Sutro Tunnel. At the Nevada mill there is a ten-foot Pelton water-wheel, which receives water through a pipe-line delivering water from the side of Mount Davidson under a head of 400 feet, giving 200 horse-power. Here the water is again caught up, delivered into two heavy iron pipes and conducted down the vertical shaft and incline of the Chollar Mine to the Sutro Tunnel level, where it is again delivered to six Pelton water-wheels, this time running under a head of 1,680 feet. Each of the six wheels is but forty inches in diameter, weighing 225 pounds, but with a jet of water less than five-eighths of an inch in diameter they develop 125 horse-power each. On the same shaft, which revolves 900 times a minute, are coupled six Brush dynamos, which generate the current for the electric motors that drive the stamps in the mill above ground. The result is that, where it formerly took 312 miners' inches of water to operate thirty-five stamps, but seventy-two inches are now required to run sixty stamps. This is the most enormous head of water ever used by any wheel, and by itself constitutes an era in hydraulic engineering. A solid bar of iron thrown forcibly against this tremendous jet rebounds as though it had struck against a solid body instead of a mobile fluid. The speed of this jet, where it impinges against the buckets of the wheel, is two miles a minute—176 feet a second. . . . There is another quality of these extraordinary wheels which renders them absolutely without a peer in the large family of prime-movers. This is the immense power exerted per pound of weight. Those in the Chollar Mine, for instance, give out one horse-power for every 1.8 pound of weight. If there is anywhere a motor which begins to compare with them in this respect, I have never been favored with knowledge of it. And it seems there is no limit, outside of that which sets bounds to the head of water itself,

to prevent further progress of the wheel in the same direction:—*Alvan D. Brock, in the Overland Monthly.*

DAMMING THE STRAITS OF BELLE ISLE.—The Straits of Belle Isle dam is again being discussed, as having an important bearing upon the proposed extension of the Quebec and Montreal Railway to that point. Aside from the convenience of connecting Newfoundland with the main land across such a dam, and thus securing the shortest possible sea voyage across the Atlantic, there are other important climatic effects expected to result. General Sir Selby Smith, in 1879, proposed to the Dominion government to divert the Arctic current from the Gulf of St. Lawrence by such a dam; and Lieutenant Maury is said to have suggested the same thing, and to have laid his plan before the British government over thirty years ago. These straits receive the direct flow of the polar current from Baffin's Bay. If this current could be shunted off into the open ocean, and the branch that now passes through the gulf be prevented from shouldering off the warmer waters of the gulf stream, as is now the case, such a change would very sensibly affect the entire gulf and its adjacent shores.—*Engineering News.*

WOODWORK AND STEAM-PIPES.—If there had been any doubt that wood touching a steam-pipe is liable to be charred, if not ignited, by the heat of the steam, that point would now be set at rest by an inspection of the trench recently dug in Broadway by the steam-power company. The wooden coverings of the pipes, which had been buried for several years underground, were, when removed, found to have been converted into charcoal on the inside to the depth of half an inch or more. In buildings, the woodwork in the immediate vicinity of live steam-pipes should be protected carefully.—*Boston Transcript.*

PLASTER-OF-PARIS AND MARSHMALLOW.—According to a French authority, much of the inconvenience arising from the too rapid consolidation of plaster-of-Paris may be remedied by the simple addition to the mass of from two to four per cent of marshmallow root, finely powdered. With this treatment it is found the plaster will not set for an hour at least; and, moreover, the mixture becomes so hard, on drying, that it may be sawed, filed, or turned, and in this condition is applicable to the manufacture of dominoes, dice, and numerous other small articles.—*Exchange.*

THE LATE JOHN MCARTHUR, JR.

At a special meeting of the Commissioners for the Erection of the Public Buildings, held on Thursday, January 9, 1890, the President laid before the meeting a letter from Mr. Grayson P. McArthur, eldest son of John McArthur, Jr., announcing the death of his father. On motion of Mr. Wm. H. Wright, the President was requested to appoint a committee to prepare a suitable Minute and Resolutions. The President appointed Messrs. Wright, Miller and Gaskill, to whom, on motion of Mr. Miller, the President was added, and the committee reported the following Minute and Resolutions, which were unanimously adopted:—

The Commissioners for the Erection of the Public Buildings having heard with deep sorrow of the death, on the 8th instant, of John McArthur, Jr., who for nearly twenty years had served as their architect, direct the following minute to be entered upon the records of the Commission: John McArthur, Jr., was elected Architect of the Commissioners, September 15, 1870. The Act of the Legislature creating the Commission had been approved by the Governor August 5, 1870; their first meeting was held August 27, 1870, when a temporary organization was effected; and on October 4, 1870, the Commissioners permanently organized. And from the date of his election, midway between the first meeting of the Commissioners and the meeting when they permanently organized, down to the day of his death, John McArthur, Jr. has been continued without dissent or opposition, by successive annual elections, during nineteen years, architect of the City-hall of Philadelphia, which is approaching final completion. His election was due not only to the eminent general reputation and character which he had acquired as an architect, but to his special attainments, which he had reached in direct reference to the erection of buildings suitable to the Municipal requirements of this great and growing city. For over ten years this subject had been his study, and in the earlier attempts, partially put into execution, he had been the architect employed. With the passage of the Act of August 5, 1870, and his election as architect, under the Commission thereby created, of the buildings required to be erected, he at once threw himself, with all the energies of a thoroughly equipped professional mind, of a mature judgment, of a ripe and multifarious experience, of a special and practical study of the immediate subject, and of a just enthusiasm, of a personal ambition, civic pride, and of rare concentration of aim and purpose, into the fulfillment of the duties of his position. From the very inception of the undertaking he has devoted himself with unswerving fidelity, industry and integrity to the responsible and complicated labors incident to his office. The records of the Commission throughout these score of years bear testimony for all future time to his many invaluable services up to the very fullest requirement of every accountability, and beyond any mere "nominated-in-the-bond" demands.

He was considerate, kind, patient, conciliatory, affable and courteous, with an equable and unruffled sweetness of temper under all circumstances, however trying, and yet with a firm and inflexible uprightness and integrity in the direction of the right and truth in decision and action. With the Commission and all their officers; with the numerous contractors and all the employes in the construction of the buildings; with the heads of departments occupying or earnestly pressing claims to be admitted to occupancy of the building; in the midst of trying financial questions and all the intricacies of the complications involved in the peculiar relations of the Commission towards the legislature, the City Councils and the people of this municipality, he ever preserved a justly balanced and strict regard for the interests of all concerned; but always keeping steadily in view the end contemplated by the Act of Assembly by which the Commission was created, and the completion of "the buildings required to accommodate the courts and for all municipal purposes in the City of Philadelphia."

The Commissioners hereby express their appreciation of all the noble qualities of his character as exemplified in his long and faithful career as their architect; their personal regard and esteem for him as a man and an upright public servant; and their sincere sorrow at his removal by death from the scene of his labors before their final completion. And they do hereby adopt the following resolutions:

1. *Resolved*, That the Commissioners for the Erection of the Public Buildings do most sincerely sympathize with the widow and family of their deceased architect and friend, John McArthur, Jr., in their sore bereavement and deep sorrow.
2. *Resolved*, That as a mark of respect to his memory the Commissioners' rooms, with the architect's office in the City-hall, be closed until after the interment, and that they be appropriately draped in mourning for thirty days.
3. *Resolved*, That the Commissioners in a body, with their officers and employes, attend the funeral services, to be held this day.
4. *Resolved*, That this minute and resolutions be published and a copy suitably engrossed be sent to the widow and family of the deceased.

On motion of Mahlon H. Dickinson, Esq., it was unanimously resolved that a suitable memorial be erected in the Public Buildings to perpetuate the name and services of John McArthur, Jr., the architect, and that a committee of three be appointed to whom the work shall be entrusted, and the president appointed, Messrs. Dickinson, Gaskill and Miller.

Attest.

WILLIAM B. LAND, Secretary.

SAMUEL C. PERKINS, President.



So far as the leading architects of the country have expressed their opinions or anticipations as to business for 1890, they all lean very strongly to the opinion that building operations will exceed in magnitude those of 1889. This probability has been hinted at heretofore. Detailed reports have been received from twenty or thirty of the larger cities, and, without a notable exception, preparations are being made for great activity, not only in the construction of houses, but in the building of manufacturing establishments, banks, offices, educational institutions and churches, bridge work, elevated-railroad work, all kinds of municipal work, water and gas pipe laying, street-paving and a variety of work which cannot be briefly enumerated. At the same time, complaints are heard in many quarters of hard times, difficult collections, narrow margins and an increase in commercial failures. Those who give expression to the more hopeful views are regarded by many as speaking wildly, or without a proper knowledge of actual business conditions. It is true that commercial failures last year exceeded those of the previous year in number, and in the magnitude of the indebtedness; but when these facts are differentiated, it is ascertained that the increased failures and increased indebtedness was not out of proportion to former years. That there should be a gradual increase, under existing commercial and financial conditions, is to be expected. Thousands of incompetents are crowding the avenues of business, rushing into undertakings without sufficient knowledge or capital, and their failure is, therefore, only a question of time. The aggregate of results speaks for itself. The bald commercial facts stand out for themselves. Railway traffic is larger than ever; farmers and cotton-planters have made more money than ever. Railroad companies are making more money and doing less quarreling. The volume of business, as it appears from clearing-house reports, was ten per cent greater last year than in 1888. The gross clearings were, in round figures, \$56,000,000,000, as against \$49,000,000,000 for 1888. Large corporations and concerns, it is true, have been squeezing out the smaller; but, if so, it was chiefly because the larger were better able to render the public good and cheap service. There is a disposition in many quarters now to predict disaster; to say that the trusts are insidiously undermining public confidence; that legislation is not able to protect the public interests as it should; that indebtedness is rapidly growing; that general insolvency is already a cloud the size of a man's hand in the sky, and that many other lugubrious indications warn the public of coming disturbances. The manufacturing interests have no time to pay much regard to these things; their order-books are full and their shops are busy.

Last week 10,000 to 12,000 tons of freight remained in Chicago store-houses for want of cars. Throughout the South cotton, pig-iron, lumber and other raw material are awaiting the arrival of cars. In the far West there is a reported shortage of rolling-stock. In very few instances, so far as reliable information goes to show, is there any accumulation of stock. There are no legislative measures threatening public security and confidence. The great political parties are differing only on minor questions. The banking interests express no fears as to their ability to see the business and commercial interests safely through. Speculation is threatening a little unsettling of values here and there, but taking the markets all through values are stable, production equal to demand and new markets are multiplying; the cotton goods manufacturers, in fact the manufacturers of all kinds of textile goods, do not find it necessary to restrict production. The absence of restriction and the necessity for it, excepting in isolated cases, is the strongest proof of a healthy industrial and commercial condition. Despite all talk to the contrary, the lumber manufacturers in all sections of the country are making preparations for a big winter's work. How long these favorable conditions may continue no one can foretell. The theory of alternate commercial chills and fevers is a barbarous one, and one which enlightened public opinion should not entertain. The industries in all foreign countries are in a preëminently satisfactory condition. Immigration is taxing the capacity of vessels. South American countries are filling up with new peoples. British and Continental ship-yards are busy. The iron and steel works and machine-shops of foreign countries are now crowded with work, the purpose of which is to enable people to move about and away from their old homes. Travel is the great industrial fulcrum; equalizing tendencies as to population are at work. Countries which were formerly months apart are now only days removed from each other. The cost of living is declining and the capacity for consumption is increasing. Raw material is being supplied in greatly increased quantities, as is shown by the increase in the production of iron ore, coal, lumber and petroleum. The masses are passing out of a condition of infancy and feebleness into manhood and activity. There is no natural or legitimate reason why the phenomenal activity of the past few years should be followed by a depression, and yet such a depression may come.

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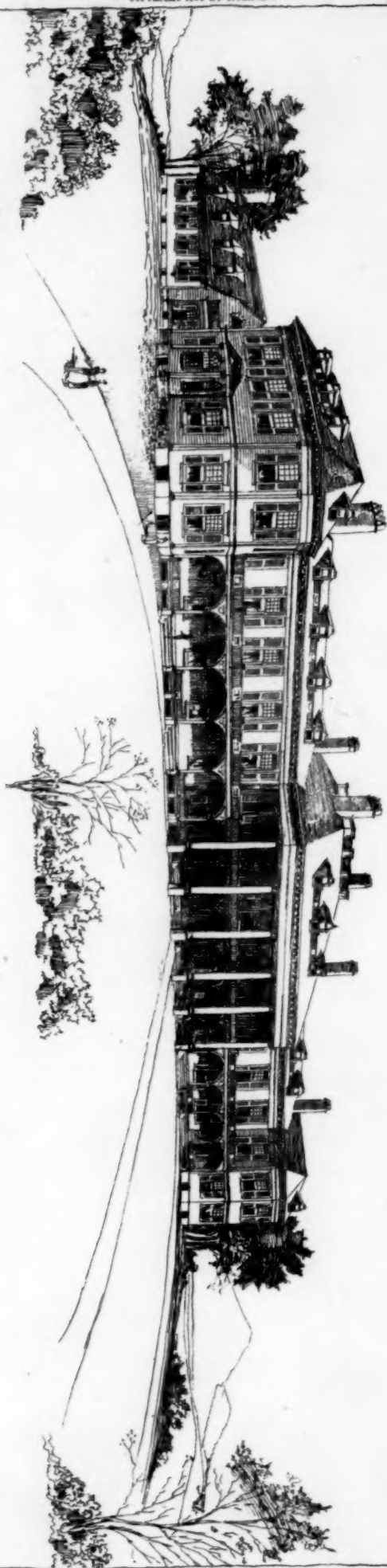
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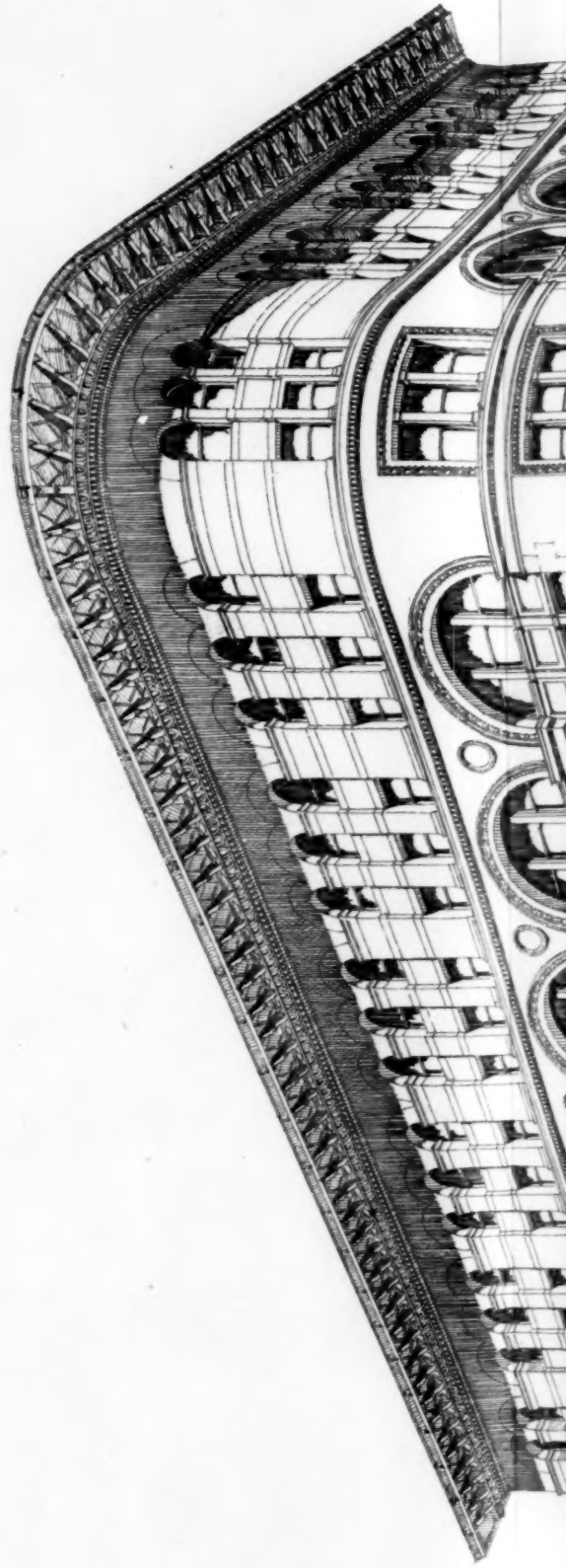
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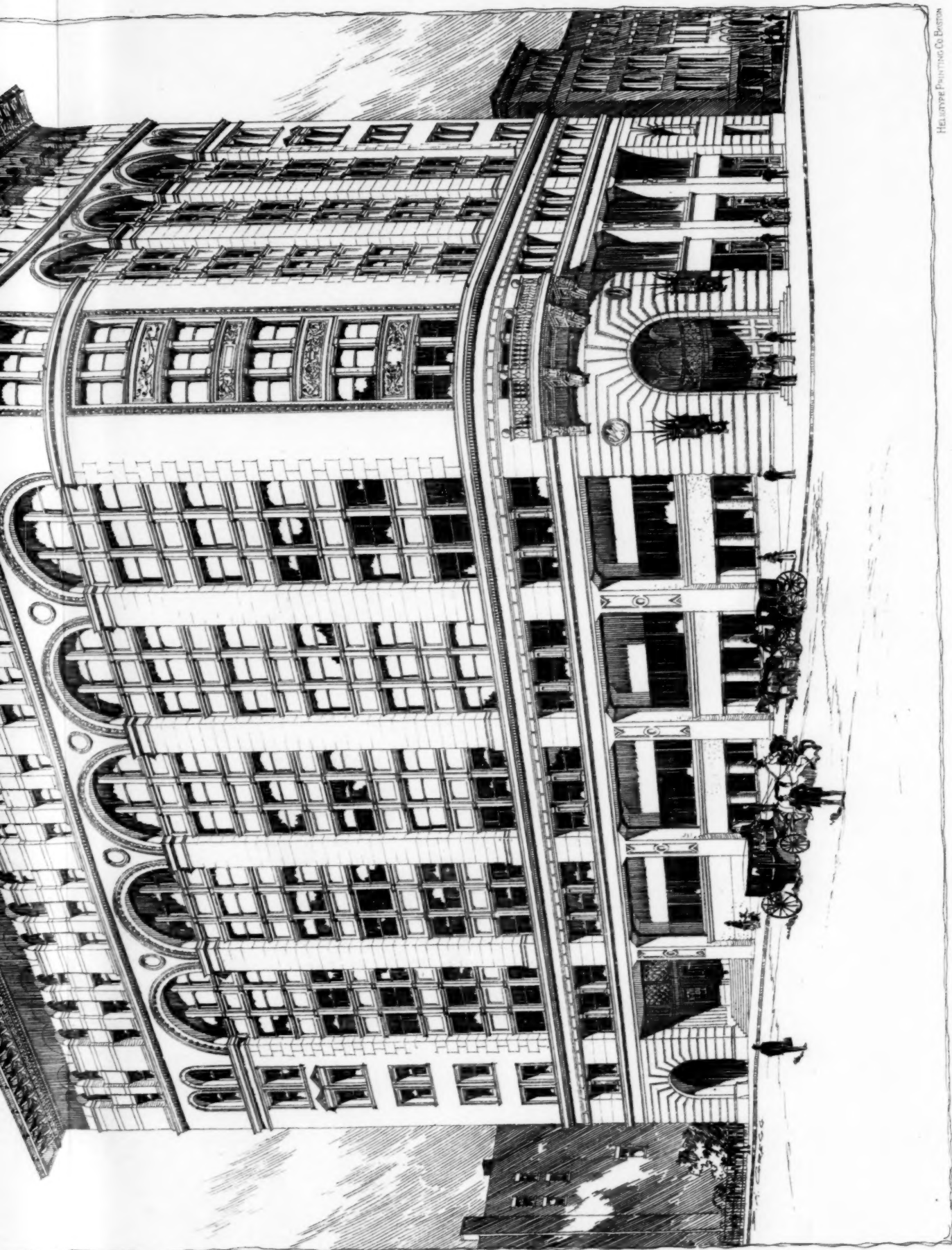
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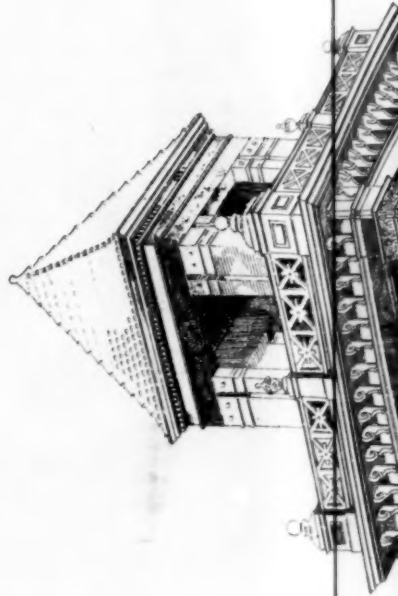
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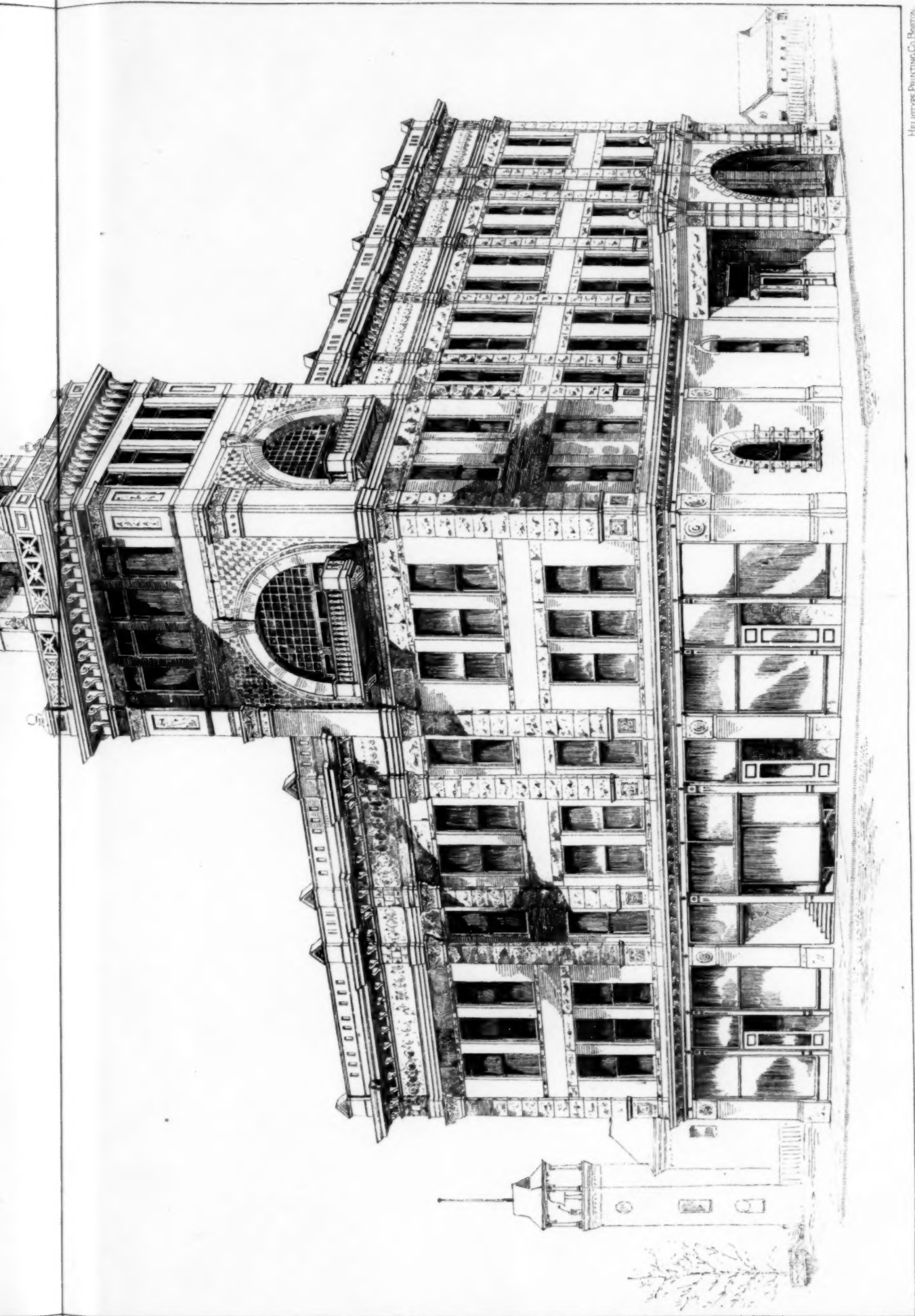




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