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VOL. XXVII.

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ARCHITECTURE

ENGINEERING

DECORATION

TICKNOR & COMPANY

CONSTRUCTION

BOSTON MASS.

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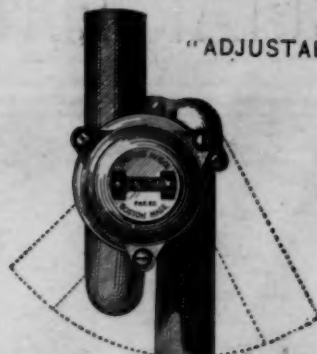
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VOL. XXVII.

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FEBRUARY 15, 1890.



SUMMARY:—

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WE have been favored with the privilege of reading a pamphlet, reprinted from one of the numerous reviews which have recently come into existence, and containing the thoughts of some person, apparently of advanced age and discursive disposition, on the subject of "Fires in American Cities." As usual in such cases, the author administers a whack to the architects, whose attention he "wishes might be directed" to the fact that about 1788 a house was built, by a person of great intelligence and worth, who "seems to have borne a strong resemblance to Franklin in his enlightened zeal for the application of science to the arts of life," in which "all the floors were laid in mortar," and the boarding of the vertical walls was back-plastered. In this wonderful dwelling, whose superiority to the creations of the degraded and imbecile modern architects is obvious, "fires might be kindled with a generous supply of combustibles," on the floors, or against the walls, but would "smoulder away and expire when the supply was exhausted, without essential injury to the building," and "by no amount of feeding or urging could a fire be made to pass from room to room." It is surprising to think that there could ever have existed another person gifted with insight and genius enough, not only to appreciate the achievements of his predecessor, but even to surpass them, but such a marvel was, it seems, produced some generations later, in the person of our author, who, instead of merely having his house back-plastered, and mortar put under the floors, filled-in the partitions with "cheap bricks laid edgewise." We are assured that this method "hardly admits of essential improvement," and, in fact, the only other construction referred to in the book as "worthy of emphatic notice," is that of the New Jerusalem, the "unflammable materials" of which, precious stones, jasper, gold, pearl and the like, are so fortunate as to meet with our author's approval.

ASIDE from these admirable suggestions as to either back-plastering houses and filling them in with cheap brick, or using gold and jasper and pearl exclusively for building materials, we do not find in the pamphlet before us all that wealth

of information and admonition suited to the needs of architects, for which our author's description of his own eminent merits had prepared us. We are told, indeed, that it is "desirable" to use iron for "floor-beams and pillars wherever required," a remark so clear and convincing that even the bestial intellect of an architect can perceive its force; and we learn that fire-proof buildings cost only about fifteen or twenty-five per cent more than combustible ones, and that, "on a wise calculation," it "would take but a few years to cancel this extra cost by saving in the single item of insurance." As architects have a great deal of this sort of ciphering to do, it would be interesting to know how to make the "wise calculations" by which the principal and interest, besides taxes, of an addition of twenty-five per cent to the cost of a building are to be extinguished "in a few years" by a saving of about one-half of one per cent per annum on the whole value of the building in insurance; but mathematics of this sort, as we often have occasion to point out, are matters of inspiration, or rather, of a sort of revelation, the sources of which are closed to the sordid minds of ignorant architects. In the present case, however, another gleam of supernal light has illuminated our author's soul in regard to insurance agents, and we would like to call the attention of these gentlemen to the opportunity thus offered them to bask in its edifying rays. "Nay," we are told, "it is doubtful whether there exists an owner of uninsured property who has not repeatedly encountered the importunate solicitations of insurance agents." Indeed, there is something "weird" in "the clairvoyance by which these agents know when one's policy is about expiring," etc. Now, we need not say that to indulge in anything weird about one's business is almost as bad as to solicit owners of uninsured property to take out policies; and it is not surprising that our author finds it "perfectly evident that fires cannot diminish in frequency so long as this system remains unchecked"; and considers that "the first movement of reform should be directed toward the agencies." The reform which he proposes is that insurance agents should no longer be paid by commissions on the business they secure for their companies, but should have "a stated compensation," to be increased, if at all, only on the ground of the prudence, integrity and fidelity with which the business is conducted. Prudence, in the case of agents, is to be shown by the rejection of doubtful risks, and by efforts "to make the insured person, as he really is, the obliged party of the two." To guard against the press of customers which would overwhelm the more "prudent" insurance agents under this system, it is further provided that each agent should be restricted to "his share of the safe business in and around his place of residence." We suppose, of course, although the matter is not further mentioned, that any soliciting of business is to be at once stopped, and that, prudence in the refusal of policies being the chief virtue of insurance agents, the man who writes the fewest policies will get the highest salary. This view of the subject had not, we confess, occurred to us before, but the proposed reform seems to be fraught with the promise of peace and leisure to a body of men now much overworked.

A RATHER curious case was decided the other day in Baltimore. It seems that there is an ordinance of that city which provides that no permit for building shall be issued, unless, in the judgment of the Appeal Tax Court, the size, general character and appearance of the building to be erected shall be such that it will not depreciate the value of the surrounding property, whether improved or unimproved. A certain Mr. Hampson applied for a permit to erect six three-story brick dwellings on a certain street, but was refused, on the ground that the intended structures would injure the value of neighboring estates. He brought suit to compel the Appeal Tax Court to issue the permit, and his prayer was granted; the court saying that, while it might be desirable to have magnificent avenues, with handsome residences, constitutional rights could not be interfered with for that purpose; and that the City Council had not the power to pass such an ordinance as that under which the permit was refused.

THE New York *Evening Post*, which takes a singular interest in the new Capitol at Albany, has discovered that at least "seventy-five thousand dollars' worth" of damage is caused every year to that building by the "defective system of gutters

and water-pipes" used in it. This statement is said to be made on the authority of Commissioner Perry, who, as the resident Superintendent of construction of the building for many years, ought to know something about it. Just what the damage consists in, we do not precisely learn, but we are informed that "visitors," observing "the discoloration of the frescoed walls and ceilings in many parts of the building," "shake their heads dismally at this additional evidence of the decay and ruin that is overtaking the nineteen-million-dollar structure." That it should cost seventy-five thousand dollars a year to restore now and then a little frescoing on the walls and ceilings will not surprise persons familiar with the financial and political history of the building, but it is rather strange that the construction should have been such as to make any leakage possible. According to the same account, the trouble is mainly with the gutters, which "should be properly lined." One might think that seventy-five thousand dollars a year would pay for lining a good many feet of gutter, and, so far as this was done, we are told that "the leakage would be stopped"; but the matter is perhaps waiting until another election shall stir up an ardor for repairs in the New York Legislature, accompanied by an appropriation which will make seventy-five thousand dollars seem an almost microscopic sum.

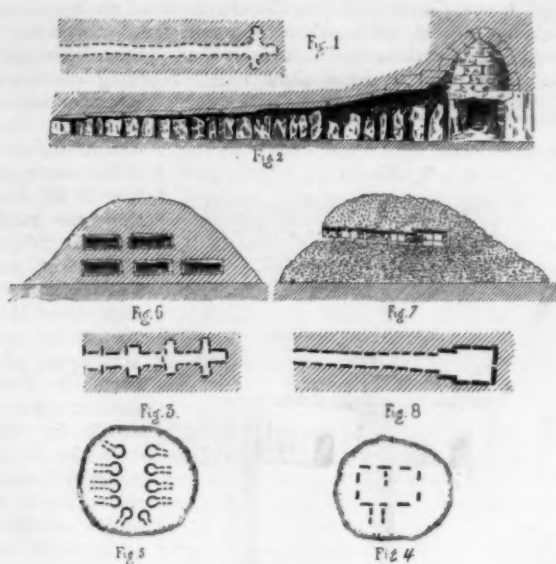
PROFESSOR TETMAJER, of Zurich, one of the greatest living authorities on such subjects, made recently an investigation into the causes of the decay of stone in buildings, and the best means of preventing it. Many of our readers will remember Viollet-le-Duc's striking observations in regard to the same matter, deduced from an immense experience, and Professor Tetmajer's conclusions agree entirely with his. According to both, the freezing of water in the pores of stone is the principal cause of its disintegration. Even the chemical effect of the air in large cities, due, it is supposed, to the sulphurous acid contained in it, probably acts through the rain-water, by which the acid is washed out of the air, and carried to the stone, so that anything that will prevent the accumulation of water in the pores is likely to diminish chemical action, as well as risk from frost. Contrary to the common idea, the most porous stones are, if properly used, not necessarily most subject to disintegration. If the water falling on the stone has a chance to escape freely, frost will not injure it, but if the movement of the water in the pores is checked, so that it accumulates anywhere, the freezing of this accumulation will gradually destroy even a strong stone. Proofs of this may be found in nearly all buildings faced with sand or limestone. If the base, or water-table, or even a belt at any height, is of harder stone, the freestone just above it will be found to disintegrate after a few years, owing to the checking of the downward movement of the water in the pores. So, on the underside of a projecting moulding, or balcony, where the water accumulates by gravitation, but is prevented by capillary attraction from dropping off, flakes of stone will soon be observed to separate and fall; and soft stone near the ground, where moisture drawn up from the earth by capillary attraction, joined with the double effect of the rain, and the spattering of rain-water from the ground, keep it particularly moist, soon perishes. The decay of stone shows itself in two ways. With a stratified stone, the frost dislodges flakes and plates, by working in the natural seams, but with a massive, homogenous stone, the effect of freezing is to dis sever the particles of sand, or the crystals of carbonate of lime, so that, although the stone may for a long time hold together nearly in its original shape, the rubbing of the hand will dislodge a shower of sand, and the profiles and arrises insensibly lose their sharpness.

THE cure for this is, in the first place, to treat the stone with skill. A soft stone, if laid above a hard course, should be protected from the rain, so that no water will descend through its pores, to be checked by the hard layer; the lower courses of buildings should be of as hard and impervious material as possible, and vertical joints should be packed hard with cement, and jointed, as imperfect joints collect much water, which soaks afterward into the stones on each side; and all projecting courses should have a drip, which will collect the water in the stone, and enable it to drop off. In cases where nothing better can be done, the old process of Faure & Kessler, now of Clermont-Ferrand, in France, by which the stone is impregnated with fluosilicates of various substances, according to

the character of the stone to be treated, is the only one which has proved itself successful. Something might be done, perhaps, with limewater, and it is curious that, where a base-moulding has begun to decay, the portions under the vertical joints of the course of stone immediately above, from which small quantities of dissolved lime have probably washed down on the moulding beneath, are preserved, while the intermediate portions are disintegrated; but this application has not been studied to a successful result. In the case of stone not built into a wall, it is often found that while damp with quarry-sap, or soaked with rain-water, a sudden frost will split the blocks into fragments, and this must be provided against by keeping the stone dry; but Professor Tetmajer and his assistants report that they have never known a stone to burst with frost after it was built into a wall.

THE city administration of Paris has been inspired with a new idea. It is now some years since the street corners were furnished with a map of the neighboring streets, at a large scale, enamelled on a porcelain tablet, and affixed to one of the corner houses; but this device is far surpassed by the new one, which has just had a preliminary trial at the corner of the Boulevard Magenta and the Rue Lafayette. Here is to be seen a bronze statue of a child, standing on the curbstone, and holding up a large lantern. The lantern has a gas-jet inside, for illumination at night, and the glass sides are covered with inscriptions. A part of these inscriptions is contained in two columns, the first of which presents the names and addresses of the deputies, municipal councillors, mayor and assistant, commissary of police, and justice of the peace, the official physician and midwife, and the dispensary for the district, together with the office hours of the functionaries in question. Following these, in the same column, are the addresses of the nearest physicians, druggists, midwives, dentists, veterinarians, express and railway ticket-offices, telegraph offices, mailing boxes and branch post-offices, police stations, fire-engine-houses, hydrants, fire-alarm boxes, employment offices, omnibus and horse-car stations, cab-stands, pawnbrokers' shops, tramps' lodging-houses, hospitals, ambulance stations and *châlets de nécessité*; the whole accompanied by a map of the Boulevard Magenta and the neighboring streets. The second column contains an historical notice of the Boulevard Magenta, and a list of all the houses and tenements to let in the district, with the number of rooms, the price, and the date when possession will be given. The remaining space on the lantern is occupied by a complete list of all the inhabitants of the district. The intention is to subdivide the city into districts in this way, each district to have its lamp-post directory.

THE *Bautechnische Zeitschrift* makes some observations in regard to the method of sinking wells by means of a ring, which may be useful. The ring which it proposes is composed of brick and wood. A ring of oak, well put together, is first laid on the ground. This has twelve holes in it, through which are put twelve bolts, four feet long, projecting upward. A circular wall of hard brick in cement is then built on the oak ring, about three and one-half feet high, and a second oak ring, with holes bored for the bolts, is laid on top, washers and nuts put on, and the whole screwed firmly together. The excavation is then started in the middle, in such a way as always to leave as nearly as possible the same breadth of foundation under all portions of the ring, although this width diminishes constantly. By taking this precaution, the undermining, and consequent settlement of the ring, proceeds uniformly and vertically, while, if the excavation should be carelessly made deeper on one side than another, the settlement is likely to take place suddenly, and obliquely, endangering the life of the workmen in the well. For all this, as it says, it is impossible, without close watching, to make laborers work in the manner on which their own safety depends. Either from the incapacity for thinking about anything, or from the stupid satisfaction in doing what they are told not to, both of which are characteristic of a good many laborers, the men are almost sure to dig at one side until settlement begins, before doing anything on the other side; and the writer of the article mentions a case where he found that the workman had dug out, close to the ring, thirty inches deep, around two-thirds of the circumference, before touching the remaining portion, thus endangering his own life without the slightest reason or excuse.

FUNERARY ARCHITECTURE.¹—I.

Celtic Tumuli.

THE custom of honoring the memory of the dead by monuments erected over their remains certainly dates back to remotest antiquity and far beyond the limits set to history. Without going into the philosophical discussions naturally enough suggested by this custom, we must consider the fact that it is intimately connected with the more or less well-defined belief which incontrovertibly prevailed among most primitive peoples, that death was only a transformation of life.

The variations introduced into this belief by the different primeval religions had their influence, of course, on the disposition and, consequently, on the architectonic forms of the tombs; but this influence generally left intact, or, at least, recognizable for centuries the two or three primordial types of sepulchres. Whether the body were deposited in a cavern hollowed in the mountain side, whether an artificial mound of earth or stones, or a monument consisting of one upright stone, or a gigantic pyramid were raised over it, the tomb of ancient times always invariably belonged to one of these types. In spite of those modifications in structure and form suggested by the individual genius of different peoples, it was almost uniformly a derivative of the *tumulus* or the *stela* [upright stone]; for change on this planet of ours comes very gradually, and only by a series of almost imperceptible transitions.

There are, indeed, exceptions to the rule, but these are fewer than would at first appear; and it was only after tombs ceased to be isolated monuments, and were placed in religious edifices—that is to say, after the first centuries of the Christian era—that their original characteristics disappeared. Different constructions were then introduced by the new religion, which was so unlike its predecessors.

Every people has, we believe, left some specimen of funerary architecture; the subject is, therefore, too vast for us to hope to treat it exhaustively in this article, and we may be pardoned for designedly omitting a large number of types of tombs, doubtless interesting from an archæological point-of-view, but only remotely relating to architecture properly so-called, or belonging to civilizations as yet but little studied.

We will content ourselves with describing in broad lines the different funerary monuments, beginning with the most ancient, though without keeping to a strict chronological classification: in the present state of archæological knowledge, such classification would often be difficult to establish conclusively. Since, as we stated above, the various tombs among ancient peoples were generally after the order of a *stela* or a *tumulus*, it seems best to begin with the most rudimentary examples of these two types, if not the first chronologically. The Celtic monuments, with which the soil of France is still strewn, will furnish the materials for this study.

It must be admitted that the rough stones planted vertically in the ground, and named by antiquaries *menhirs* or *poutvans*, were not always tombs; they were sometimes commemorative

monuments, and sometimes even mere boundary-stones. When, however, as has often happened, bones are found interred beneath them, they are beyond a doubt burial-stones, and it seems to us difficult not to recognize in these monuments the indisputable archetype of the *stela*. A considerable number of them are still to be seen, in an upright position, not only in France, but in England, Scotland, Ireland, Germany, Denmark, Sweden, Greece, Tartary, and even in America and Africa. They are of varying dimensions, being sometimes forty or fifty feet high. They are in their natural shape and the rude carvings sometimes seen upon them belong to a later period. It is not to be inferred, because similar stones exist all over the globe, that the Celtic form of worship was of world-wide adoption; it is a much more probable supposition that this primitive way of rearing a monument was the one which was, by the very nature of things, forced upon all aboriginal peoples, whatever their religious dogmas might have been.

As for the *tumulus*, which we find in use among all peoples, and of which the pyramids and the great Roman tombs are only the artistic *avatars*, what could have been its origin? Was it the artificial mound designed to recall the mountain in whose side primitive man was born, lived and died? Was it the heap of stones piled up at a certain spot, as an act of worship, by pious passers-by? We will not attempt to solve the question, both hypotheses appearing equally plausible.

The Celtic *tumuli* present a considerable number of varieties; some are spherical or ovoid, others are conical or bell-shaped; sometimes they are found in couples. Some are merely of earth, with or without circles of upright stones. Others contain one or several burial-chambers, the walls and ceilings of which are made of slabs of unhewn stones; for example, the *tumuli* of New Grange (Celtic Tumuli, Figs. 1, 2); Yellow (Fig. 3); Bougon (Figure 4); and of Fontenay-le-Marmion (Figure 5). More rarely they show several superposed coffins (*tumulus* in the Orkneys, Figure 6). Sometimes, instead of a rectangular burial-chamber, we find one formed of two large, flat stones inclined like a roof over the body. Lastly, when the *tumuli* are heaps of stones, antiquaries give them the name of *galgals* (Galgal of Gavrenez, Figures 7, 8). The dimensions of the Celtic *tumuli* vary greatly: there are some with a base-diameter of over 325 feet and an altitude of fully 100 feet. According to a custom which has been perpetuated among peoples of a more advanced civilization, the dead were buried with their weapons and other articles which they used in life. It is to this custom that modern archæology is indebted for much of its knowledge.

A vast number of the celebrated tombs of antiquity were nothing more than *tumuli*. We will merely mention those of King Alyattes, father of Cræsus, of Ninus, of Patrocles, of Achilles and of Tisias in Phocis. The works of ancient authors abound in conclusive evidence on this subject. In fact, this sort of grave monument has never gone wholly out of use, and we find examples of it to-day among savage tribes.

But let us turn to the history of funerary architecture among peoples where the worship of the dead manifested itself in productions that were genuinely architectonic, and, consequently, much more interesting to us.

THE EGYPTIANS.

Of all sepulchral monuments, those erected by the Egyptians are unquestionably the most important, on account of their great size; they are also the most curiously arranged, and the most remarkably adapted to the preservation of the body for an almost indefinite period. The works of modern Egyptologists, like Mariette and Maspéro, have recently thrown much new light on these monuments, which have been so long known and so often described. Their learned investigations, which fresh excavations and discoveries are daily rendering more valuable, have cleared up many mysterious points and explained many strange peculiarities.

A few words on the beliefs of the Egyptians are indispensable here. According to their views, the second life was much like the first, and it was assured to the dead only through the preservation of the body, which was necessary to the support of this new life. Hence the extraordinary study and care given to the perfecting and exercising of the art of embalming; hence the endless precautions taken to hide the entrance to tomb and to guard it from subsequent violation; hence the unflinching observation of the rule to bury the body above the level of the highest floods of the Nile; hence, lastly, the pains taken to conceal near the tomb images of the occupant which,

¹ From the French of Pierre Benouville in Planat's "Encyclopédie l'Architecture et de la Construction."

it was thought, might replace his body and assure him continued existence. As the dead man carried with him to the grave his earthly needs and tastes, all articles requisite for their gratification were deposited near him; his servants were represented in bas-reliefs or by statuettes, and provisions either real or artificial were supplied. The funeral repasts and libations, the endowments for the care of tombs and for the perpetuation of ceremonies which to their minds were a sort of material necessity to the dead were, therefore, only the logical result of the beliefs of the Egyptians.

Admitting the importance which the execution of these rites possessed for the dead, it is clear that filial gratitude or the respect of man for his ancestors must have raised the worship of the dead to the height of a veritable religion. Among no people was this worship more deeply rooted than among the Egyptians, and consequently their funerary architecture is the noblest manifestation of their art, especially is this true of the burial monuments of the time of the First Empire.

The most ancient Egyptian tombs are those which Egyptologists have for several years designated under the name of *mastaba*, a word borrowed from the Arabs employed on the excavations. This kind of tomb belongs to the First Memphite Empire, and it is in the necropolis of Memphis that the largest number of them are to be seen. Whether found in that part of the necropolis named Sakkara or at Gizeh near the great pyramids, they differ but little from one another. They are, of course, in ruins; however, it has been possible to restore the chief sections from what remains of them. It is this restoration which we give below, following the descriptions furnished by Mariette.

The *mastaba* is a massive quadrangular structure, a genuine tumulus. The outer walls batter quite decidedly, though not sufficiently to warrant the conclusion that the tomb is an unfinished pyramid. The larger axis of the rectangle follows very nearly the direction of the magnetic needle; at Gizeh, for example, where the *mastabas* are symmetrically placed, the necropolis presents the appearance of a vast checker-board

(Egyptian tombs, Figure 1); at Sakkara they are scattered haphazard, but are, nevertheless, set due north and south. A wide difference is noticeable in the character of their construction; some are of brick, others of stone, the latter being of medium size; within, the foundations are generally roughly built. The exterior faces show either receding courses of

steps, or smooth surfaces. Their dimensions sometimes reach 160 feet x 80 feet; they are rarely less than 26 feet x 20 feet, and the height varies from about 13 to 25 or 30 feet. The upper platform is level; earthen vases sunk in the débris of the masonry forming the ceiling of the burial chambers once held the water destined to slake the thirst of the occupants. The entrance is almost always found on the eastern face of the tomb; the door opens in a rectangular niche

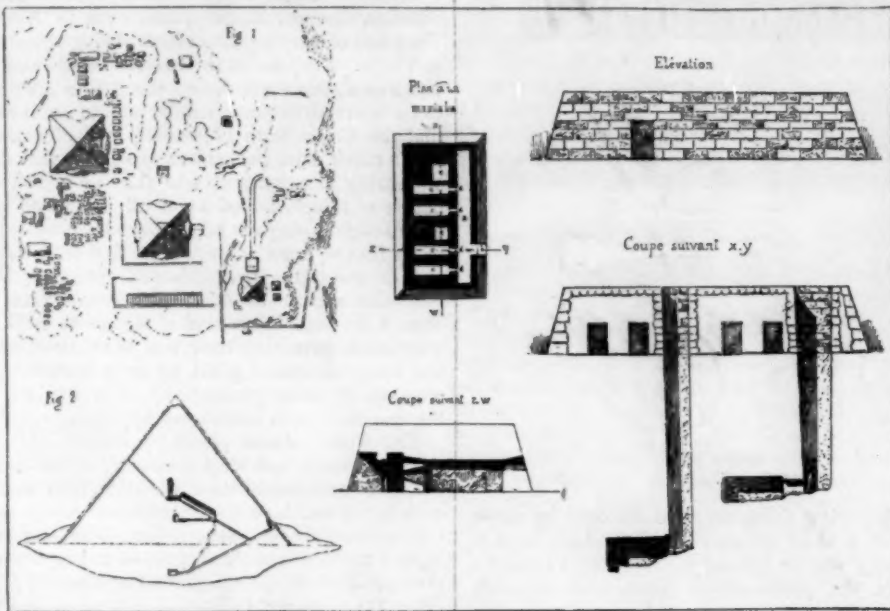
near the north-east angle. The interior of the *mastaba*, whatever the minor variations, always comprises one or several chambers or chapels, the *serdab*, the well or shaft, and the burial-chamber proper.

The chapels are lighted by the door, and sometimes by openings managed in the ceilings; their walls are often decorated with a profusion of sculptures or paintings representing the occupations of the dead in their new existence; fronting the east rises the stela, at the foot of which the table for offerings is usually found. The chapel is the only accessible part of the tomb.

The *serdab* (c, Plan of a *Mastaba*) is a sort of corridor buried in the masonry, and often has no communication with the chapel; in certain cases a connection is established through a narrow conduit designed to carry to the dead the odor of the sacrifices offered in his honor. The *serdab*

always contained one or more of those statuettes of the deceased which, as we have said, were indispensable to the support of his posthumous life, in case the body became totally annihilated.

The well or shaft generally starts from the upper platform, and, traversing the entire *mastaba*, enters the ground or rock to a distance of even 80 feet: it gives access to the burial chamber, which is without decorations and contains the



Egyptian Tombs.



The Pyramids.

sarcophagus. The latter, which is of limestone, red granite or black basalt, is more or less ornamented; the receptacle is rectangular in shape. The precautions taken to close the receptacle hermetically were in inverse ratio to the degree of perfection attained in the embalming process at the period when the tomb was built. The entrance to the walled burial-chamber, that is the shaft, was filled up with stones, earth and sand.

The illustrations, taken from the work of Lepsius, complete this outline of the prevailing type of the private Egyptian tombs of the First Empire. The essential features here described are always found (except in the case of the *serdab*, which the perfecting of the embalming process seems to have rendered dispensable); this is true not only of the *mastaba* but also of its royal contemporaries, the pyramids. Every possible use has been assigned to these gigantic monuments; the hypothesis on which the various theories have been framed have proved equally baseless; notwithstanding the mystery that still envelops certain of their dispositions, no scientific investigator now doubts that they served as tombs.

Near the pyramids, ruins of ancient funeral temples have been discovered, which were designed to take the place of the chapel of the *mastaba*; did these temples, to which officiating priests were attached, contain *serdabs*? Their ruined condition makes it impossible to affirm this absolutely. As for the pyramid itself, it requires but a glance at the accompanying section of one (Egyptian tombs, Figure 2) to discover, in spite of their modifications, the shaft and the burial-chamber. The interior arrangements of the large number of pyramids that have been studied are greatly varied, but the same principles are always observed. Their dimensions, which are sometimes gigantic, differ widely; this is accounted for by the fact that every king, like private individuals as well, began his own tomb, and kept on enlarging it until his death, his heirs contenting themselves with completing the monument without adding to its dimensions. Starting with this peculiarity as a basis, several *savants* have developed an entire constructional system for the pyramids, which supposes them to have been built of successive courses constructed about a core. Their system, at least in certain of their deductions, cannot be unreservedly accepted; subsidences would have been inevitable in a mass thus put together; and the relatively high position in the monument of the burial-chamber and the conduits leading to it could not be explained. The discoveries already made on the subject are far from conclusive, if not for all the pyramids, at least for the greater part of them.

The outer sides of the steps or courses, which are to-day bare, were originally covered with a stone dressing having a smooth polished surface. Some authors think that it was formed of hard stones or marbles of different colors: this hypothesis seems plausible in view of the marked fondness of the Egyptians for polychromy. In addition to the temples mentioned above, the pyramids were often accompanied by enclosures entered through pylons.

In closing the description of these gigantic sepulchral monuments, the aspect of which, mutilated though they be, leaves an ineffaceable impression on the beholder, we give a brief sketch of the largest and most celebrated, the pyramid of Cheops.

Its base measures¹ 475.73 feet; its altitude is 450.47 (479, originally). From the entrance, which is carefully concealed under the facing about 50 feet above the base, a corridor, showing a section 5.97 feet square, slopes down to the central mass at an angle of about 26 degrees.

About 130 feet from the entrance, the passage is shut off by a huge block of stone, which was precipitated into it after the accomplishment of the solemn burial task. This block, which could never be displaced, was passed by forcing a way through the adjoining masonry. While the monument was in process of construction it had been lodged in a spot expressly prepared for it, and supported on stays which were knocked out when the tomb was to be closed. In nearly all the pyramids, specimens of this ingenious arrangement are found, showing the extreme precaution exercised to guard against the depredations of spoilers.

¹ Our author should give his authority for measurements so at variance with those given by the accepted authorities. — Eps.

Napoleon's Survey in 1799	gives the length of side as	763.62	feet.
Col. Howard Vyse	" 1837 "	" " "	" 764. "
Atton & Inglis	" 1865 "	" " "	" 759.163 "
Royal Engineers	" 1869 "	" " "	" 760.83 "
Piazzi Smyth	" " "	" " "	" 761.06 "

Beyond this first and serious obstruction the passage bifurcates. One branch descends at the same inclination to an unfinished underground chamber; according to Herodotus, it could be flooded by the Nile. The other branch takes an upward direction to the entrance of a second passageway, which runs horizontally and leads to the room called the "Queen's Chamber," situated at the centre of the monument, and measuring 19.7 feet x 17 feet.

From the horizontal corridor a passage, sometimes vertical and sometimes slanting, opens into the lower chamber. Returning to the entrance of the horizontal passage, we find a large ascending corridor, 6.86 feet broad and 65.6 feet high; a series of corbels reduces the width of the ceiling to 4.82 feet. This last passage gives access to a sort of anteroom, preceding the burial-chamber; both these rooms were originally closed with granite slabs fitting into grooves. The latter, measuring 34.76 feet x 16.86 x 20.04, contains the sarcophagus, which, like the chamber itself, is destitute of all ornamentation. Above the royal hall are several hollow spaces, one over the other, designed solely to relieve the weight on the ceiling, which is constructed, like the walls, of huge pieces of granite handsomely polished and matched. Two narrow ventilating ducts complete the list of open spaces thus far discovered.

(To be continued.)

SPIRES, TOWERS AND DOMES. 2—II.



Carpeaux's "Dance." Grand Opera-house, Paris.

THE principles which are shown by modern science to underlie architectural construction are in themselves few and simple, and at the same time reliable. A firm grasp of them may be obtained in the first year or so of study. The mathematical knowledge wrapped up in them is not extensive, and should flow without effort from the mind fresh from college or school. Such knowledge, once allowed to rust, never regains its old vigor. The mathematical and scientific attainments obtained in college life must be carefully nurtured and trained, or they will wither and die under the fierce glow of aestheticism—a sentiment early permeating the whole being of the earnest student.

The few principles which govern tower-building may be enumerated very shortly. After having settled the general plan, outside dimensions and approximate height, the thickness of walls should be tentatively settled, being dependent upon subsequent calculations. Such preliminary judgment should be based upon the least thickness of masonry that is requisite for keeping out weather, consistent with forming a secure and complete bond in the material, and other practical considerations, as window treatment, provision of sufficient abutment for vault springings and corbelling. The approximate weight of the structure may then be calculated, and attention is then paid to the influences which are likely to endanger the stability of the tower when properly constructed.

Towers and spires, above all other buildings, are exposed to the full fury of gales. The force of wind obviously varies directly as the rate at which it is going along, and is given by the following simple formula: $P = \frac{V^2}{100}$ where P is the pressure upon the square foot in pounds, and V the velocity in miles of the wind in one hour. The full wind-pressure that has been experienced must be allowed for, as tending to produce overturning effect. A careful estimate of what the maximum force of the wind is likely to be in the particular situation must be made. This calculation should never be omitted when designing a spire, for the reason that there is no more powerful agent of tower destruction than that which produces the rocking action of a superincumbent steeple.

The effect of wind-pressure upon a tapering Gothic spire is considerably modified by the plan, elevation, and mode of construction of the spire. The inclination of the sides of Gothic spires, varying, as they do, from about one in five to one in ten, reduces the estimated horizontal wind-pressure by two pounds and a one-half-pound respectively on the square foot. This is so small an amount as to be

² A paper read by Mr. Sydney Beale before the Architectural Association January 3. Continued from No. 737, page 93.

negligible. For an architect's purpose, it is unnecessary to find what the reduction is for the vertical slope of a particular spire, as the error is on the side of safety. The plan, if polygonal, necessarily reduces the maximum wind-pressure from what it would be if acting upon a rectangular-planned spire—a reduction ranging usually from one-third to one-half for plainly-constructed spires.

Further, if the spire is built with rounded or other rolls projecting up the ribs at the line of intersection of the planes of the spire, not only is there more surface exposed to the wind, but the edges of discharge for the wind are cut off, and its impacting force aggravated. From experiments of wind-pressure on cellular surfaces composed of test-plates with only one instead of the usual four edges of discharge, the practice is based of adding one-fourth of the registered pressure on the square foot for each of the lines of discharge cut off. This operation has been regarded in the calculations of the tower on the large diagrams of Pisa.

The vertical faces of lucarnes, or other features, would slightly modify the effective wind-pressure upon a spire, and they must be regarded or neglected according to the degree of nicety aimed at.

Having at last obtained a careful estimate of wind-effect, the approximate weight of the spire with a tentative thickness of material is then estimated, and the subsequent investigation may be either done by calculation of the moments or by graphic resolution. If the investigation be by taking moments, the point about which the forces are estimated as acting should be one-fourth or one-sixth of the least diameter of the spire from the leeward edge, according to its plan. The calculation by moments is advantageous from its allowing any modification of the weight of the spire that may be necessary to balance the respective moments in foot-tons or foot-pounds of the wind-pressure and the spire weight. By this means a reliable spire will be produced, possessing the minimum amount of material required for absolute safety and rigidity. Of all the features of spires that do not contribute to their stability, the entasized outline is the most prominent. Its introduction to correct a visual delusion surely subverts the important artistic office of the Gothic spire. Who will say that the spire of St. Vincent's, Caythorpe, or St. Helen's, Broughton, Lincolnshire, and many other highly-entasized spires, are not artistic failures? For stability, the entasis thickens out the spire at the wrong place; by its adoption the base is cut off at the point where, if anything, it should be widened out.

On the other hand, such features as broaches, pinnacles, miniature buttresses and turrets add weight and consequent stability to the spire when clustered around its base. To make the investigation complete, the further points that should be inquired into are the tendency of portions of the spire to slide on the bed-joints. This action cannot possibly occur if the total wind-force is less than the normal component of the weight of the spire above any bed-joint, multiplied by the coefficient of friction of the material used in the construction. Failure by crushing should be looked into. The amount of the pressure on the square foot will, in the majority of spires, be greatest at the base, and will vary in disposition and amount according to the distance of the centre of pressure of all the forces acting in and on the spire from the outside edge of the spire. The amount of this pressure upon a unit of area must, of course, be some fraction of the ultimate crushing-strength of the material. If the actual pressure is too near the ultimate strength, the thickness of the material of the spire will be modified. From constructional failures may generally be learned useful lessons for future work.

The failure of the spire of St. Aldate's, Oxford, is a notable instance. The spire, built of stone 50 feet high, stood upon a tower 56 feet high; the spire had become considerably out of the perpendicular and dangerous. It was taken down to the level of the tower.

The cause of failure was attributed to the presence of a 1½-inch iron bar inserted in the first or base-course of the spire. The rusting of the bar had burst the masonry away, inside and out, and it is averred that the pinnacles at the angles only saved this spire from actually falling.

This is but another instance of misapplied material; the spire was 7 inches thick at the base, while to a depth of 10 feet down from top it was of solid stone. If these conditions had been reversed the original spire might now be standing.

This habit of self-extinction has been very eccentric in its operations. It has deprived the art-loving world of many beautiful examples of English and Continental spires.

The calculation for a tower runs upon the same lines as those for the spire, the modifications being due to the different plan and elevational shape and the consequent modification of wind-effect. The tower must answer the same demands for stability against overturning, safety against sliding on any bed-joint, and possess a factor-of-safety against crushing; lastly, the total weight brought by the structure upon a unit area of the subsoil should be estimated, and be within the limit of safety. An interesting inquiry into the tower-construction of Coutances appeared in one of the professional journals some while ago. The result arrived at showed an excess of material in those towers to the extent of 1,000 tons beyond the needs of the case.

Upon the screen is exhibited a chronicle of some of the constructional failures in tower and spire designs in the limited area of England. France, Germany, Spain, Italy, must have an extraordinary record in this same respect. By far the larger number of these towers owe their failure to the causes previously enumerated. Too much importance cannot be attached to the failure of the towers of

the ecclesiastical buildings scheduled here, for the reason that the architecture of a country, if it is considered at all, is measured by the standard of its ecclesiastical buildings.

If a factory collapses under the effect of wind-pressure, and the lives of an appreciable number of persons come to a painful end, the sad occurrence soon passes out of the minds of all but those most nearly related to the sufferers; but when a cathedral spire or tower passes out of existence the world chronicles the fact for all time.

Who will deny that each and every one of those towers would be now existing as they originally existed if they had been proportioned according to the laws of stability as we know them? Ely Cathedral and Winchester, Peterborough and St. David's, with their massive construction, paid the penalty. It is difficult to understand the reason for such massive design as is found in them. The size of a structure can be emphasized without unduly thickening of walls. If for richness of effect, it is a mistake. The luxury of material in the case of a tower can neither be seen advantageously from within nor beheld from without. A window-opening may attempt to show the wealth of masonry while vainly endeavoring to let the light through it; but that is poor satisfaction. The insertion of masonry in spires or towers of a thickness beyond what is absolutely necessary to meet the conditions previously laid down can only be considered as a useless and dangerous practice.

A very forcible example of an ill-conceived tower is the leaning one of Pisa. The diagram is enlarged from a measured drawing, and is to a scale of 4.25 feet to the inch.

Preliminary.—The tower, circular upon plan, is nearly 178 feet high, with an out-to-out base diameter of 50 feet, the height bearing a ratio to diameter of $3\frac{1}{2}$ to 1. The walls of the lower story are $13\frac{1}{2}$ feet thick and of the upper 9 feet. The tower is entirely of marble. The calculations explain themselves. The first item is the super-area of the foundations. Then comes the cubic contents of the portion of the tower resisting overturn of the wind; that is, of the exposed part from top to ground-line. The weight of the marble is assessed at 170 pounds the cube foot, and is expressed in decimals of a ton; the total weight of the portion resisting the overturn movement of wind is 15,325 tons, and its moment about point A is 91,950 feet-tons.

Point A is $\frac{D}{4}$ from leeward edge.

The peculiar case of this tower exhibits graphically the application of the previous remarks of the effect of wind upon cellular surfaces.

The reduction of the wind-effect registered upon a flat surface, due to the circular plan of this tower, is annihilated by the galleries in consequence of their forming cells for the reception of the full force of the wind, in consideration of which a 60-pound pressure has been calculated. The moment of this force about the point A is ridiculously below the strength of the tower, the ratio being as 1 is to $5\frac{1}{2}$.

The graphic resolution coincides; the distance of the red line resultant from the centre-of-gravity only deviates two-elevenths of the distance between the centre-of-gravity and the point it would be absolutely safe at, showing that, notwithstanding the severe inclination, there is still a very large margin of safety against the overturn effect.

Next, as to the total weight of the tower upon the earth foundation. The soils in the neighborhood of this tower are not noted for their weight-carrying powers.

The tower brings a pressure of $7\frac{1}{4}$ tons on the square foot, and, at a fair computation, the soil, a sandy one, is only capable of sustaining $4\frac{1}{2}$ tons.

This fact obviates the need of any further inquiry into the causes of the subsidence. The tower is thrown from $12\frac{1}{2}$ feet to 15 feet out of the perpendicular, has sunk bodily down some feet into the earth, which has since been excavated away from its plinth.

This tower is a unique example of useless masonry overloading its foundations, still standing, as it does, to tell the tale.

It would be safe to say, from the figures that are before us, that many thousand tons of masonry are in the structure which have no business to be there. It can easily be imagined what the fate of the cathedral would have been with the tower of Pisa joined to it.

The investigations of Canon Moseley, Rankine, and other noted American, French and German scientists have now taken a firm hold upon the constructive professions, and these researches are destined to have a far more weighty influence upon architectural construction than has hitherto been the case, tending to produce in our buildings the fullest economy of material consistent with practical needs and lasting stability.

Domes.—Of the numerous domes that have found existence in the last few centuries, how many can be said to be monuments of architectural and constructive skill? The last century has seen great strides made in many branches of science, and yet in the erection of domes, a field in which scientific knowledge could have such full scope, construction is drifting in a backward rather than in a forward direction. The most recent dome (that for the tomb of the late Emperor Wilhelm of Germany) decides that the dual construction still holds the field.

So that, since the days of Wren, there has been seen no legitimate advance in the matter of dome-raising, and it is the opinion of some that his step was to one side of the obstacle rather than over it.

The cathedral cupola of London was the first of a new race, and in

its essential principles one which has been followed by each successive dome constructed of similar materials.

There is no need to recapitulate here the time-honored theory of the construction upon which have been based the erections of recent centuries. High architectural authorities have satisfied themselves upon the point, and the casual student rests content. It must, however, be felt that the lighting difficulty has not received the attention it deserves as being really the pith of the whole problem. Suppose that the convex surface of the spherical dome, as seen from the exterior, is endowed with the importance and dignity that is consistent with the magnitude of the structure of which it forms part. Then, by nineteenth-century reasoning, the inside surface of this identical shell is unsatisfactory by reason of the unpleasant visual exertion required to grasp its contour—a disadvantage due to the great distance from the dome to the level of the inside pavement. How can it be otherwise, when the dome-shell, even on the St. Paul's plan, is in semi, if not complete, darkness?—a defect undoubtedly due to the system of admitting the light at the wrong place. There is a great deal to support this view.

In the opinion of many, there is no dome interior that satisfies the canons of artistic taste so completely as that of the Pantheon at Rome, an interior lighted directly from the sky.

Again, by universal consent, there is not a more inartistic and depressing dome exterior than that of the same Pantheon at Rome.

The evil effect of the flattened appearance of the exterior and its piled-up abutments has been a more powerful factor in modern dome-construction than has the principle, almost divine in its simplicity, of admitting the light direct from the heavens. The former has generated the dual and triple constructions of St. Peter's and St. Paul's and most subsequent domes, while the principle of lighting from the eye of the dome has not been perpetuated with success.

It is not suggested that the great value of top-lighting for the dome has not been fully realized, but, rather, its non-adoption has been due to the concomitant difficulties having proved too much of an obstacle to its realization? What are these difficulties?

In the first place, artistic and even religious sentiment demands that the apex at the crown of the dome shall be surmounted by a lantern erection so as to annihilate the Mahomedan associations attaching to a bald domical sphere. But this very lantern as now built obstructs rather than lets in the light.

With the example of St. Peter's before him, no dome constructor has again ventured to support a lantern erection upon a single, spherical, masonry or brickwork-coffered dome.

And however we may marvel at the unique construction of the great Sir Christopher, no architect of the present or coming centuries will venture to make such a large draft upon labor and material as was made in the construction of the three roofs to cover the one floor area of St. Paul's.

Granted that for architectural reasons the lantern is essential. Then such lantern must be of such a design and of such a size that it conveys a bright strong light from the heavens to the dome interior. If this can be done the need for the dual system ceases to exist. Now the difficulty of carrying a heavy load in the shape of a large lantern at the apex of a spherical dome has hitherto proved insuperable. It will remain so while stone or brick is relied upon as the sole medium of construction.

The materials hitherto composing domical construction, though possessing a full complement of compressive strength, have not possessed that cohesive strength and tensile resistance in sufficient abundance to resist the aggravating bending moments set up by a load at the apex of the dome.

It will here be a fitting opportunity to review the mathematical theories involved in dome construction. So few investigators have brought their work to a practical conclusion, and fewer still have arrived at conclusions that are of the slightest value to the practising architect, that a résumé is not a formidable task. Upon the writings of Rondelet and Venturoli are based the calculations to be found in Gwilt. Mr. Merrifield read a paper, many years ago, before the Royal Institute of British Architects upon the dome of uniform stress, which showed the shape to be a parabolic cone—a conclusion already arrived at by Wren in designing St. Paul's. Lastly, Mr. Wyndham Tarn has put on record his views. His results, if anything, are more useful than those of the former writers, although he goes about his calculations in a similar manner to the method of Venturoli. His opening steps are common knowledge, and may be followed by any student. By the simple laws of mechanics it is shown that there are two forces generating moments about every point in the arch ring of the dome resting upon an abutment. These forces are the thrust at the crown acting with a leverage about each point in the arch ring, the amount of the leverage varying as the point under consideration alters its position, and the weight of the half arch acting also with varying leverages about different points.

It must be patent to an observer that there is some point in the dome where the effect of the thrust is greatest—in other words, where the dome is weakest.

The question arises, where is this point? Mr. Tarn, in a purely mathematical enunciation and proof, in which trigonometry, the calculus and the higher algebra involving cubical equations are introduced, demonstrates unquestionably, from pure mathematics, that the thrust is a maximum at a point twenty degrees from the springing and seventy degrees from the crown. This may be accepted as

reliable, inasmuch that on reference to some experiments made by a Mr. Bland on arches composed of wood voussoirs, after careful observation, it was seen that the voussoir first to give way under the thrust was at a point corresponding with Mr. Tarn's mathematic conclusion. At this point, of course, in a masonry dome the chain would be placed as has been pointed out.

Given the respective radii of the interior and exterior of a dome-shell, together with the weight of the masonry per cubic foot, the height of the pier, and, lastly, the amount of the thrust at the crown—then from Mr. Tarn's data it is easy to calculate the amount of thrust passing from the dome to abutment, and the thickness necessary at the abutment to obtain equilibrium and also stability.

A remarkable dome is that over Sultan Mohammed's tomb at Gol Gumbaz, at Beejapore. As far as our knowledge of it is correct, its construction is opposed to all modern ideas of good design, the thickness of the shell at the crown being no less than eighteen feet, and diminishing at various stages to nine feet six inches at the abutment. Whether it is solid at the thickest part is not known to the author; anyhow, it is the soundest dome existing without extraneous aids at the present time.

The days of masonry and brick domes existing solely as such are numbered, if not even now at an end. And if a dome, such as has been indicated here, can be constructed (and there is no reason why it should not be) satisfactorily from an architectural point-of-view, when viewed both internally and externally, supporting a suitable and effective lantern erection, then the dual construction which has been the great bar to domical roofing development will be superseded, and an architectural sham be abolished forever.

The question naturally arises, how can this be effected? The following suggestions have been roughly sketched out:

The introduction of metal into masonry dome construction has had a precedent for a century past in the presence of the iron chain. But suppose the chains are entirely done away with and a series of iron ribs are fixed radiating from the eye of the dome, formed by a circular metal curb and abutting upon a similar curb at the base, the whole cross-braced and tied and fixed upon expansion-rollers. By such an erection a framework would be obtained, which could be calculated to resist any bending moment that might be brought upon it by a superimposed lantern, and no thrusts would be transmitted to the drum or abutments. The scheme for covering the metal framework is not a new one, inasmuch that it was suggested some years back to construct a dome entirely of terra-cotta. The idea of the author is that terra-cotta would form a very suitable material for casing the whole of the metal framework internally and externally alike: by blocks interlocking and treated architecturally inside, with overlapping joints externally.

Such a construction would produce a dome which, if suitably treated internally, would be satisfactory artistically, and constructively exceedingly economical, compared in the light of the present accepted modes of dome construction—proof alike against fire, frost, and the dreaded hand of time.

A few domes are illustrated upon the screens. That of Sta. Maria della Salute, Venice, of which there is a near view and a general one, exhibits an arrangement and general design that is peculiarly graceful externally.

The remarkable central protuberance on the dome over the Pisa baptistry is a feature more unique than elegant. To it may be traced, perhaps, the bulbous roof terminations on some Belgian and North German cathedrals.

In drawing attention to the collection of photographs in this hall to-night, comprising as they do examples of many of the principal phases of tower, spire, and dome design, I would venture to say that they are a unique set. They form part of a fine collection gathered together in the course of some forty or more years. This portion numbers some 240 views. I feel the whole meeting is indebted to the gentleman who has placed these views at our disposal, Mr. James Cubitt, in whose service it has been my privilege to spend some little time. He published, seven years ago, some notes upon tower-design, in which were classified towers of the Romanesque and Gothic styles under two great heads—towers with super-towers and towers without super-towers. Under these two divisions come some hundreds of types classed according to their plan, their roofing, their buttressing, etc. On the tabulated diagrams are scheduled the places where examples of the several types are to be found. The arrangement will repay careful study, and in thus directing attention to these views my paper concludes.

THE WASHINGTON WATER-WORKS TUNNEL is again before Congress in the form of a resolution presented in the House, on January 25. Quoting the experts' report as proving that the tunnel is absolutely worthless, and that the \$2,575,279.30 expended on this work is without return to the city in the form of an increased water-supply, the resolution requests the Secretary of War to inform the House whether the contractors and subcontractors for the work of lining the tunnel can be held individually liable for the loss incurred. Also, whether they can be criminally prosecuted. If this resolution is pushed it will open up some nice questions concerning the relative responsibilities of engineers and contractors. — *Engineering News*.



A COMPETITOR SUES A BUILDING-COMMITTEE. — SCAFFOLD-ACCIDENTS. — THE PROVINCIAL ESTIMATES. — PROPOSED PUBLIC BUILDINGS.

A CURIOUS case has lately been before the courts of Montreal, in which the apparently unfair dealings of a competition-committee with one of the competitors was the cause. It seems that the Governors of the Insane Asylum advertised for drawings from architects for a new asylum, the total cost of the building not to exceed eighty thousand dollars. The plaintiff in the case was a Mr. Walbank, architect, of Montreal, and he sued the Governors to force them either to submit his plans to the experts named or pay him the full value of his plans, or, in other words, to carry out their own conditions or pay him. For some reason or other not mentioned, the drawings sent in in competition were not submitted to the experts, so that, in fact, there was no competition, but the Governors instead gave the building into the hands of their own architect, who, at the trial, said he had been employed without reference to the competition. Mr. Walbank, as a competitor, sent in, under seal, an estimate made by a contractor of the cost of the design, and this envelope was opened by the Governors at their meeting, although marked "not to be opened unless plans are accepted," and the Governors made use of this so far as to make notes from it and enter them in their minutes. And now comes the extraordinary part of the matter, the bearing of which upon the subject one can hardly comprehend. Judgment was given in favor of the Governors because it was held that Mr. Walbank had not proved that the designs could be carried out for eighty thousand dollars. Although Mr. Walbank sent in, under seal, a *bona fide* tender, and although it was proved that the Governors had seen this, yet it is stated that there is no proof on the matter, and on that count alone the verdict must be against the plaintiff. The court says nothing about the Governors not complying with their conditions, but comes down upon the competitor on an outside point. The defence of the Governors seems to be that they could do what they pleased with the design sent, not according to their conditions, while Mr. Walbank maintains that their conditions were fulfilled by him, and, therefore, demands that they (the Governors) should be made to fulfil them themselves. It is said that this case will be appealed, and it is to be hoped it will—Montreal justices seem to be altogether at sea with regard to professional customs and practice.

The continual accidents to workmen through defective scaffolds are attracting a good deal of attention in Toronto, and there are a good many schemes suggested as means to prevent them. One idea is to make the master-builder responsible for the safety of his workmen, another is to employ another inspector whose duties shall be entirely devoted to the examination of scaffolds, while a third is to make responsible the men who build the scaffold: one and all are equally impracticable. A master-builder has more important things to watch than the temporary staging erected for the use of the men. If he provides them with sufficient planking, posts and ropes, he has certainly done his duty. One inspector would never get through half the scaffolding erected on any one day, not to mention the necessary inspection, perhaps three times a day, of scaffolding that had to be enlarged or raised in the course of that day. An inspector would be an expense to the city even were one sufficient: the city would then be responsible for accidents to scaffolds supposed to have been inspected, or all work would be delayed at a building until the inspector had certified that such a scaffold was safe for the men to venture on. The third idea, that of making the men responsible, is the best, but it is altogether impracticable; workmen are proverbially careless and you cannot teach them to be careful. There is really nothing to be done in the matter if the men will go on scaffolds they have sense enough to know are unsafe, they must take the consequences; there is no law to make them endanger their lives by venturing on flimsy structures, but, if they will not use their common-sense, it will do no good to treat them as children and give them a scaffold nurse to look after them.

Since my last letter the International has appeared, and really the first few numbers took away one's breath, but now one is getting accustomed to the weekly flood of illustration. To look at one's *Architect* is not now a matter of a few moments. It takes time even to look through it, not to mention to study it, while in the great variety of the subjects each week every individual who sees it must find something that interests him particularly.

The Dominion and Provincial Parliaments of Canada have "knuckled down" to work, and the end of last month (January) saw the announcement of the "estimates" for the year. A casual glance, not at the figures of the amounts devoted to public works, but at the various items upon which the money is to be expended, clearly shows how great and rapid is the progress of "civilization" throughout the Dominion. The number of post-office buildings to be erected in various small towns, varying in cost from \$8,000 to

\$15,000 each, shows this better than any other item, for a town must be founded and developed, and must exhibit very decided evidence of its future progress before it can be entitled to have a special building given to it for postal facilities.

The sum of \$5,000,000 is devoted to railways and canals, of which the River St. Lawrence and the western canals get \$1,000,000.

Grants of large sums are voted for "public buildings" (which means municipal offices) in various places which, having formerly reached the "post-office stage," have progressed to a degree entitling them to city-halls. But the architects of the Province of Ontario have a special interest in the session of their local parliament, on account of their Bill of Registration. There is, however, likely to be a dissolution about the middle of next March which may delay considerably the legislation they are anxious to obtain.



THE ANNUAL PRIZES AND MEDALS. — ELECTRIC-LIGHT AT THE BRITISH MUSEUM. — IMPROVING THE STRAND. — HOUSES FOR WORKING-MEN. — THE WATKIN TOWER.

THE competition for the annual prizes at the Royal Institute of British Architects has hardly brought forth such good work this year as is usually the case; indeed, two of the principal prizes were not awarded. The Institute Medal and £26-5-0 attracted no competitors, and the judges did not consider the work submitted for the Soane Medallion of sufficient merit to justify their awarding the prize. One of the competitors might have received the laurel-wreath had he not yielded to a temptation to be original, and submitted a perspective sketch of a highly sensational character. Sensationalism does not meet with favor at the Royal Institute of British Architects.

The Tite Prize does not call for any special mention. The Grissell Medal, for a design for a timber spire, attracted eight competitors: one extremely clever design was submitted by Mr. W. Percival. The Pugin Studentship was gained by Mr. John Begg, who follows in a minor degree the style of draughtsmanship inaugurated or revived by Mr. A. B. Mitchell, of washing in his shadows in light washes of lamp-black. He does not, however, pursue the idea so far as Mr. Mitchell is wont to do, but by his moderation obtains, as is very justly pointed out in the *Institute Journal of Proceedings*, a more delicate and refined result.

Results of the travels of last year's students were shown by the sketches of Messrs. Mallows, Prentice and Lanchester. Mr. Mallows is, I believe, an American. Anyhow, he enjoyed the great advantage of having studied under Mr. Joseph Pennell, whose influence is very notable in some of his sketches. Mr. Lanchester took the Owen Jones Prize for Color Decoration last year, and sends a collection of really most beautiful studies in color from North Italy. The prevailing tone of his work is rich to a degree almost sombre, but they are full of true artistic feeling.

There was a new prize offered this year for models of a vault in plaster, and the prize was taken by Mr. H. A. Woodington, for a very painstaking piece of work.

The Ashpitel Prize, given to the "Senior Wrangler" in the Examination in Architecture, was won by Mr. Herbert Baker, a son, I believe, of Mr. Arthur Baker, F. R. I. B. A., who has done a great deal of good work. Mr. Baker is in the office of Messrs. Ernest George & Peto. This is the first time the Ashpitel has been awarded to a London student for three years.

On Tuesday, January 28, there was a large gathering at the British Museum to witness the first public illumination of the Greek and other galleries by the electric-light. On February 1 the Museum will be thrown open to the public between the hours of eight and ten in the evening. This is, of course, a great boon to architectural students, most of whom are busily engaged in offices during the day, and to whom the Museum has hitherto been practically inaccessible except for an hour or two on Saturday afternoons. Now it is open for them to go and draw any evening at their leisure from the priceless Elgin marbles and other examples of Greek art in the Museum.

The London County Council have prepared an "Amendment" to the Metropolitan Building Act for submission to Parliament during the coming session. The chief points of interest to architects are:

(a) An appeal is given from the superintending architect's decision in matters of frontages to a tribunal composed of one member appointed by the Council, one by the Royal Institute of British Architects, and one by the Surveyor's Institute. At present, the decision of the superintending architect in these matters is final and decisive.

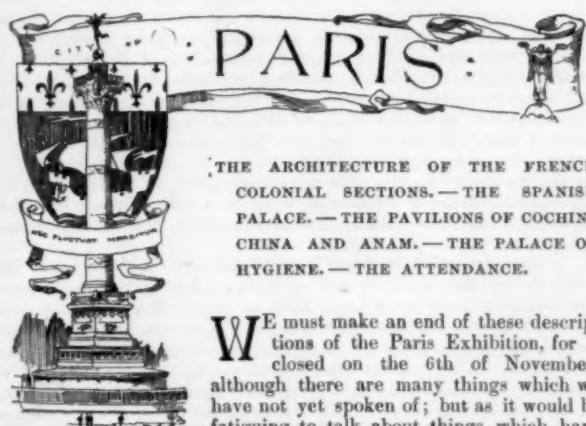
(b) A clause is inserted that no building shall be erected higher than seventy feet without the consent of the Council.

The "Strand Improvements" Bill will also come before Parliament this session. I have already informed you as to the causes

which led to this Bill and its nature, but I do not think I have ever referred to a peculiar principle which the London County Council have embodied in the Bill. It is quite a novel idea, but is hardly being treated tenderly by the British public. The argument of the promoters of the Bill is, that in consequence of the action of the Council in cutting an important thoroughfare through a network of slums, the value of certain of the slums is immensely increased, whereupon the Council seek to impose an annual rent-charge upon all property within a given area which they have somewhat arbitrarily defined. The clauses have been termed the "betterment" clauses. Naturally the owners of property in the district object very strongly to any such proposition, and their influence has been sufficient to induce the Strand-District Board of Works to oppose the Bill in Parliament. It has always been an understood thing in England until now that if a certain property was benefited by a public improvement, so much the better for that property, and the suggested innovation of the London County Council betokens a spirit of unnecessary meanness which can hardly be called economy.

The housing of the working classes has again been receiving a share of public attention. The munificent bequest of £250,000 by Sir Arthur Guinness is partly the cause of this. People are anxious that the Peabody fiasco should not be repeated, and that the money should really benefit the very poor for whom it is intended, and not simply enable clerks and respectable artisans to live at a cheaper rate than they otherwise would have done. Another thought has somewhat agitated the minds of certain people who know a little about artisans' dwellings. At the present time these dwellings, carefully built by experienced men and well-administered afterwards, can be made to pay from 4½ per cent to 5 per cent at an average weekly rental of 2s. per room. Now, if it is the intention of the Guinness Trustees to adopt this rental, where do all the vaunted benefits of the trust come in? If, on the contrary, they lower it, they will inevitably not only set up a most undesirable competition with those who have borne the burden and heat of the day, but also frighten away from the market money that might otherwise have been invested in a safe, if not a brilliant, investment. The administration of this trust seems to be fraught with the gravest difficulties.

An evening paper reports that there are some hundreds of competitors in for the Watkin Tower which is going to be forced upon us in England, partly, it seems, for the dedication of Sir Edward Watkin. There appears to be a reasonable chance of the erection proving a financial success, and if legal difficulties do not prove too great for the promoters of the tower, up, I suppose, it will have to go and stand there alone in its gaunt ugliness, a standing tribute to the utter depths of childishness to which modern Englishmen can descend.



THE ARCHITECTURE OF THE FRENCH COLONIAL SECTIONS.—THE SPANISH PALACE.—THE PAVILIONS OF COCHIN-CHINA AND ANAM.—THE PALACE OF HYGIENE.—THE ATTENDANCE.

WE must make an end of these descriptions of the Paris Exhibition, for it closed on the 6th of November, although there are many things which we have not yet spoken of; but as it would be fatiguing to talk about things which have

already partly disappeared, we will rapidly review those buildings which still remain unmentioned.

Before leaving the Champ de Mars let us cast a glance at the Rue de Caire, whose success has been prodigious, and which every day during six months was crowded to the very verge of putting a stop to all circulation. The idea of the Egyptian exhibit and the plan of the Rue du Caire was due to M. Delort of Gléon, commissioner-general, who had for his objective point to give Paris a specimen of the Arabic art of the caliphs,—but not an absolutely exact reproduction of one of the real modern streets.

The Egyptian section covered about 3,000 metres and was divided into two parts. First, the Rue du Caire, properly so-called, and second, the exhibit in the galleries of the palace which contained shops and bazaars. The street was composed of houses with bizarre and irregular façades, with balconies and projecting moucharabihs. It formed a very gay perspective, full of movement, the principal feature of which was a minaret, recalling, at the same time, that of Caid Bey and that of Sultan Hassan. All the details of ornamentation, faience, stuffed crocodiles and moucharabihs were imported from Cairo. One quite believed himself in Egypt when, in full summer daylight, the projecting stories and the moucharabihs with their delicate windows threw their long shadows upon the shops of the lower story with their colored awnings. The oddly dressed

merchants completed the charming illusion. Passing rapidly through the Morocco exhibit, which does not long delay us and presents little interest from the point-of-view of construction, since it is merely composed of arcades sheltering bazaars and a café-concert, let us cast a glance at the Roumanian cabaret, all of woodwork, all of original and varied form, and recalling the pretty architectural fantasies of M. Sauvestre; and then let us stop before the Indian palace. This is composed, inside, of a long gallery interrupted at its middle by a rotunda decorated with a fountain and with a balcony at the first story. Bazaars and small shops are in this gallery, and on the outside a veranda, resting on squat columns with curiously sculptured capitals, runs the full length of the building. The general effect is massive, and the entrance is emphasized by a large projecting doorway, flanked by two minarets. In general it recalls the architecture of the fifteenth century, which was a transition between the Buddhist and the Mussulman styles. The decoration, obtained in the first place by a succession of red courses interrupted by friezes of fine sculpture, was copied after the buildings of that epoch and models at the South Kensington Museum. The sculptures of the veranda were inspired from Taj Mahal, at Futtipoor-Sikra, while the minarets are from the mosque of Ahmedabad, and the central rotunda of gay and elegant appearance has its columns copied from those of the Mosque of Katub at Delhi.

On the other side of the Pont de Jena we could not overlook the pretty forestry pavilion built by M. De Gayffier, Conservator of Forests, and M. Lucien Leblanc, with every kind of wood which grows in France. The architect had the ingenious idea to use the wood in its natural state, and seek his decorative effects through the natural differences between his woods and the diversity of their colors. The columns are formed of tree-trunks with the bark on, and for them were used some of the most beautiful specimens of our forest trees.

The pavilion of Public Works, which was *vis-à-vis* to it, had quite another air. Everything was of brick and iron, and was surmounted by an ungainly light-tower, which, nevertheless, afforded an agreeable outlook over the garden of the Trocadéro.

Going to the esplanade of the Invalides by the quay we discover certain other interesting buildings. First, the Palace of Alimentation, by M. Raulin; all of iron, with a very rich decoration in stucco. At its side and connected with it the Portuguese Palace, by M. Jacques Hermant, a very charming building in open timber work covered with sheet-metal and with sculptures in stucco. The style (Portuguese, Louis XV) is inspired from the hotels at Coimbra and the buildings at Lisbon. The pediments over the windows are decorated with the arms of Portugal and the family of Braganza. A loggia looks out over the Seine, and reminds one of the arches of the cloister at Belem. We thus reach the foot-bridge of the Alma, which connects the galleries of the exhibition with the quay d'Orsay, interrupted by a long open square. This bridge is borne on an arch twenty-seven metres high and fifty metres in clear span, which allowed a large open space for the enormous crowd of foot-passengers and carriages which collected at this spot. Two staircases of forty-two steps each ascend to the bridge-floor seven metres above the ground. At each side of the arch four pylons rise to the height of thirty-six metres. The summit of the arch itself is decorated with the escutcheons of every department of France and the flags of all foreign nations. This bridge was carried out under the direction of M. Charles Gauthier, who was also the author of the memorial bridge which serves as entrance to the exhibition from the esplanade of the Invalides.

Crossing into the Agricultural galleries we notice the Spanish palace, constructed by M. Melida, a Madrid architect, and M. Poupinel, of Paris. Intended to receive wines and alimentary products it consists of two stories, the lower one of which is arranged like the Spanish wine-vaults. The decoration is managed by pilasters and octagonal columns, the capitals of which, of three different types, are those of Santa Maria la Blanca, of Toledo. In the upper story the rooms are large and well lighted. The ceiling of the central hall is an exact reproduction of the ceiling of the Sinagoga del Transito at Toledo. In Spain there are some monuments built at the same time, but composed of very different styles. At the end of the fifteenth century and beginning of the sixteenth, the Arabic style was influenced by the growing ascendancy of Christianity. This style is called Mudjar. Then the Gothic style flourished, and next came the commencement of the Renaissance style called Plateresque, because it was imported by the silversmiths who had come from Italy. These styles of different characters give the Spanish palace an unbalanced air but interesting, as they show differences of style little known in France.

Reaching at length the esplanade, we have arrived at the last, but not the least interesting, halting-place of our visit to the Exhibition. It was one of the successes from every point-of-view: this superb colonial section united in fact all possible elements that could attract the crowd. It offered a curious spectacle of indigenes transported with their dwellings and their costumes, and living their ordinary life, with their own customs and habits and even their own religious rites. Artists and men of letters found here subjects of study and analysis, and carried their investigations farther than the ordinary public. But for the architect how many subjects were offered for reflection in this primitive architecture, inspired from authentic monuments, or reproducing completely certain portions of existing edifices!

In the exhibition of Algeria, the most important of our colonies,

the palace is composed of several specimens of the Algerian style, not Arabic, as has been carelessly said. The entrance is through a porch with three arches under a projecting pent-roof copied from the tomb of the last Dey of Constantine in the mosque of Sidi-Abd-er-Rahman, one of the most celebrated in Algiers. It was erected in honor of the Marabout Sidi-Abd-er-Rahman, who, according to popular legend, raised the waves which engulfed the fleet of Charles V by simply touching the sea with his wand. The minaret at the left of the entrance is an exact reproduction of the minaret of the same mosque, with all its faience work. It encloses a staircase which recalls that actually in use in the mosque at Algiers, and which gives access to two rooms, supported on corbels, and connected together by a wooden balcony on the interior of the dome upon which the entrance porch opens. This dome ("Kouba"), which is a copy of that of Sidi-Abd-er-Rahman, is the entrance vestibule, and its centre is occupied by a very commonplace statue, by M. Gauthier, sculptor, representing Algeria. The vestibule gives access to a long gallery, at the extremity of which is found the Hall of Honor. This gallery is charming, with its Moorish decorations, its sculptured piers covered with geometrical arabesques and its ceiling, which allows the entrance of light through the glass, bright with colors. This hall of honor is very richly ornamented, and the decoration of its ceiling is borrowed from the Archbishopal Palace at Algiers. This portion of the Algerian palace has a very Oriental character, which we do not find, at least within the building, in the three bays of the grand hall, situated at the left of the gallery, which are devoted to the exhibits of Algiers, Oran and Constantine. At the right, porticos and bazaars enclose an interior court, which contains a pretty tile-work fountain in the Moorish style, shaded by palm trees and decorated with Algerian plants. Here are gathered an extraordinary crowd of native merchants and weavers of stuffs who do their work in public. The portico ends on the garden side in a little square pavilion covered by a dome ornamented on the inside with green tile-work. At the other end it butts against another pavilion of more importance. This pavilion is a reproduction of the Pavilion of the Fan at Algiers, where the Dey gave the French ambassador the buffet which brought about the conquest of Algeria.

Faience plays a great part in the general decoration of this pretty place. It is due to M. Albert Ballu, architect, ably seconded by M. Marquette. This faience is of French make, but draws its inspiration from the Italian work of the same kind which is much used in Algeria. The lining of the basement of the principal entrance, which was designed by M. Parvillée, has been executed by Fourmistrain-Courquin. This very brilliant and very elegant entrance recalls the Mihrab of the Mosque de la Pêcherie with its adjacent windows.

After Algeria, fronting on the central avenue of the esplanade, rises the Tunisian palace, composed in a very interesting manner by an archaeological architect, M. Saladin. This artist particularly studied the country where he once discharged important duties for the Ministry of Public Instruction and the Fine Arts, so he has very ably grouped in the palace the different types of Arabic and Tunisian architecture. We approach the palace by a wide flight of steps, on which the three-arch portico, sixteen metres long by six and one-half metres deep, opens and surrounds an interior court-yard nine metres square, paved with ancient mosaics, and in the midst of which stands a fountain. This is the "patio" of the Arabic palaces of Tunis. At the right of the square a flat-roofed pavilion is a reproduction of the Souk-el-Bey at Tunis. The arcaded bay filled with windows and ornamented with colonnettes occupies almost the full width of the pavilion, which on the other side is lighted by a moucharabieh. On the left a second quadrangular pavilion with a pyramidal roof draws its inspiration from the tomb of Sidi-ben-Arouz at Tunis. The lateral façades, are composed of elements drawn from the Bardo and from Dar-el-Bey, and the rear façade, of a more varied character, has been borrowed from the Mosque of Kerouan (Sidi-Okba), with the ribbed dome so peculiar to the Tunisian style and which crowns the cupola which surmounts the Mihrab of the grand mosque. At the left of this rear façade rises the minaret and a school-house. The decoration of the interior court-yard is particularly noticeable for the faience work which comes from the palace of the Bardo. The ceilings are ornamented with designs sculptured in intaglio and painted in brilliant colors, and form a whole of great richness and very marked Oriental character. The fountain which occupies the middle of the court-yard is surrounded by a pavement of ancient mosaic fragments, and in them we can admire other fine examples taken from the tombs of Sbeitla and Lamta.

About this central pavilion are several interesting structures: first, a brick house from Djerid, of great originality of character, and on the other side the souks or bazaars. These are like long corridors, on either side of which are raised cases, serving as stalls. They are open alike on the outside and inside, and are protected from the sun by unbleached awnings. Here we see the occupants at work on embroideries, damaskeening, jewelry-making and cabinet-making. The perspective of this souk is a charming spectacle, with its columns striped with red and green, and brilliant with stuffs, the glitter of jewels, silverware and copper utensils; but all these brilliant colors, all the red and the gold, clash against one another in the brilliant rays of sunlight which creep between the openings of the awnings.

Without being distinctly of any style, the Palace of the Colonies has the general air of a building which would not be out of place in the land of the sun, with its somewhat brutal decorations and its

lively red and green colors. The windows break through the roof, the bell-towers at the angles, and the dome give to the Colonial Palace a varied silhouette and movement in spite of its rectangular form.

About this central palace are grouped the pavilions of Annam, Tonquin and Cochinchina, the pagoda of Angkor, the Creole restaurant and various Asiatic and African villages, where exotic productions are sold.

The Javanese village, whose success has been so great because of the pretty little Javanese dancers, comes next. Of all these different buildings, two are particularly remarkable for their architecture and the richness of their decorations, these are the pavilions of Cochinchina and of Annam and Tonquin. The first occupies an area of about 1,200 square metres. It is composed of a principal building with two wings enclosing an interior court-yard, which is obligatory under the customs of the country. A fountain, some shrubs, vases and a faience dragon furnish the decoration. The entire construction is of wood carved in a remarkable manner. The entrance, with its projecting roof supported by great consoles of wood, is a marvel of fine workmanship. The plaster basement is covered with paintings executed by the Anamese artists on the spot. Nothing was more curious than to see these people compose their decoration without models and without documents of any kind. They drew with the brush-point and at the first go-off, images conceived in their imagination, images representing flowers, animals and human beings. Fragments of faience buried in the plaster became, under their able fingers, plants and fantastic branches of shrubs, and all formed a very decorative whole. A magnificent enamelled terra-cotta cresting, twenty metres long and three metres high, crowns the pavilion of Cochinchina. This beautiful morsel, with figures and animals very curiously incised, was made at Cholon. First built in its own country, this very interesting building, which it is hoped will be preserved, was set up in a few weeks by a gang of Anamese workmen under the direction of M. Foulhoux, Director of Civil Buildings in Cochinchina.

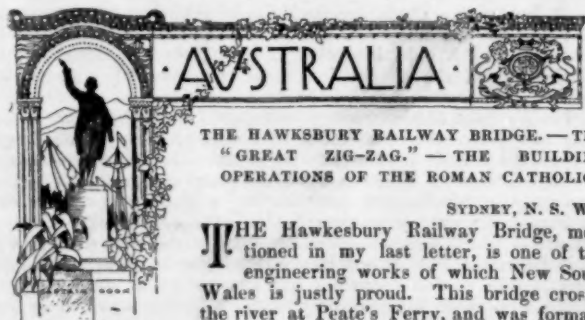
The pavilion of Annam and Tonquin is less fine in detail and construction, but wood here plays a principal part. It has the ordinary pagoda form, and is built on a square plan, with an interior court-yard, in the centre of which is placed a cast of the great Buddha of Hanoi, Tonquin. The principal entrance is a reproduction of that of the pagoda at Quan-Yen. As to the rear and side doors, they are inspired after beautiful specimens of Tonquinese architecture. The paintings, tile-work and sculpture have been cast at Hué from portions of the palace of Tien-Tri, Tu-Duc, Gia-Long, etc., through the enterprise of M. Vildieu, architect. This pavilion, like that of Cochinchina, was executed in its own country at Saigon. The carpenter-work, cabinet-work and the paintings were made at Paris by the Anamese artists we have already mentioned.

This magnificent colonial exhibition has as its *vis-à-vis* on the side of the esplanade a series of structures of quite a different air. These were the buildings of the Exhibition of Social Economy, rather uninteresting from an architectural point-of-view. The Palace of Hygiene is more attractive. The architect, M. Girault, gave it the form, on the outside at least, of the Roman baths. This seems rather irrational, considering that this building was to shelter the appliances of modern hygienics.

By the side we find, in a special pavilion, the apparatus of Messrs. Geneste & Herscher, who, from the point-of-view of the sanitation of cities, ventilation and heating, have made immense progress.

Finally, to end here, here is the Palace of the Ministry of War, which stretches to a length of 150 metres. It is an immense structure in the style of Louis XIV, of which the central doorway is treated like a Corinthian triumphal arch, and the two extremities of which are accentuated by two great motifs, which recall the Porte St. Denis. The general aspect is imposing, and the detail is well studied. It is not absolutely ugly, but it takes up too much space.

It is this monument of M. Walwein, architect, which closes our rapid review of the buildings of the Universal Exhibition of 1889, which has seen gathered within its limits an average of 150,000 visitors a day, which gives a total number of 25,000,000 of attendants. This is more than double those in 1878.



THE HAWKESBURY RAILWAY BRIDGE.—THE "GREAT ZIG-ZAG."—THE BUILDING OPERATIONS OF THE ROMAN CATHOLICS.

SYDNEY, N. S. W.

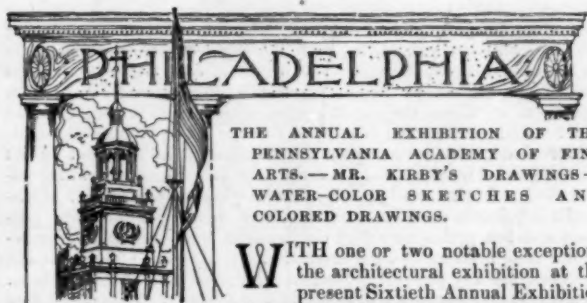
THE Hawkesbury Railway Bridge, mentioned in my last letter, is one of two engineering works of which New South Wales is justly proud. This bridge crosses the river at Peate's Ferry, and was formally opened in the early part of last year. There are seven spans of over 400 feet each, and the stone piers on which they rest are built on massive caissons filled with concrete, the depths varying from 100

to 172 feet. Each of the spans was constructed on a large pontoon provided with water-tight compartments, and surmounted by an enormous staging capable of sustaining the whole weight of the ponderous mass of metal-work, and somewhat higher than the piers of the bridge. This pontoon was sunk close inshore by opening the valves of the water-tight compartments, and the span was then put together and completed on the top of the staging. When everything was ready the compartments were again closed, the water pumped out, and the pontoon rose gradually to the surface and floated there. At high water it was then towed down between the piers on which the span was to rest, and, as the tide fell, the girders settled slowly onto a properly-prepared bed; then the pontoon, released from its burden, was towed back to its former moorings and made ready for receiving the subsequent spans. The total length of the bridge between the abutments is about 2,900 feet, and it is raised about 50 feet above the surface of the river. As I mentioned before, an American firm of contractors carried out the work, but the girders used in the construction were imported from Scotland.

Our other engineering triumph is of much earlier date, and is known as the "Great Zig-zag." In constructing the railway across the Blue Mountains, the ascent was found to be so abrupt that it was decided to carry the line up a series of inclined planes till the crest of the hills was reached. Thence it winds along the summit of the main range, ascending continually, for a distance of 60 miles, till it arrives at the farther side of the mountain barrier, and then the descent onto the Western plains is commenced. It is here the second series of inclined planes (which we call the Zig-zag) has been constructed, by means of which a precipitous fall of 700 feet is traversed by easy gradients. The cost of this work averaged nearly £23,000 sterling per mile, and from this some estimate may be formed of the difficulties which had to be surmounted.

The Roman Catholics here are gradually covering the best sites in the city and suburbs with their churches, schools and colleges. The Education Act in force in New South Wales recognizes no sect or creed, and the instruction is purely secular. The Catholic Church claims that, if not inculcated as a part of a child's education, religion is too apt to degenerate into indifference, if not atheism; they have fought, therefore, for the denominational system for many years, but their struggles have been unavailing. They have now abandoned the conflict, but their position remains unaltered. They have accordingly set to work and built themselves splendid scholastic establishments all over the colony, which are paid for and supported by the voluntary contributions of the members of the Church. The fees are almost the same—that is, merely nominal—and the tuition quite equal to that imparted in the public schools. Besides the fine Catholic Cathedral, which is barely half completed, and which has already cost upwards of £200,000, we have a large Catholic seminary at Manly, which is undoubtedly one of the best ecclesiastical buildings in Australia. Then the Jesuits have built, and lately opened, a grand college on one of the most picturesque sites about Sydney, and on Sunday last was laid the foundation-stone of another college, equally large, for the Marist Brothers. The Jesuit College, architecturally, seems well adapted for its purpose, but entirely unsuited to the site. It is a building which would look well in a crowded city street, and is, consequently, unfit to be set on a bold headland, against a background of dense foliage.

There is little else worthy of record just now; in fact, we have arrived at a period of almost utter stagnation so far as professional work is concerned. Our business has been steadily decreasing month by month, until now there is absolutely nothing doing in most of the architects' offices. The tide of our affairs is about to turn, though, we are told, and, if we can only hold out long enough, we may meet the flood which is to carry us on to fortune. May that flood come speedily, for life is becoming terribly irksome to many of us who flounder in financial shallows.



WITH one or two notable exceptions the architectural exhibition at the present Sixtieth Annual Exhibition of the Pennsylvania Academy of the Fine Arts is much more purely local than usual, or rather is much more than usual the work of local men, for a large proportion of the drawings shown were made abroad. Very unfortunately many drawings shown at the Architectural League Exhibition were unaccountably delayed until too late, and are, therefore, not in the Academy. The most important exceptions to this rule are the twenty inimitable drawings by Mr. H. P. Kirby, several of which were in the League Exhibition. A note in the catalogue tells us that Mr. Kirby's drawings "are here for a limited time, through the courtesy of the artist

and of the Boston Architectural Club, a private exhibition already arranged by the Club for Mr. Kirby having been postponed in order that the drawings might be shown here." Unlike the pen-and-ink work of a good many well-known draughtsmen, these superb examples command more admiration in the original than in any reproduction; the line is as firm as true, and as delightfully free when it wanders over a square yard of paper as when it is confined within the boundaries of a quarto volume. If we cull out the least characteristic pieces, the studies for a cottage and a gate-lodge, and perhaps the interior sketches, it is hard to tell which of the others attract us most. There is the noble drawing called a "Study for a Country House," the less imaginative, but still fascinating country house with its arch over the roadway on the left, the seaside house, the sketch (in brown ink) for a club-house—possibly this is the best of all, although without any dominating mass which would have helped it as a composition—this rambling club-house, partly Gothic, partly Renaissance is altogether delightful. Then there is the well-known sketch for a country tavern and the study for a hotel in Colorado, a design in French Renaissance for a building that if it exists must make an architect think twice before going to France in search of picturesque. One wonders to what use the ill-lighted rooms in the round towers will be put and the front-door strikes certain fault-finding people as not being conspicuous enough; but small entrance doors and large chimneys are characteristics of Mr. Kirby's designs, and in the presence of drawings like these one ought not to feel hypercritical.

All the drawings are admirable, the sketch in St. Lizier, the clearly drawn corner in Bayeux, the mass of rich detail in the study for the tower of the court-house and jail, and the fascinating compositions and views in imaginary French towns. One feels the strongest desire to see the whole of the church whose spire is the feature of one of the sketches, and in another to know what may be hidden behind the half-timbered gables above which looms the noble tower of a rich cathedral.

From the numbers of draughtsmen who have been seen apparently taking mental notes from these drawings, it seems as though Mr. Kirby might have many imitators, and the next exhibition may contain as many pen-and-inks after the manner of Kirby, as there are generally to be found of water-colors after the manner of Luce. It would seem—and this I think a pity—that the influence of the school of architectural water-color, of which Mr. Luce is easily master, is somewhat on the wane. There were very few drawings that recalled his single-wash style at the Architectural League Exhibition this year, and here there is only one, a water-color by Mr. W. C. Noland, of a building by Messrs. Shepley, Rutan & Coolidge. This perspective is catalogued as being colored "under direction of Clarence S. Luce," and, indeed, the rich, strong brown wash shading into blue might easily be mistaken for one of his own. Immediately over this, and occupying the place of honor on the north wall, is the large water-color that is one of the drawings with which Mr. T. P. Chandler, Jr., won the competition for the building for the Penn Mutual Life Insurance Company. One cannot help admiring this impressive building with its huge Ionic shafts brought into greater prominence by the finer detail of the impostes, and at the stage at which it has now arrived, one has involuntarily the same thought that arises on seeing the Public Buildings and calling to mind the numerous perspectives of them that flood the city—that it is a pity the tower should ever be built. Of course, there can be no fair comparison between the painted iron sham that is to dominate our City-hall and the honest stonework of the Penn Mutual Building, but the tower for the latter is not in Mr. Chandler's happiest vein, and even—if I might venture so profane a thought—verges on the commonplace. This cannot be said of Mr. Chandler's other design, a pen-drawing for the building for Brown Brothers & Company. This shows the extension of the Chestnut Street front in the same strong, light and graceful style as the present building. Next to this drawing is another pen-and-ink by Mr. Charles M. Burns, a rear view of the Church of the Nativity, at Bethlehem, Pa., showing the apse crowned by an encircling colonnade. Mr. H. Bloomfield Bare has three water-colors, English in their treatment, of more or less known architectural subjects, but his most interesting drawings, at least to architects, are two large frames of sketches entitled "Rambles in Europe." Together they include twenty-seven small sketches of towns, details, corners, churches and houses from various countries, all apparently made on the spot in whatever material happened to be at hand, water-color, pencil, Chinese white—anything, and on paper of all sorts of shades. The most pleasing of them all is a charming water-color drawing in light washes, of that most picturesque of buildings, the Town-hall of Malines. Mr. Frank A. Hayes has some water-color sketches from England and Belgium, very rich in color and boldly handled, without retouching. Perhaps the best of these is a frame of three sketches in Chester. The middle one, which has been worked very "wet" throughout, is especially successful. A pen-sketch of an old house at Kenilworth is drawn in a charming manner, but is a little smudgy-looking at a distance. Mr. Hayes also shows a good design (which has taken third mention in a late T-Square Club competition) for a fountain in a blank wall.

Mr. Wilson Eyre, Jr., has four drawings. One of these is a sheet of sketch-plans and elevations for a country-house in Michigan. The simple hipped roof covering both house and stable, the stone arch that connects the two, the loggia in the corner and a certain air of comfort and repose about the whole composition make this study

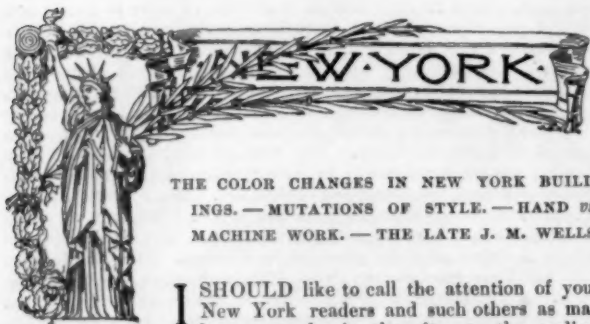
a very interesting one. Mr. Eyre's other designs are a capital pen-sketch in a few strokes of a house he is building on Locust Street, the entrance to the Walnut Street Turkish-bath building, and an oriel window in the general style of Louis XIV, rather out of the architect's habitual manner of design, but admirable and very characteristic in its drawing. Mr. Linfoot has two of his pen-drawings: one of the home buildings of a large country-house at Merion, and the other of the Miners' Hospital at Hazleton. It is to be regretted that the plan of this hospital is not shown, for in a hospital, of all buildings, the plan is the most important thing. Messrs. Cope & Stewardson have even thought it worth while to show the plans of the two country-houses of which they exhibit perspective sketches, and these plans certainly add greatly to one's interest in looking at the drawings.

Mr. Frank Miles Day has a couple of pen-sketches, one of a country-house and one of the out-buildings for it. These drawings are evidently by different hands, and suggest again the advantages often spoken of that would follow the general adoption of the system of giving credit both on the drawing and in the catalogue to the draughtsman, whether he be architect or assistant, who has actually made the sketch.

Mr. L. C. Hickman has six spirited and clever water-color drawings; five of them are designs submitted in T-Square Club competitions. Perhaps the prettiest of these is the charming design for a fountain, and the least original the "Hospital Entrance." All of them are remarkable for clean, masterly workmanship. Some other competitive designs are Mr. E. C. Kent's Renaissance city front, Mr. A. C. Muñoz's skilful, highly-finished drawing for a fountain, Mr. Clement Remington's excellent designs for a Flemish front and for a Francis I chimney-piece, and Mr. Percy Ash's attractive sketch for a drinking-fountain. Mr. Truscott has a large perspective drawing submitted in competition for the Brooklyn Soldiers' and Sailors' Monument. This is very hastily, almost carelessly, drawn in pencil, with a light wash of color over it, yet the drawing and the designing are full of spirit and very striking.

Mr. Wm. L. Baily sends half-a-dozen careful and very truthful-looking pen and pencil sketches from Switzerland, France, England and Germany, and Mr. L. C. Baker, Jr., as many water-colors from Italy. Even those who are not fond of Mr. Herzog's rather German schemes for decoration cannot fail to be impressed with the marvelous technical skill he displays in his frame of studies for wall-decorations. These drawings are pushed to the farthest possible point, and make the most striking and perhaps healthy contrast to the sketches and impressions around them. An attractive drawing, soft and without the usual forced contrasts of light and shade, is the satisfactory design for a pair of cottages by Messrs. Smith & Pritchett. By all odds the most "important" water-colors in the Exhibition are those of Mr. Nattress. They are done in an extremely English manner, finished to the highest possible point, and yet not at all muddy, as is so apt to be the case with drawings rendered in this way. Besides Mr. Nattress's interior and exterior designs for an oratory at Brompton, England, there are several other water-colors on the walls that are evidently by the same hand, although his name is not to be found on them.

Mr. George C. Mason, Jr., has an interesting group of city houses, and Mr. Mead shows two decidedly mannered but most attractive drawings of country-houses. It is useless to continue any further a description that is rapidly degenerating into a catalogue, but it may be said that, while the Exhibition, after the departure of Mr. Kirby's drawings, will have no one particular feature of interest, it is of fair average merit. As for the exhibition of paintings of which it forms a part, the readers of the daily papers can best judge for themselves, for the *Inquirer* and *Press* of the same date say of it, the one that "While the Exhibition is creditable, it is less so than on many former occasions"; and the other that it is "By all odds the most creditable and notable for many years back."



THE COLOR CHANGES IN NEW YORK BUILDINGS. — MUTATIONS OF STYLE. — HAND *vs.* MACHINE WORK. — THE LATE J. M. WELLS.

I SHOULD like to call the attention of your New York readers and such others as may happen to be in the city, to the radical change in our standards of color, as shown by some of the more notable new buildings, just completed or in process of erection. I refer to the *Times* Building and the Union Trust Company's Building, by Mr. Post, and more particularly to the *Judge* Building, the new hotel for the Goetts' on the corner of 32d Street and Broadway and the new Madison-Square-Garden Building, by McKim, Mead & White.

These buildings and many others, enough certainly to prove a changed tendency of style, are decidedly light in color, almost gay in their pearly grey stone and pale cream-colored brick and terra-cotta.

One need not be very old to remember the first awakening of our architectural and decorative impulses, through the precepts and example of Sir Charles Eastlake. Before that, all was barren for generations until one got back to the Colonial, excepting, perhaps, some features of the Greek revival, not the French Néo-Grec of 1865 to 1870, but the English impulse which belonged, I think in the forties. Eastlake, the style, I mean, was a popular revolt against the prevailing deadness and dreariness, but almost before it was born there were a few choice spirits, with us and in England, who felt it to be but a transition and a palliative, and the influence of Ruskin, Norman Shaw, Morris and the pre-Raphaelites overlaid the more popular prophet of constructive sincerity, and the perceptions of the choicer spirits soon brought in the style that was popularly christened Queen Anne. We are too near, yet, to good Queen Anne to be able to determine its value as a style, or even to explain what was really meant by the term. My own impression is that it means Norman Shaw, with certain Japanese influences and a renewed interest in our own colonial work all blended in a potpourri, more or less successful according to the degree of skill of the perpetrator.

It is easy enough to poke fun at the Queen Anne cottage or palace, but it is true, nevertheless, that we then learned for the first time to study and appreciate our own colonial houses and the more picturesque features of the English and Flemish Renaissance. From this point we have separated and individualized our work, always studying, always drawing from the past some deeper and truer lesson.

Mr. Richardson's earliest work was Gothic, his later work showed the predominating influence of the French Romanesque with certain features of decidedly Spanish tendency, and to my mind the Romanesque or Norman, whatever you may call it, the style that prevailed between the fall of the Roman Empire and the development of the Gothic, pointed-arched style, has the fascination of a period that seems never to have been worked out to its legitimate conclusions, it was stopped short, switched-off as it were into other lines by the discovery of new and attractive principles, more in key probably with the mediæval social fabric. One feels in the Romanesque more than in any other style the consciousness of being able to add to it something entirely new and yet be consequent and logical and to a great degree in keeping with our modern requirements. Other men, hardly of another generation, but still younger men than Mr. Richardson, with greater advantages perhaps of travel and certainly helped on by the clearing away of rubbish that he and others as notable of his age and generation have accomplished, have shown strong and almost exclusive leanings towards the purer Renaissance as a source of their inspiration. What the outcome of it all will be, we can as well leave to be settled by the generations to come, that the outlook is most hopeful, no one I think can doubt, and all we need to do is to earnestly strive to do the best we can.

The point I wish particularly to call attention to, is that the revolution in our ideas of color to which I alluded, is to be attributed to the growing influence upon the minds of our architects, of the purest and best work of the Renaissance, and I do not consider that the fact that all the buildings I have mentioned are not Renaissance, — some as a matter-of-fact are English Norman — invalidates my inference. The influences immediately preceding, call them Queen Anne or what you will, were all in favor of broken or tertiary colors, dull greens predominating, and "pale blacks" as a bright lady of my acquaintance once called the color of her cottage.

Now the Renaissance was essentially optimistic, cheerful, gay in all its conceptions, and contrasted markedly with the ages preceding that were mystic and sombre, and full of weirdness and dim religious obscurities. Is not after all the Renaissance much more in keeping with our civilization of to-day which is sanguine and self-satisfied to an extraordinary degree, convinced of its own advance beyond the achievements of any preceding age and unwilling to turn to any one or anything for precept or example? Is it not much more in keeping with our own social conditions, with the steam-engine, the telegraph, and the electric-light, to choose the brightest and the gayest effects that Nature will afford us and starting with cream color and gold, touch them up where they need accent with vermilion and emerald green? And if this color-scheme is the one that best expresses us, and our times, why not accept it frankly and make the most of it; we have gained from our study of the past and from the refining influences of wider knowledge and broader sympathies, a power of distinguishing shades of color and shades of meaning, that were perceived and felt perhaps by past civilizations, but that have never before our time been so well understood and analysed. Our aim is not to reconstitute any past epoch, but to take from that period the best, as we see it, and adapt it and refine it to our needs. We realize that in a restricted sense, there is nothing new under the sun, and are apt to be pretty severe upon those whose only claim to our attention is novelty, not that we are not eager for the novelty, if we could get it, but that we doubt the possibility of any new principle in art, whilst admitting it in science. We are, therefore, not likely to go far astray, for the keener the perceptions and the more able the individual practitioner of our art, the more likely he is to feel the restrictions imposed by the best efforts of preceding workers in the same field.

I go back, therefore, to the point from which I started and call attention to the latest work done and being done here as likely to

mark an epoch in our historical development and one that has great promise of advance in the right direction.

I noticed in the last *American Architect* but one, the report of a meeting in Boston, of the National Brick Makers' Association, in which the speaker reported speaks of the demand on the part of the architects for the accidental and imperfect results of the brick makers' processes, and which ends with the speaker's saying, "So I expect to get double price for my accidents after this."

There is an element of truth underlying the remarks of Mr. Fiske, the speaker in question, but Mr. Fiske misses the mark when he treats the matter, as he does, in *quasi* jocose fashion, and shrugs his shoulders metaphorically, as though there were no use trying to account for the vagaries of unbalanced and unreasonable creatures who happen to be architects, and advises his hearers to humor them because, after all, they have power in disposing of paying contracts, and because their vagaries, though ordinarily worthless, can be charged at double price. The architect is waging a constant and never-ending war against the lifeless product of the machine. He knows better than his client, and much better than the manufacturer, how much any given piece of work gains by being *hand* made, and how much in addition to that is added to most works of art by the softening and poetizing influences of time and partial decay. It is natural, therefore, for every architect of delicate appreciation to try to discount so far as he can the lack of those agencies which made the work of the past charming and effective. The architect does not want a particular brick because it is an accident, but because the accident has to that extent destroyed the dull and purely mechanical perfection of the machine. The architects, the best at least, will insist on perfection in essential qualities and on freedom in nonessentials. The machine and the unthinking drone will strive for purely mechanical perfection throughout, and the architects will be grateful to those manufacturers, whether of brick or of lamp-shades, who will help them to attain their object—an article perfectly adapted to its practical use, but free from purely machine or reasonless perfections, and having, rarest quality of all, a bit of human individuality woven into its composition if possible.

I cannot close my letter without a few words of reference to the loss we have sustained in the sudden and unexpected death of Mr. Joseph M. Wells. He was not widely known even among the architects and other artists here, although he was an enthusiastic and appreciative musician, as well as a lover of all that was highest and best in art in all its forms. He was almost painfully diffident with strangers or those whose perceptions he felt might jar with his, and his contempt for anything that rang false was absolute and insurmountable. To those, however, who enjoyed his friendship, confidence and esteem, he was a most charming companion and a never-failing source of sympathy and inspiration. To see a man of his exceptional ability, devoted as he was, to the exclusion of all sordid motives, to the highest ideals of his profession, must have been a stimulus of the best sort to the younger men who came within the range of his influence, as it was consoling and fortifying to those more of his own age to meet him and rise with him to the higher planes, whose existence we all recognize, but which grow dim and unreal in the struggle for existence but for the power of the few exceptional ones on whom the cares of every day have less hold, and the devotion to the ideal more.

THE BOSTON BUILDING LAWS.



"All the Modern Improvements."—No. 1.

nough, of Boston, introduced an order which was referred to the Committee on Cities, covering the following points:

To amend the law so as to make the language more definite and precise, and more readily understood by builders; by clearing up all doubts as to the interpretation of the several sections; by limiting still further the height of buildings; by limiting the floor-space of warehouses and mercantile buildings; by prohibiting the constructional use of iron and steel in warehouses and mercantile buildings unless encased in brick or other similar materials, and by defining what is meant by "incombustible materials." Also to provide for the encouragement of the use of deep brick piers instead of iron columns for the outside walls of buildings; by restricting the number and dimensions of openings in external and partition walls; by increasing the thickness of foundations and of external party and partition walls; by restricting the extension and use of party-walls; by limiting the use of tar and gravel roofs; by providing that plaster or other suitable material shall be placed between the floor-boards of floors built of joists and boards in the common manner; by prohibiting or restricting the use of wooden furring on masonry walls; by specifying the requisites for methods of construction not referred to in the law; by increasing the extra thickness required in the case of raising old walls; by restricting the use of soft and light or light hard bricks, and by otherwise providing greater security to inmates, adjoining owners and the public generally against fire, decay and falling walls.

The above order is comprehensive enough to cover every possible suggestion that can be made, and it is understood to have been drawn with that end in view; so that no meritorious proposition submitted at the recommendation of the commission, or of private individuals, or of the Inspector of Buildings, should fail of consideration by the committee by reason of not having been submitted to the Legislature in season. The composition of the committee is a guaranty of judicious action.

We think there is a general feeling that the law should be amended so as to make its provisions clearer, and to remove the many ambiguities which architects and lawyers have found in the Act of 1885, and to provide more effective machinery for the enforcement of its various provisions. The amount of money at the command of the Inspector's department is totally inadequate to insure either a thorough inspection of buildings or a general enforcement of the law; and although the department has been active, particularly in the matter of fire-escapes, and the deputy inspectors do everything that can be expected of them, still innumerable violations of the law go undetected and unpunished.

Besides these changes there is a disposition to regulate the height and floor-space and material of buildings with a view to prevent such disastrous conflagrations as we have lately witnessed.

The public generally will await the action of the Mayor's commission with interest; and it is to be hoped that the members of it will, before reporting, consult not only with builders, owners and architects, but also with those whose special business it is to wrestle in the courts with the legal meaning and effect of the various clauses of our building law.



OLD MATERIALS IN CASES OF REPAIRS.

Question. In case of alterations, more or less extensive, where no special provision is made, can the contractor rightfully absorb, under the *agis* of custom, the old material which he tears down?

Answer. We can safely assert that no custom of the kind suggested would be recognized by a court of law. The whole question would turn upon the actual terms of the contract. If the contract provides for the removal of the old material to some particular spot, or doing anything else with it which would recognize by implication the continuance of the owner's property in it, there would be little doubt that the contractor would not be permitted to claim the material as his own. If, on the other hand, the contract simply specified that the contractor should take down and remove from the premises the old material, we are inclined to think that the necessary implication would be that the material was to be his. The contract, like others, would be construed with the aid of surrounding circumstances and of all additional and collateral facts and agreements which could shed any light upon the problem; but we think that, in the absence of provisions in the contract, or facts outside it indicating a continuance of the owner's rights, the courts would construe the contract as giving to the contractor the property in the material taken away.

In other words, the custom above referred to is in no sense a legal custom, but is simply the necessary meaning of a contract of removal where there is nothing to show that the owner was to retain the property in the material.

A case has arisen in Philadelphia, in the Department of Public Works, where a contractor who had undertaken to remove an old building claimed to include the sidewalk surrounding the structure, and one of his employes who had started to remove the slabs was arrested for larceny. The questions in this case are whether the contract in question included the sidewalk, and then whether there was anything to show that the contractor was to keep the material for the city.

ILLUSTRATIONS

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

INTERIORS FOR HOUSE AT MALDEN, MASS. MESSRS. CHAMBERLIN & WHIDDEN, ARCHITECTS, BOSTON, MASS.

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

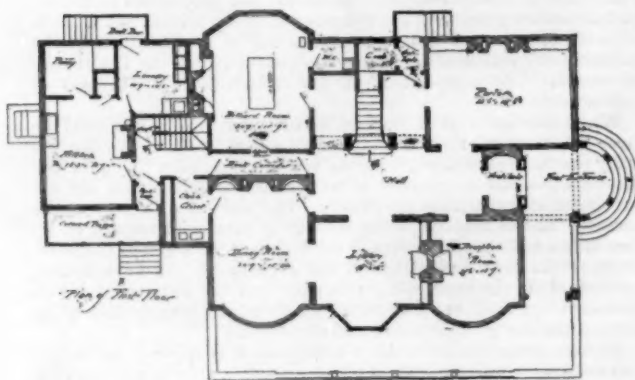
COMPETITIVE DESIGN FOR THE CATHEDRAL OF ST. JOHN THE DIVINE, NEW YORK, N. Y. MR. B. G. GOODHUE, ARCHITECT, NEW YORK, N. Y.

[Issued only with the International and Imperial Editions.]

COMPETITIVE DESIGN FOR THE CATHEDRAL OF ST. JOHN THE DIVINE, NEW YORK, N. Y. MESSRS. CRAM & WENTWORTH, ARCHITECTS, BOSTON, MASS.

[Issued only with the International and Imperial Editions.]

HOUSE AT MALDEN, MASS. MESSRS. CHAMBERLIN & WHIDDEN, ARCHITECTS, BOSTON, MASS.



HIGH SCHOOL BUILDING, LOS ANGELES, CAL. MESSRS. N. PRESTON & SON, LOS ANGELES, CAL.

ROCHESTER ARCHITECTURAL SKETCH CLUB COMPETITIVE DESIGNS FOR RAILROAD-STATIONS.

HOUSE FOR CAPTAIN JESSE FREEMAN, BROOKLINE, MASS. MR. WARREN A. RODMAN, ARCHITECT, BOSTON, MASS.

DESIGN FOR ALICIA SPRINGS HOTEL, PENNFIELD, PA. MR. EBER CULVER, ARCHITECT, WILLIAMSPORT, PA.

THIS hotel which measures 114' x 201', enclosing an open court 36' x 99', is intended to accommodate 200 guests. The 9-foot basement contains besides the cellars a bar-room, bowling-alley, laundry, store-rooms, etc. The first story 12' high, contains the public rooms and offices. Approximate cost \$75,000.

TOWN-HALL, EAST PROVIDENCE, R. I. MESSRS. WM. R. WALKER & SON, ARCHITECTS.

This building, now nearing completion, has been erected at an expense of about \$50,000. The first story is of body brick, with brownstone trimmings, resting on an underpinning of cut granite. The second story is framed and covered with California red-wood shingles and the roof slated with Brownville black slate. The interior is finished in cherry and the walls and ceilings are decorated in water-color. The large hall on second floor finishes up into the roof showing the framework and construction thereof.

[Additional Illustrations in the International Edition.]

RESIDENCE OF THE VICEROY IN FORMER TIMES, SANTIAGO, CHILI.

[Gelatin Print.]

CONGRESS HALL AND CHAMBER OF DEPUTIES, SANTIAGO, CHILI.

[Gelatin Print.]

CAWDOR CASTLE, NAIRN, SCOTLAND.¹

"It is a matter curious, and not in itself unpleasant, that the principal places noted in the great tragedy of Macbeth should still

¹ It should always be kept in mind that these illustrations from the "Baronial and Ecclesiastical Antiquities of Scotland," (1845) by R. W. Billings, are republished very largely for the sake of giving instruction in one manner of the rendering of architectural drawings.

present two remarkable baronial edifices—the huge, tall, isolated pile of Glamis, and the grim keep of Cawdor, surrounded by its rambling, irregular, half-fortified outworks. Their true association, however, is more with the days of Shakspeare than those of Macbeth. Perhaps some part of the great tower of Glamis may be as old as the thirteenth century, but no portion of Cawdor is older than the fifteenth; and though its threatening draw-bridge, its vaults, and its dark corridors, may aptly associate themselves with the 'I have done the deed;—didst thou not hear a noise?' yet the time when they were built was more distant from the days of Macbeth on one side, than from those of Queen Victoria on the other. Indeed, had we an actual building of Macbeth's day in Scotland, it would not be invested with so much tragic gloom, nor could it so appropriately associate itself with deeds of horror; for it would probably be made of wicker-ware or slight timber, and be in all respects unfit to represent the proper stage-properties of a tyrant's stronghold, and the scene of a royal murder. Yet not many years ago scepticism was put to utter shame at Cawdor, by being shown the identical four-posted bed in which the murder was committed, of a fashion so old that no respectable upholsterer of the nineteenth century, even in Inverness or Forres, would have tamely submitted to the scandal of having constructed it. The room, and the bed within it, were both burned by an accidental fire in the year 1815; but it is somewhat contrary to the usual course of such traditional identifications, that a mere accident should deprive the visitor, especially the native of London, of so very interesting an exhibition; and it may be hoped that the noble owner of the castle may yet restore the room where Duncan was murdered, and fit it up appropriately with a few tattered tartans, and a broadsword or two, from the decayed accoutrements of a Highland regiment.

"Cawdor has, however, apart from its purely nominal association with Macbeth, some little mysteries of its own. In one of the dungeons stands a hawthorn tree, stretching from the floor to the roof,—an instance of the durability of that stubborn shrub, since the castle must have been built over it. So eccentric a circumstance of course elicited a tradition to account for it, which may be best described in the words of Mr. Carruthers of Inverness:—

"The Thane who founded the castle is said to have consulted a seer as to the site of his intended building. The wise man counselled him to load an ass with the iron chest full of the gold he had amassed to erect his castle with, and to build it wherever the ass should first halt. The ass stopped at the third hawthorn tree. The advice was followed; the castle was built around the tree, enclosing the precious stem; and here it still remains, many a generation having pledged to the toast of 'Freshness to the Hawthorn tree of Cawdor Castle.' The *dungeon* is about ten feet in height, and the tree reaches to the top. There is no doubt that the walls must have been built around it. An old iron chest lies beside the tree, which is said to have borne the precious burden of gold. Two other ancient hawthorn trees grew within a few score yards, in a line with the castle—one in the garden, which fell about forty years since, and the other at the entrance to the castle, which was blown down after a gradual decay, in 1836. Some suckers are now springing from the venerable root, and are carefully enclosed by a wooden fence."

"From the same picturesque pen, we quote the following description of part of the interior of the castle, supposed to have been built soon after the commencement of the sixteenth century, venturing on no antiquarian commentary of our own:

"In one of the apartments of this new erection is a carved stone chimney-piece, containing the family arms, and several grotesque figures,—among which are a cat playing the fiddle, a monkey blowing a horn, a mermaid playing the harp, a huntsman with hounds pursuing a hare, etc. One of these rude representations is that of a fox smoking a tobacco-pipe. On the stone is engraved the date 1510, at which time that wing of the castle, as we have mentioned, was erected. Now it is generally believed that tobacco was first introduced into this country by Sir Walter Raleigh, about the year 1585; and it is singular to find the common short tobacco-pipe thus represented on a stone bearing date 1510. There can be no mistake as to the date, or the nature of the representation. The fox holds the 'fragrant tube' in his mouth, exactly as it is held by its human admirers; and the instrument is such as may be seen every day with those who patronize the 'cutty pipe.'"

ENTRANCE TO CAWDOR CASTLE, NAIRN, SCOTLAND.¹

THE HALL, HOLCOMBE, CHATHAM, ENG. MR. JOHN BELCHER, ARCHITECT.

THE HALL, HOLCOMBE, CHATHAM, ENG., SOUTHWEST VIEW. MR. JOHN BELCHER, ARCHITECT.

THE RAILWAY TAVERN, GRIMSBY, ENG. MR. FAREBROTHER, F. R. I. B. A., ARCHITECT.

THESE buildings, which are approaching completion, are near to the M. S. & L. Railway and the Docks Station, and occupy a prominent corner site at the junction of Cleethorpe Road with Railway Street, and provide every accommodation for a modern family

¹ Carruthers' Highland Note-Book, p. 154.

and commercial hotel. The materials employed are red stock bricks, with Ancaster and blue Idle stone dressings and strings, the roofs being covered with green Westmoreland slates.

CLEE PARK HOTEL, GRIMSBY, ENG. MR. E. W. FAREBROTHER, F. R. I. B. A., ARCHITECT.

This building, which has commanding frontages to Cleethorpe Road and Park Street, is being erected by Messrs. J. M. Thompson & Sons, contractors, Louth, and contains every modern improvement in arrangement and fittings. The materials employed are thin red stock bricks, Ancaster and Idle stone dressings and strings. The corner turret forms a ventilation shaft, and is covered with copper, and the roofs with green Westmoreland slates. In addition to the hotel a hostler's house and commodious stabling are provided.

BUSINESS PREMISES, HOLLOWAY, LONDON, ENG. MR. FREDERICK WALLEN, ARCHITECT.

THESE buildings occupy the site of Nos. 368, 370 and 372 Holloway Road, and 2 Tollington Road, with land at the rear. The corner shop is occupied by a jeweller, and the remainder of the premises for the business of a confectioner and a restaurant, dining-rooms, etc. There is on the first floor a banquetting-hall, extending the height of two stories, about 40 feet long by 30 feet wide, covered in one span, and lighted by two ranges of traceried windows, with a lofty dado and gallery of oak and pitch-pine. Over this at the rear is a bakery and pastry-making room, but the principal bakery is in the three-story building at the rear, not shown in the view, in which also the electric-light engines are placed. All the most modern appliances, including ovens and heating apparatus, for the business are in course of erection. The buildings are fireproof. The facings are in red brick and Doulton stone, with some mosaic-work introduced, the shop-front pilasters being in glazed faience. The total cost, including electric-lighting, ovens, heating, etc., will be about £20,000.



[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.]

ELECTRIC RAILWAYS.

ST. JOSEPH, MO., February 6, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs,—Referring to a clipping from the *Electrical Review* published in your issue of January 25, and purporting to be a list of electric railways now in operation in this country, I beg to state that the compiler thereof must have been singularly ill-informed as he makes no mention whatever of this city—St. Joseph—which was one of the pioneers in the introduction of this means of transportation. The omission is the more remarkable from the fact that more miles are in operation here than in any city named in the list, there being five lines with a total mileage of 34½ and employing about 100 cars.

As the article did not emanate from you, it is not incumbent upon you to note the correction; but I thought proper to lay the information before you.

Very respectfully,

JOHN I. McDONALD.

THE CLERK-OF-THE-WORKS.

CHICAGO, ILL., February 5, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs,—I am glad to take time to answer the request made in your last issue for opinions on the subject of "Clerk-of-the-Works," for I believe this to be the most important question which is now receiving the consideration of our profession. There is a growing opinion among owners of buildings, as well as architects, that, as a general rule, buildings do not receive as much superintendence as they ought to have. On the part of the architects, it will be fair to state that a building usually receives all the superintendence that the owner pays for. This brings us to two questions: First, Is it worth while for the owner to pay for more superintendence than is usually given? Second, In what manner shall the additional superintendence, if any, be given? I have noticed a disposition among those who erect important buildings in this city to secure an extra amount of superintendence, for which they are willing to pay. In one case which came under my observation, the architect was paid an extra sum above the usual five per cent for giving a large share of his personal attention to a certain building. In another instance, the owner paid a large sum to a superintendent who had had special experience in the kind of building which he was erecting.

This subject has been brought to my attention recently by the proposition of an owner to employ a superintendent to give his whole time to one building. This set me to thinking whether it would be advisable to have a clerk-of-the-works who should be paid

by the owner independently of the architect's commission, and, therefore, who would be less completely under the control of the architect than if the superintendence was all included as a part of the architect's work. My conclusion in the matter was that the employment of a separate clerk-of-the-works would be very unwise. If such a man looks to the owner rather than to the architect for his pay, it would be very natural that he should take pains to show the owner that he is earning his salary; therefore, he would call the attention of the owner to all defects he could discover in the architect's plans, and say: "If it had not been for me, these mistakes would have been carried out in the building." In this way a clerk-of-the-works could cause unjust blame to be attached to the architect. There are often details of construction or design which are purposely left to the superintendent, because they can be settled at the building better than on the drawings. The superintendent who goes from the architect's office understands this, and sees that the work is carried out in a proper manner. A clerk-of-the-works who is paid independently by the owner cannot be completely under the control of the architect, whatever stipulations may be made in the agreement to the contrary, and he will be placed in a position to misrepresent the architect's plans if he has personal ends to gain by so doing. For this and other reasons, I am convinced that the best policy is for architects to increase their charges to a sum sufficient to cover all the superintendence a building may need. If an architect receives five per cent for a \$10,000 house, the one and one-half per cent which is expected to cover the superintendence will not pay the salary for a special superintendent for that building; but if the building is to cost \$200,000, the architect can well afford out of his commissions to pay the salary of a superintendent who shall give special attention to that building, and give his whole time at such periods in the construction as require constant supervision. Cheaper buildings do not require such constant supervision, and in many cases the owners cannot afford to pay for it, however desirable it might be. If additional superintendence is needed for a small building, the architect should ask an increased compensation for it.

It is not an uncommon question for an owner (usually one who is about to build a small dwelling) to say: "Now, when you superintend, how often do you propose to visit my house—once a day?" This sort of a proposition is usually so alarming that I fall back upon the code of the Institute, and point out to the ambitious owner the clause that says: "The supervision or superintendence of an architect (as distinguished from the continuous personal superintendence which can be secured from the employment of a clerk-of-the-works) means such inspection by the architect or his deputy, etc."

I have never found this explanation very satisfactory to the owner or to myself. After persuading an owner that it is for his interest that the architect should superintend his building, it does not give a good impression to begin immediately to explain that this does not mean that we are to visit the building very often, but only in a very general way look after the progress of the work. It would be much more satisfactory to say to the owner: "If you pay us our regular commission, we will give your building all the superintendence it requires, and you need give yourself no anxiety concerning the execution of the work; the number of visits will depend upon the importance of the work and its particular stage of progress, but we give in each case all the supervision the nature of the work demands."

In reference to the contract between owner and architect, there is as much reason for reducing this to writing as with the contract between the owner and the builder. If we took as great pains in drawing up an agreement between ourselves and our client as we do in making the contracts between our clients and the various contractors, we would avoid almost entirely the misunderstandings and consequent law-suits that are a damage to our profession. An official form of contract between architect and owner would be of great value, for the reason that many an owner who would object to signing certain agreements if presented to him as peculiar to one office would not hesitate to sign the same agreements when told that it was the form endorsed by the American Institute of Architects and adopted by the leading members of the profession.

Respectfully,

NORMAND S. PATTON.

TO FIND THE NEUTRAL AXIS.

MONTCLAIR, N. J., February 3, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs,—I am trying to study "Safe Building" from your paper. I have got a problem now that brings me to a stop. It is this: In the enclosed figure it gives the "neutral axis" *L G*, but I do not know how to find it. If you or Mr. L. D. C. Berg will explain, you will greatly help a lad of sixteen.

STUDENT.

[On page 7 of "Safe Building," Vol. I, will be found the rule for obtaining the neutral axis of any figure.—EDS. AMERICAN ARCHITECT.]



AN AMERICAN ELEVATOR IN STOCKHOLM.—One of the most prominent objects of interest in the city of Stockholm is a passenger-elevator constructed on American principles, by a Brooklyn firm, and designed to raise passengers from a square in the centre of the city to the level

of an elevated section of the place, known as the Stadsgården. The enterprise, which was opened to the public in March, 1883, was the device of Captain K. Lindmark. The ground required was given by the city, which also guaranteed that no one except the municipality should be allowed to construct a similar structure within a distance of 500 feet. The right was reserved to purchase the elevator with all its machinery, at the end of twenty years, for a sum not exceeding the cost of construction. The machinery for the elevator was constructed on the hydro-pneumatic system invented by George Johnson and was supplied by Weeks & Halsey, of Brooklyn. The total height of the lift is 115 feet, the greatest speed is 2.5 feet per second, and the time occupied for the whole ascent forty-five seconds. There are two cages capable of containing eleven passengers beside the conductor. The greatest number of passengers recorded has been 11,000 in a day of fifteen working hours. The cages are driven by two steel wire cables working independently of each other and are balanced by counter-weights in the elevator tower. The cables are .7 inches in diameter and contain six strands; each strand has eight wires grouped around a central strand, composed of four wires 1 mm. in diameter. The breaking weight of each cable is at least eleven tons. A cable lasts from fourteen to sixteen months. The machinery consists of a double air-compressor driven by a double-cylinder non-condensing steam-engine. The diameter of the steam cylinders and of the compressor is one foot; the stroke is fourteen inches. The steam-pressure is about sixty pounds per square inch. The consumption of coal has averaged less than a ton per day of fifteen working hours. The level footway from the top of the elevator tower is 498 feet long. It is constructed of lattice girders, and has four spans, the largest of which extends over houses and measures 275 feet. The total weight of ironwork in the footway is 212 tons. The weight of passengers was computed at seventy-five pounds per square foot, and the coefficient of safety was taken at five. The maximum wind-pressure was reckoned at thirty-one pounds per square foot of vertical surface, but twice that amount of strain was allowed for. Everything seems to have been conducted with an ample margin for safety, for the records of the Meteorological Institute at Stockholm show no wind-pressures in excess of eighteen pounds per square foot, and only 500 persons are allowed upon the footway at a time, although there is room for five times that number. The cost of the whole undertaking was 9566 pounds sterling and the working expenses for the year 1885 were 1816 pounds sterling. The traffic that year amounted to 1,667,000 or 4570 per day. — *Providence Journal*.

A MYSTERIOUS COUNT AND HIS MACHINE.—The visit of a certain French Count to London has given us much to think of beyond the limits of the disease, both mental and bodily, by which we have been assailed. This Count P.—who, strange to say, seeks no publicity—is one of the most learned men of the century. His studies have been followed in participation with the experiments of the great experimentalist, the late Ruhmkorff. The latter was generous enough to own that it was under the direction of Count P. that he accomplished most of his greatest inventions. The wondrous reel invented by the Count is still considered the most marvellous conquest of science. Upon this reel is wound a length of silver wire measuring 75,000 metres. Two magnetic needles crossing each other in a contrary direction are fixed upon the reel, and suspended by a slender thread. The apparatus works under glass like a watch, so that no tampering with the mechanism is possible. It is mounted, moreover, on a high stand. The Count takes hold of the two conductors, to which are attached the two ends of the silver thread rolled upon the reel, and bids you order the machine to move to right or left, according to your will. Under this power alone, hitherto misunderstood or underrated—this, the mightiest power in the universe, according to Count P., the power of the human will—the machine will act without the contact of touch. To right or to left will the reel revolve according to the fancy of the visitor. Without speech, without touch, by the mere mental influence alone, will the machine move in obedience to the unexpressed command. But not in all cases does the machine answer unreservedly. It is to the powerful will alone—the concentrated and fixed determination—that it can be made to reply. Ruhmkorff used to laugh immoderately at the vacillating movement of Count P.'s machine when the savants of the Académie were induced to try the experiment. With some the wire would tremble and vibrate, then start to one side, then move towards the other; while with others it would refuse to move at all, but confine its trembling vibration to one spot. The experiments made by Count P. in London have all been exhibited strictly in private. His object in coming here is merely to obtain wire more finely spun than any he has hitherto been able to get in Paris. They say that, contrary to the general rule, the Count, from having been all his life a confirmed materialist, has been converted to the highest degree of religious faith, to conviction of the lofty destinies of man and his connection with the divinity; man has abused his gifts and delivered himself to evil, but the divine essence is still within him. So fearful has the philosopher been of the pursuit of the fashionable co-teries who under pretext of scientific inquiry merely seek to derive amusement from the most serious experiments in science, that he has sought a retreat in a convent near London, and his excuse of being compelled to return thither by eight o'clock is made to reply to all invitations to dinner, or to "select parties," or to "small-and-earlies" with which the fine ladies of London would seek to overwhelm him.—*Birmingham Post's London Correspondence*.

A NEW YUCATAN EXPLORING EXPEDITION.—An important scientific exploration is to be made of the less known parts of Yucatan and Mexico, regions which have not hitherto been scientifically explored, except so far as archaeology is concerned. It is the object of the expedition to ascertain, as a continuation of former explorations in Florida, the general structure of the basin of the Gulf of Mexico, concerning which there is much diversity of opinion among scientists. The exploration will comprise, besides the geological examination of the region, a close examination of its zoology and botany, towards which end specialists

in various departments of science will accompany the expedition. The exploring party will be under the leadership of Prof. Angelo Heilprin, of the Academy of Natural Sciences, and will devote special attention to geology and paleontology. The expedition will leave New York by steamer on the 15th instant, stopping first at Progreso, Yucatan, whence the research will extend into the interior of that State. The expedition is organized under the auspices of the Academy of Natural Sciences, which has received the co-operation of its individual members, and also of the American Philosophical Society. — *New York Evening Post*.

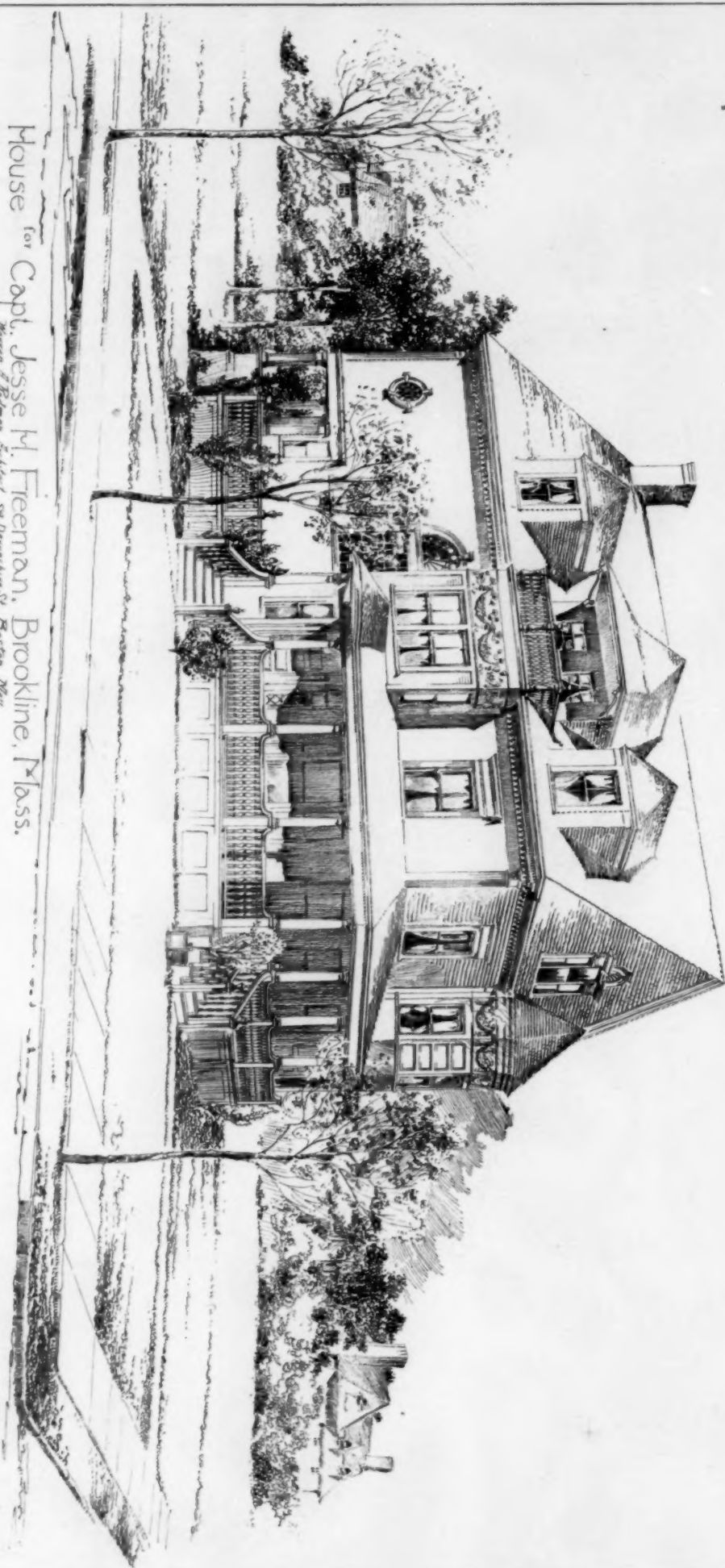
TRADE SURVEYS

A SUMMARY of the new commercial, manufacturing and building enterprises announced since the opening of the year, so far as it has been possible to make it, shows that the increase in activity over the month of January last year amounts to from 10 to 15 per cent. Fuller reports, were they available, might increase or decrease this approximation; but it is evident that the business interests of this country have started in under a stronger head of steam, so to speak, than last year; no doubt the possibilities of a reaction or depression are kept in view by all. The advancing cost of raw material has not been deemed a sufficient cause for restricted activity. In fact, the improving prices have rather stimulated than retarded new work. Buyers of all kinds of raw material are still placing contracts for future delivery. This statement is made upon the authority of those competent to speak on such a matter among iron-makers, lumber manufacturers, machinery-makers, and the manufacturers of all kinds of equipments and supplies. The testimony of the jobbing interests in our larger cities, while not so strong, is yet of the same character, viz., that the country is preparing for a heavier production and consumption. The New York jobbing interests report a very heavy and steady distribution of all lines of goods handled. The orders for the fall trade, usually placed about this period, are fully as heavy as they ever have been. Distributors are rather anxious to place their orders, especially when assured that the prices named are to be the prices paid. Manufacturers in nearly all lines are entering into heavy and long engagements for products at fixed prices. They are pursuing this policy in the face of this danger, viz., that should an extraordinary demand set in two or three months later, the prices of all kinds of crude and finished products would presumably advance. These interests are protecting themselves against such a catastrophe by the above-mentioned policy of placing their orders for raw material now, and under such conditions as will insure their execution. An enumeration of the new enterprises of sufficient magnitude for specific notice would be quite interesting reading. Among these new enterprises are one; and possibly two, well-equipped ship-yards, three large rolling-mills, several blast-furnaces, projected bridge-work, involving an immense amount of capital safely to be estimated anywhere between twelve and fifteen million dollars, projected elevated railroad-work roughly estimated by engineers at twenty million dollars. The purpose of referring to these few lines of projected work is to emphasize the probability of an advance in certain kinds of raw material. Builders, whose judgment it is safe to rely upon, have very recently made contracts for supplies to carry them several months ahead in view of this very fact. At the same time, this possible advance in prices may not occur, and for the reason that never in our history were so extraordinary efforts being made to increase the supply of material of all kinds for construction work. Producers are quick to adapt themselves to most unexpected requirements.

The makers of machinery, especially, are being crowded with work as they never were. Machinery for making machinery is wanted upon a very large scale. A few years ago, a 1,000-horse-power Corliss engine was the wonder of the world; the other day an engine-builder received an order for an engine of 3,500 horse-power. The rush for machinery, big and little, has not only stimulated the demand for the necessary raw material, but it has resulted in the projection of many new machinery-making establishments. This extraordinary prosperity rests upon a stronger foundation because like conditions prevail in foreign countries. The character of this improvement can be best observed by reference to iron and steel prices abroad. Steel rails have advanced in England within a year from a little under four pounds to seven pounds per ton; iron plates, from five and a half pounds to eight; steel plates, from six and a fourth pounds to nine; steam-coal has advanced from six and a quarter shillings to twelve shillings; blast-furnace coke from twelve shillings to thirty shillings. The foreign ship-builders have under contract all the work they can do for six months. Such a rapid advance may not be a permanent one, but there will be no return to the extremely low prices of former years. On the Continent a corresponding advance has taken place, and the advance is likely to prove a permanent one, for the reason that both government and private requirements have suddenly grown to unusual proportions. Prices on this side have also advanced, but within narrower limits. American manufacturers are now questioning the possibility of the permanence even of the ten to twenty per cent improvement that has been made. The point which the now vast producing interests on both continents have to keep in mind is, to control their expansion. Markets cannot suddenly absorb increasing outputs. A healthy trade is the result of a number of agencies and conditions. The extent of our railway system and the cheapness of travel are a strong protection against those disasters which have left their mark upon our industrial history. From twenty to fifty years ago, people could not move freely or cheaply from place to place; the slightest depression or overcrowding of one industry or one market is the signal for a scattering of the surplus humanity, energy and capital, and the railroads automatically tap the evil and precipitate the unemployed surplus where it will find employment and create new markets. This is a question which banking interests have studied with more care and acuteness than the manufacturing or smaller business interests. The careful study of this problem has led these heavier and farther-seeing interests into schemes for the development of newer sections of country, which are now employing a great deal of capital. The inevitable expansion of land values in these new sections is one of these foreseen things. In years past, the bulk of railroad investments were made for immediate returns. There is more light now spread upon the science of investments, and capitalists are now measuring their investments by ten or twenty year possibilities. For this reason, the business interests of the country are less susceptible to ups and downs. Far-off results are now kept in view.

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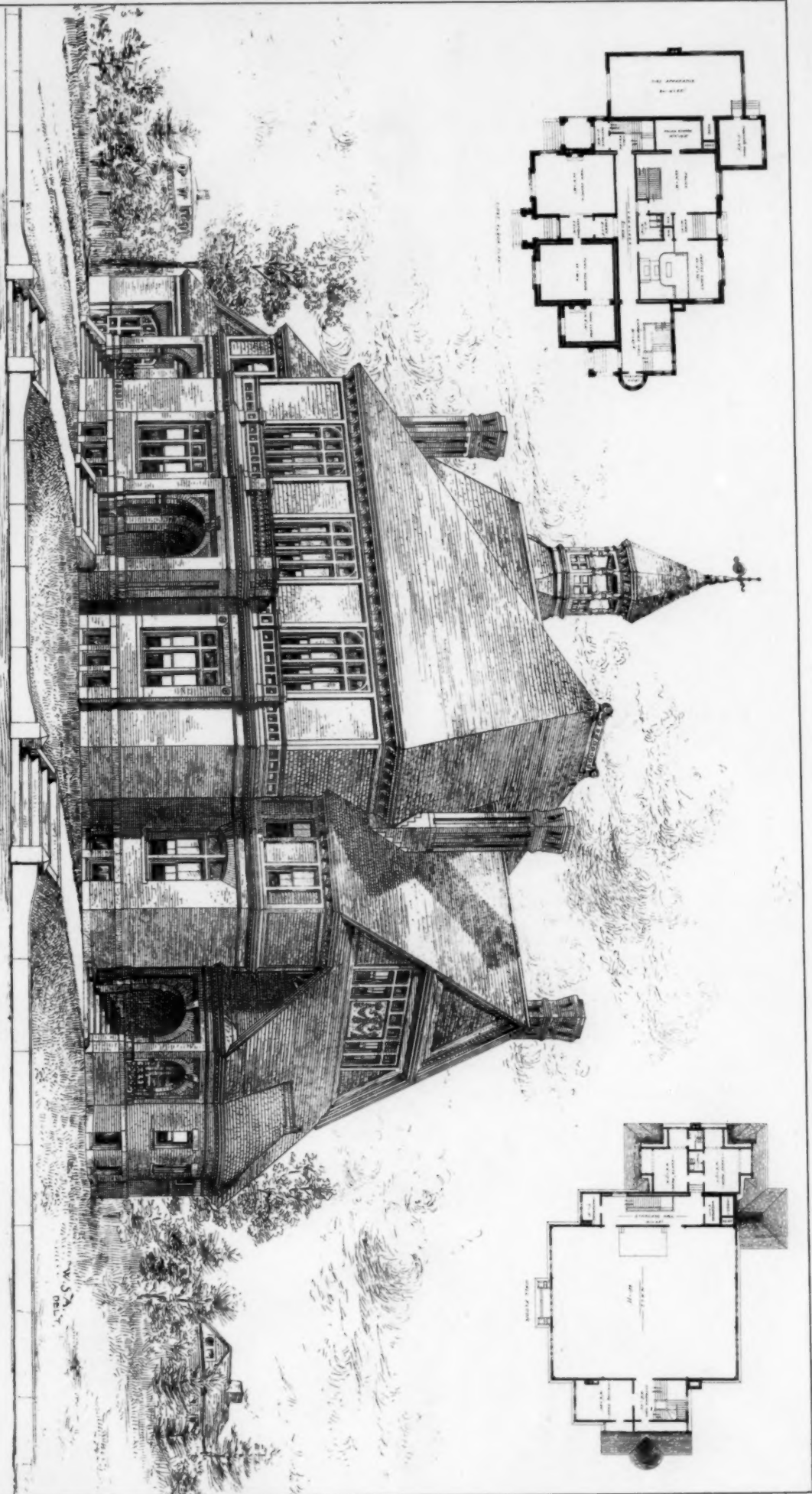
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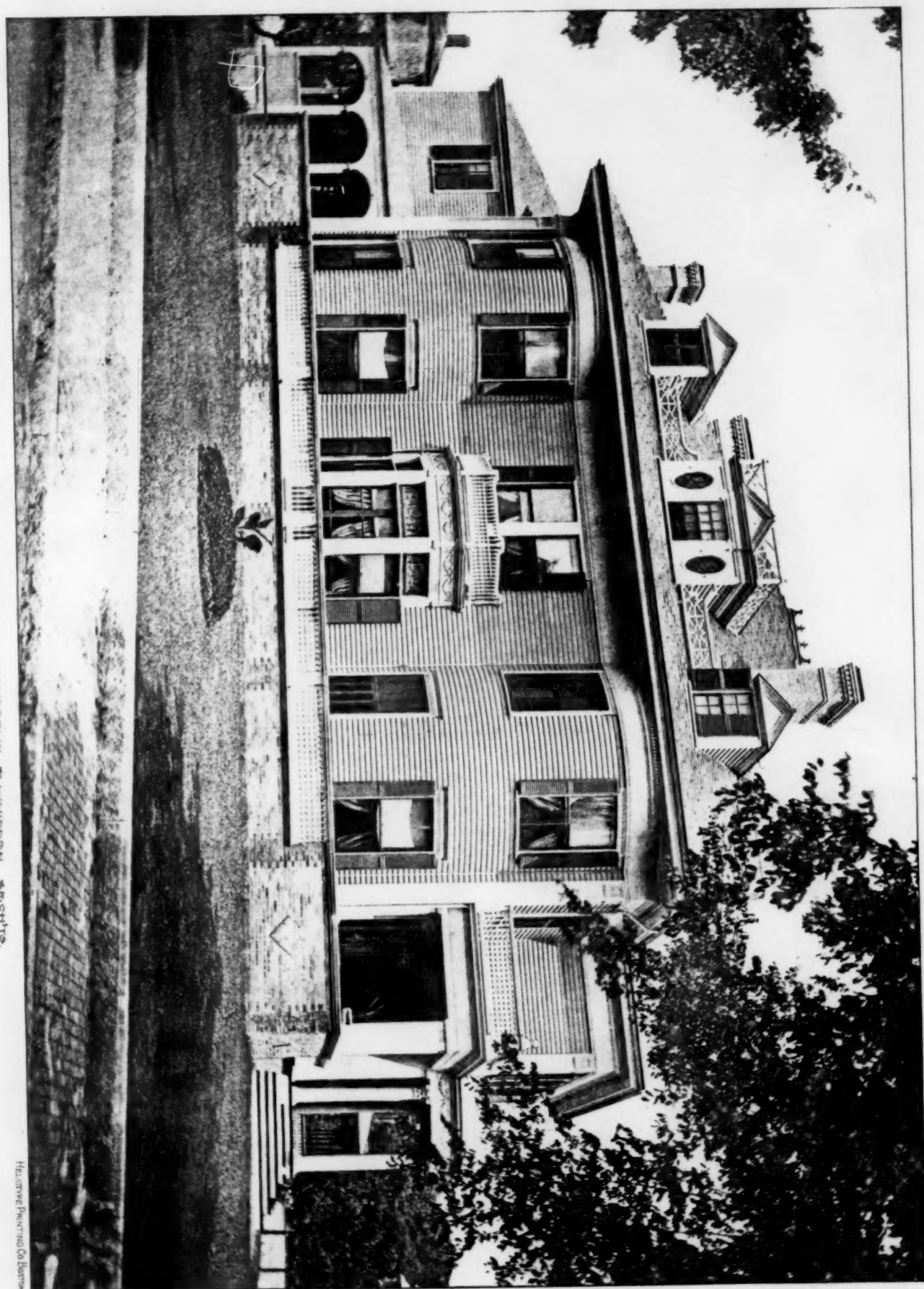


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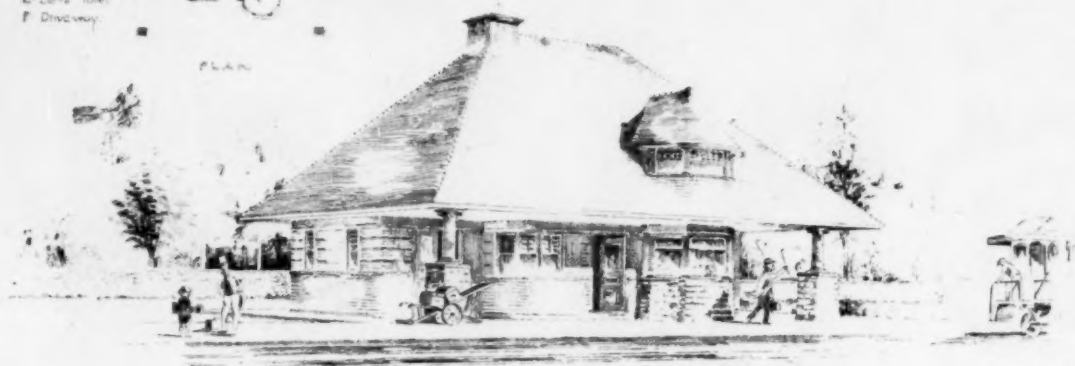
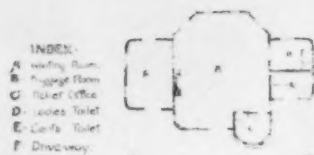




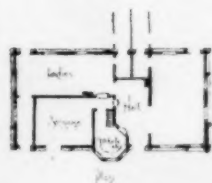
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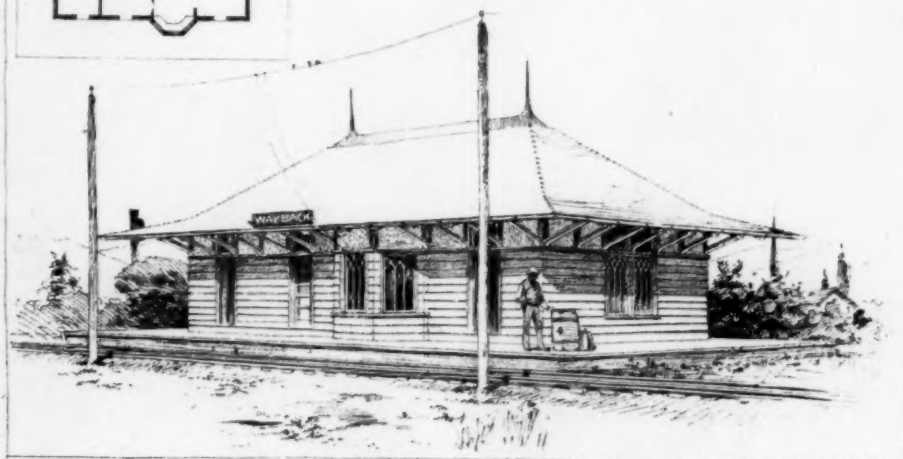
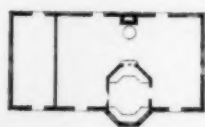


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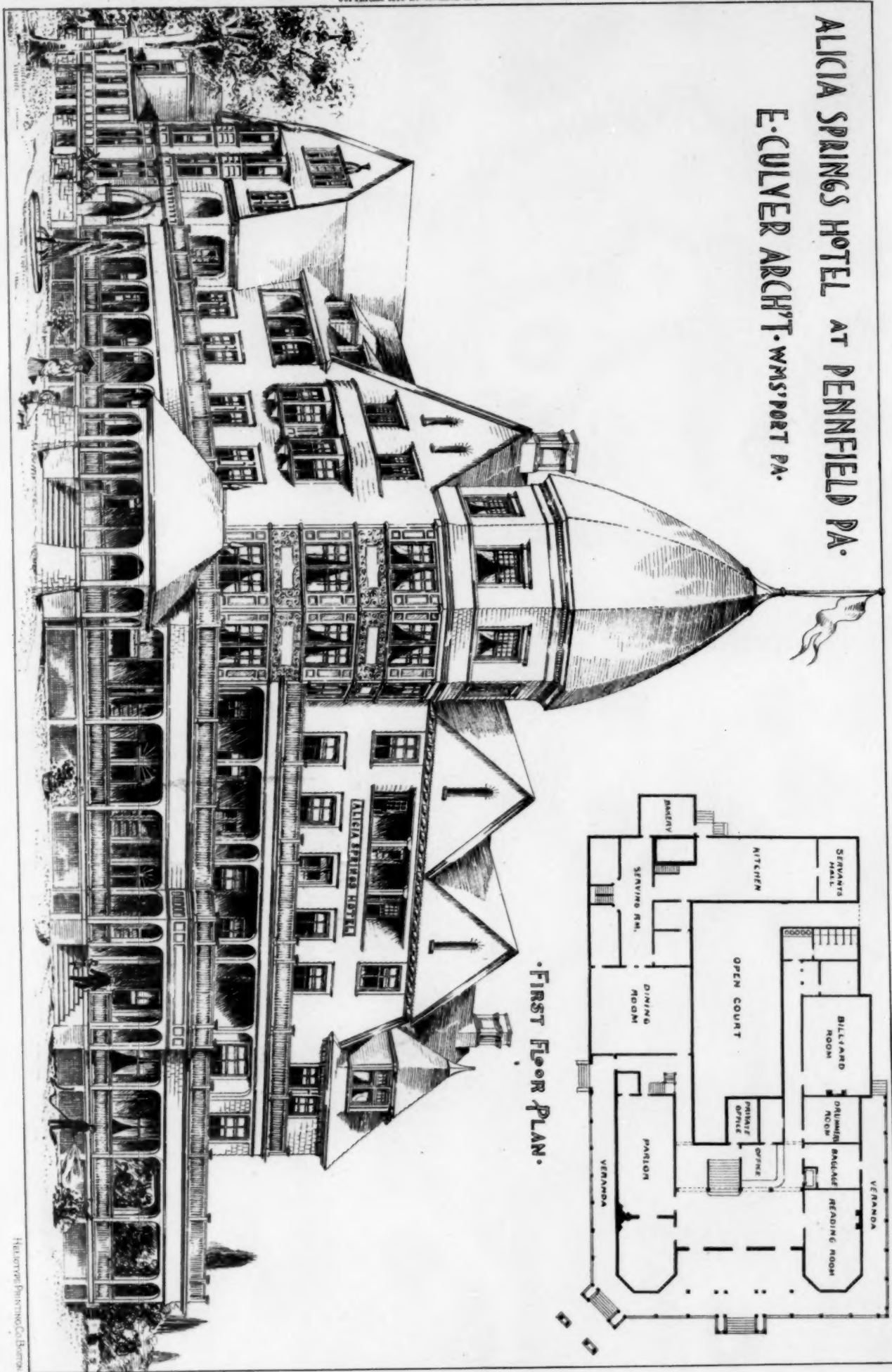
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