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CONTENTS.

ARCHITECTS and owners of real-estate should take to heart the discussions which have been going on for some days past among the officers of insurance companies, in relation to the proper rates of insurance for fireproof buildings of the modern kind. It will be remembered that, a few months ago, reductions were made in the rates of premium on certain classes of buildings in New York. This reduction led to a demand for reductions on other classes of buildings, and to a certain demoralization in rates generally, which, as usual in such cases, resulted in competition among the companies for policies on the best sort of risks. Such risks, apparently, they consider to be presented by the great fireproof office-buildings, and premium rates on these have fallen to a point almost unheard of in this country. One company is said to have offered to write a policy for a million dollars on the Clearing-House building for five years, for five hundred dollars. This is one cent per year on each one hundred dollars of insurance, and the Clearing House is situated in the middle of a block, on a narrow street, and surrounded by old buildings, so that it is by no means the best risk of its kind. The manager of another insurance company is reported to have said that, "If we wrote fireproof buildings for nothing we should lose but little. Total destruction of the steel-constructed office-buildings of this city is practically an impossibility." Considering how short a time has elapsed since the insurance companies found little or nothing to commend in steel-constructed office-buildings, professing to regard them as exposed to frightful but mysterious hazards, from which ordinary structures were exempt, it is with a certain astonishment that we read these new deliverances; but the fact appears to remain that steel-constructed buildings of the sort that American architects have learned to design and carry out can now be insured, with their contents, at a rate which makes it for the interest of owners to erect them. The tendency in all our cities is toward the concentration of masses of goods in warehouses, so that a building costing a hundred thousand dollars may contain a million dollars' worth of merchandise. Supposing the insurance on the merchandise, if stored in an ordinary building, to be one per cent a year, and if stored in a fireproof building, to be one-tenth of one per cent, which would still be ten times as great as the Clearing-House rate, the saving to the owner of the goods, by having them placed in the fireproof building, would be nine thousand dollars a year. If the owner of the goods were also the owner of the building, this saving, added to that on the insurance on the building itself, would pay the interest on the extra cost of fireproof construction over that of the ordinary kind about ten times over; while, even if the owner of the building had no interest in the goods, the owner of the latter would be glad to pay a part of the saving in his insurance in the shape of an extra rent, which would abundantly compensate the proprietor of the building for his extra outlay.

CONTRACTS, to the amount of half a million dollars, are said to have been awarded in Boston for what is perhaps the most peculiar railway-station in the world. The New York, New Haven & Hartford Railroad, having occasion to build a large station in the residential part of the city, a mile or more from the terminus, instead of purchasing land for this purpose beside the tracks in order that the latter might receive light from the sky, conceived the economical idea of placing the station-rooms over the tracks; and it is this frugal scheme which is now to be carried out. Of course, every one has seen small suburban stations arranged on bridges over railroad tracks, and, where the bridge is not more than thirty or forty feet wide, there is no serious objection to such an arrangement, as light and air are only cut off over a small space; but the Back Bay Station in Boston, with its approaches, is, according to the published plans, to cover entirely a space eight hundred feet long, or more, wide enough to accommodate four tracks, with platforms between them, and only fifteen or sixteen feet high, the height being limited by the fact that it is intended to drive into it at each end from existing streets, and the grade of these streets is already fixed at such a level as to give only just sufficient room for the passage of trains under the bridges by which they are carried over the tracks. It is obvious that the light entering at the ends of the lower story of the station, in which are the tracks and platforms, will be practically nothing, especially as lofty buildings line the railroad location beyond the bridges; and, as the whole width of the railroad location is covered by the station, no light can be counted upon from the sides, so that there is, apparently, no way of lighting or ventilating the track-room except through the upper station. In the published plans, no provision whatever was shown for openings through the upper station for this purpose, and, although it is fair to presume that further study has enabled the designers to save room enough for some sort of ventilation, the station promises to be anything but a cheerful place.

WE recommend to the earnest attention of a certain sort of auctioneers and real-estate brokers a decision lately made by a German court. A certain person, named A, sold a piece of ground to B, taking in payment a mortgage. He hesitated about accepting the mortgage as payment, but C, in whom he had confidence, assured him that it was safe and good, and offered to guarantee it. A, therefore, concluded the bargain. The mortgage turned out to be worthless. B being, apparently, financially irresponsible, A called upon C to make good his loss, and the court held that he was entitled to do so, and that C must pay. Some general observations were made, in connection with the decision, which indicate that German jurisprudence is far more strict than ours in dealing with such cases, it being declared that if a person gives advice to another in regard to subjects about which he knows nothing he must pay for loss caused by following his advice; and that one asked to advise upon a matter concerning which he knows both bad and good things is responsible, if he mentions the good things without also speaking of the bad ones.

THE Annual Report of the President of the National Sculpture Society shows a considerable increase in professional membership during the year, together with a praiseworthy devotion to the duties which the Society has undertaken. Through its official position, it exercises a very great influence upon public art in New York, and it has been several times called upon during the year to pronounce, through its President, or through a committee, its judgment in public matters. The present year finds it better prepared than ever to perform this important service. As we have before mentioned, it has, in addition, undertaken the task of collecting a comprehensive series of photographs of American sculpture, for permanent record, as well as for temporary exhibition.

A FEW weeks ago we commented on a very interesting paper read before the Engineers' Club of Philadelphia, which purported to give an explanation of the various Keely motors and the force by which they were operated, an

explanation which was quite in agreement with our own expectations based upon earlier accounts of Mr. Keely's "claims." Our own comments have resulted in bringing about an interview with several gentlemen of this city who have seen Mr. Keely and his inventions, not only once but several times, and have seen his "vibrodyne" or motor dismantled and put together before their eyes, handling the several parts with perfect freedom and asking and receiving explanation at all points. More than this, they have seen the allegedly "hollow wire," have seen it cut and found it solid. Besides this, Mr. Collier, Mr. Keely's patent lawyer, who has full knowledge of the essence of Mr. Keely's invention — which, with a very complete set of exquisite drawings and full calculations, will enable him to complete the motor in case of the inventor's death — declares that at his invitation, since the reading of the paper on which we based our comments, more than fifty gentlemen of attainment have also seen the experiments, seen the machine dismantled and the wire cut. Amongst these he mentions the vice-president of the Engineers' Club, the electrical engineer of the Edison Company, and the general manager of the Novelty Electric Works, while the editor of *Engineering News* had earlier made independent examinations. It is fair to say, however, that although explanations were fully and frankly given, yet no one seems really to have understood them, owing to what Mr. Lascelles Scott — Mrs. Moore's English expert who reported so favorably — calls Mr. Keely's "hopelessly obscure language." We are far from disbelieving in the possibility of discovering a new motive force, or asserting that Mr. Keely may not have discovered one, but if he has, and there certainly seems to be more evidence that he has than we had been disposed to believe possible, it is very regrettable that his operations have had so much the air of charlatanry. But if there be no "hollow wire," and if careful tests conducted at all stages of the operation by competent electrical experts have been able to discover no trace of electric or magnetic agency, then it is only fair to concede the probability of a new force. Moreover, it will not be very long before the result may be known of all men, as our visitors informed us that only two or three weeks more would be required to complete the first of the vibratory engines, with a vibrodyne three feet in diameter, at a scale large enough to produce commercial results, and judgment can easily be held in suspense as long as that. One statement made to us was very interesting. Mr. Keely was represented as being a very interesting and, until he got beyond his hearers' depth, a very instructive talker, not only on his own theories but on other matters of general scientific interest, and a well-known physiologist, after a long talk with him on physiology, is reported to have said that not only up to the limits of his own knowledge was he unable to discover any break in Keely's information, but he seemed to have just as competent and unerring knowledge of physiological possibilities far beyond the ken of his listener. When Mr. Keely's theories and their practical results shall have been established beyond question, it may be painful to look back on the time when we were in the ranks of the unbelievers.

IT seems that the discoverer of the tomb of Osiris, at Thebes, in Egypt, has a rival in this country, who not only found a little while ago the tomb of the same divine personage in Yucatan, but gained a point over the Egyptian explorer by ascertaining that the remains of the proprietor were still intact in a stone vase in the tomb, and bringing away with him proof which must convince the most incredulous, in the shape of a piece of the hero's heart, charred, in order to preserve it, which he still has in his possession. This enterprising archæologist is none other than Dr. Le Plongeon, who, according to the New York papers, seems to have been reading the inscriptions which he brought from the Maya country, and to have discovered in them strange things. Whether these inscriptions are the same that were described by him years ago as being in "old Chinese" characters or not, we cannot say; but whatever may have been the Chinese affiliations of the Mayas, their history subsequent to their appearance on this continent is, according to Dr. Le Plongeon, connected mainly with Egypt, and he shows an intimacy with the personal details of this connection which is exceedingly interesting. It appears that a certain Prince Coh, who reigned in the Maya city of Chichen, or Chichen-Itza, at some period not precisely specified, had a wife, whose name was Queen Môo. Now Prince Coh had a brother, named Aac, who was so ill-advised as to murder Coh, and, whether before or after this circumstance we are not informed, to offer some fruit to Môo, in token of love, this being, we are told, a common form of declaration among the Mayas, Egyptians and Greeks. Môo, however, declined "indignantly" both the fruit and the love, and fled to Egypt, where she was welcomed by a colony of Mayas, who had previously settled by the bank of the Nile, and rechristened Isis. How Coh, after he was dead, came to have his name changed to Osiris, or how Môo, or the other Mayas, got to Egypt in canoes, or why Osiris, or Coh, should have two tombs, five thousand miles apart, are questions which appear to present no difficulty to the archæologist, especially to one who, as we are told, has discovered in the Maya books "the true meaning of the tree of knowledge." It is interesting, in addition to all these facts, to learn that, notwithstanding the energy of the Mayas who paddled their dug-out canoes all the way from Yucatan to Egypt, their descendants, the Egyptians, "were not navigators," and it was not until the Phœnicians, portraits of whom, "easily recognizable," still exist at Chichen, had included Yucatan in their itinerary, that regular communication was established between the Mediterranean Sea and the Gulf of Mexico. We need hardly say that the Phœnicians all died many years ago, so long ago, in fact, that it is surprising that Dr. Le Plongeon should have been able to recognize their portraits; and the Egyptian-Maya commerce has been since suspended; but "a great number of words and letters, as well as ideas and practices portrayed in sculpture," which are now found in Egypt, "were clearly derived from the original Mayas."

MR. MORRIS K. JESUP, of New York, is to send out two expeditions to study American archæology. One of the expeditions is to visit Alaska, to trace, if possible, the route by which the colonists from Asia, who are now supposed to have been the ancestors of our native tribes, reached the other parts of the country. In all probability, there were several successive colonizing expeditions; and, as it is certain that conflicts took place between the members of some of them and the people whom they found already in possession of the land, it is important to determine whether all the immigrants came from a single tribe in Asia, and, if not, what were the races concerned, and when, and why, they came to these shores. It is not likely that the barren rocks and glaciers of Alaska will furnish much evidence in the way of inscriptions on these points, but the native tribes are still said to show Chinese affinities, and it is possible that, like the Zuñis, they may have some legendary knowledge of their past history.

THE other expedition is to go to Central America, to continue the explorations which Dr. Le Plongeon and Mr. Charnay began. We must confess that Dr. Le Plongeon's accounts of his investigations have had a little too much the flavor of a fairy-tale for our prosaic mind, but if, as the *Tribune* hopes, the Jesup expedition will not only confirm, but add to, his extraordinary discoveries, we shall be ready to welcome all that it may have to say about pigmy cities, with triumphal arches four feet high, about inscriptions, still easily legible, in "Old Chinese" characters, and the rest of the marvellous things which it has been reserved for Dr. Le Plongeon alone to see.

IN the second trial competition for the Prize of Rome in the Architectural Department of the Paris School of Fine-Arts, out of twenty competitors, ten were admitted to the final trial, which will occur August 1st. These ten are MM. Bigot, Auburtin, Arfvidson, Garnier, Chifflot, Hulot, Guadet, Faure-Dujarric, Carré and Senès. It is rather curious that the ten "*logistes*" come from eight different *ateliers*, the *atelier* Pascal having furnished three successful candidates, MM. Auburtin, Faure-Dujarric and Carré, out of six of its pupils who competed; while the *atelier* Guadet-Paulin, for example, seven pupils of which had reached the second competition, had only one successful candidate. This year, the final struggle for the prize will have a special interest, through a legacy left by M. François-Eugène Dejean, who died in February last, and left by will twelve thousand francs, to be paid out of his estate to the competitors for the Prize of Rome in Architecture in the year of his decease; five thousand francs to be paid to the winner of the prize; three thousand to the next in rank, and five hundred to each of the other eight competitors. As there are already other money prizes attaching to the Prize-of-Rome competition, the winner may count, this year, on a very comfortable addition to his cash resources, besides the certain fame and Government favor which will await him.

THE MEDIÆVAL CAMPANILI OF ROME.[1] — I.

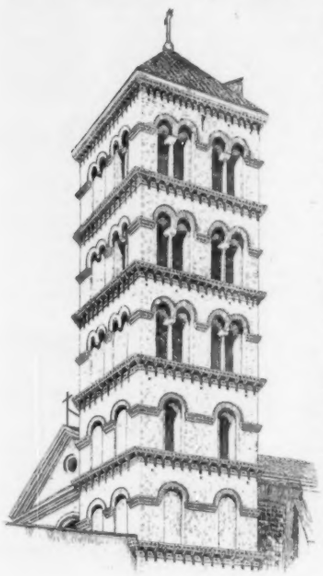

Fig. 1. S. Alessio.

EARTHQUAKES, sieges, and civil troubles have done their share of damage all through mediæval times; but it is to the neglect and destruction of more recent years that the melancholy condition of these monuments is largely due, and from such circumstances we have to fear for them a yet worse fate; so that a future generation may have nothing but our printed records to tell them what they have lost. The beautiful tower of the Annunziata, standing in the ruins of Mars Ultor, and that of SS. Cosma e Damiano in the Forum[2] were, it is true, destroyed many years ago; but it is to the period which has followed the change of government in Rome, and to many circumstances attending it, that the greatest damage is to be attributed. Many of the campanili belonged to conventual establishments, which have been either suppressed or disendowed, and no funds are now available for the simplest necessary repairs. One of the finest of them, St. Silvestro in Capite, is occupied by the telegraph service, and others in the Trastevere, such as St. Giacomo Lungara, seem doomed to destruction to make space for the roads along the new embankments of the Tiber. For these, among other, reasons I think I need not apologize for bringing forward a subject which, at first sight, might appear to be so familiar. . . .

In describing the normal type of the mediæval Roman campanile I cannot do better than quote the exact words of Professor Willis[3]: —

"The brick towers of Rome are square, the basement story is carried up without apertures to a height about equal to that of the roof of the building to which it belongs; above this the tower is divided by brick cornices into stories, the number of which varies in different examples. At St. Maria in Cosmedin there are seven, exclusive of the basement; the two lower ones have on each face two round-headed windows, and the third three; the remaining four stories have on each face a window of three lights."

Of the towers which answer to this description there are some thirty-six still remaining, and they are, St. Alessio, St. Bartolomeo all' Isola, St. Benedetto in Piscinula, St. Cecilia, St. Cosimato, St. Crisogono, St. Croce in Gerusalemme, St. Eusebio, St. Eustachio in Platana, St. Francesca Romana (St. Maria Nuova), St. Giacomo alla Lungara, St. Giorgio in Velabro, St. Giovanni in Laterano, St. Giovanni a Porta Latina, SS. Giovanni e Paolo, St. Lorenzo fuori le Mura, St. Lorenzo in Lucina, St. Lorenzo in Panisperna, St. Lucia ad Arcum Obscurum, Madonna del Divino Amore, St. Marco, St. Maria in Capella, St. Maria in Campomarzio, St. Maria in Cosmedin, St. Maria in Monticelli, St. Maria in Trastevere, St. Michele in Borgo, St. Prassede, St. Pudenziana, SS. Quattro Coronati, SS. Quirico e Giulitta, SS. Rufina e Seconda in Trastevere, St. Salvatore delle Coppelle, St. Salvatore della Corte, St. Silvestro in Capite, and St. Sisto Vecchio. Besides these there are others which bear a general resemblance to the normal type, such as St. Maria Maggiore, which has pointed arches, and St. Spirito in Sassia, which is Renaissance. There are also some other mediæval towers of quite a different character, such as St. Maria del Popolo and St. Maria dell' Anima. In describing all these campanili as of the normal type, it must be understood that, although the limits of design within which these towers are built seem very narrow, there is so much variety that no two, even apart from proportion and decoration, are exactly alike. In the number of the stories, the grouping of the window-openings, and in their arrangement and proportion, the diversity is as great as the number of the towers; while the variations in the applied decorations, the cornices and niches, the marbles and the majolica, are almost as great. . . .

The building of towers in Rome was a tradition of imperial times, and no invention of the mediæval period, either for defensive purposes or for ecclesiastical use. Pliny informs us that he had two towers at his villa at Laurentum.[4] Augustus built one by his palace, to the upper part of which he used to retire to enjoy the view over Rome and the Campagna, or avoid the attentions of his friends. This tower he called "Syracuse." In Professor Lanciani's work on "*Pagan and Christian Rome*" there is a plate[5] giving the reproduction of a ceiling carved in stucco, from a house discovered in the Farnesina gardens, on which is shown in low relief a tower of three stages, the lowest one, the loftiest in proportion to its breadth, pierced for a doorway, and the two upper ones of less altitude, the intermediate pierced for two windows and the top one for five. The stages are separated by horizontal cornices, and the whole is crowned by a low-pitched roof and a bulbous finial, as in the mediæval campanili. The period to which the Professor assigns this ceiling is the age of Augustus, and it may be taken as representative of the class of towers common in Rome at this period, and suggests, perhaps, what his own tower of Syracuse was like. Some paintings in a tomb found in the grounds of the Villa Pamfili Doria, published in our *Transactions*,[6] show two towers of a similar character, each in two stages, the lower one solid and the upper one with openings. Round the palace of Diocletian at Spalato there were numerous towers, which Adam considers were intended for ornament rather than for defence.

Fig. 2. Sta. Cecilia.

But besides these towers, intended merely for use or adornment, many examples of the square staged tower, erected as tombs or monuments in imperial times, for long survived to accustom the eyes of the mediæval builders to this form of construction. One, the tomb of the architect Titus Claudius Vitalis, in the grounds of the Villa Volkonsky by the Lateran, was measured and described by Professor Donaldson.[7] This is a brick building, nearly square on plan, three stages high, the upper one separated from the lower by a bold cornice.

It is thus evident that when towers became necessary for purposes other than those of defence or decoration models were found ready to hand which required but little alteration in their form or arrangement, or, indeed, in their architectural treatment, to fit them for the novel requirements which had arisen.

These new requirements were twofold: First, to provide a place of safety for the protection of the treasures of the Church during the frequent tumults within the city, or against the attacks of pirates and foreign enemies, to which Rome and all Italy, from an early period, became exposed; and, second, for the hanging of the church bells, which, from the time of Constantine, were used to summon the faithful to worship. . . .

In a paper like this there is no occasion, beyond a mere reference to it, to deal with the subject of the invention of church bells, or the legends about them, for on this topic innumerable memoirs have been written. There seems to be but little doubt but they were well known before the time of Paulinus of Nola, to whom their discovery is generally ascribed, although it is very likely they were for long treated as ecclesiastical luxuries. But if it is true that in the time of Constantine they were used for public announcements, and that by Pope Severinus (640) it was ordered that the hours should be sounded on them,[8] their use was much more common than is generally admitted. A proper place for the housing and hanging of these bells in such a manner that, when sounded, they should be heard in the surrounding neighborhood, became an immediate necessity; and gradually, perhaps, but surely, these requirements were met, and a style and mode of construction had been formulated, to some extent at least, by the date at which we are informed the first bell-tower was erected by the atrium of St. Peter in the Vatican. . . .

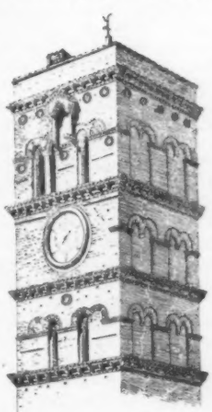

Fig. 3. S. Croce in Gerusalemme.

The first definite account we have of the building of a bell-tower in Rome is given by Gregorovius, describing the works to St. Peter's basilica, and mentioning his authorities thus:[9]

"Stephen II (752-757) added a fourth monastery, apparently St. Tecla, or Jerusalem, and also added a bell-tower to the atrium of the basilica, overlaying this tower with gold." . . .

Ponyard says that when the Vatican bell-tower was thrown down, on October 27, 1610, under it were found medals of Constantine,

[1] Extracts from a paper, by J. Tavenor Perry, read before the Royal Institute of British Architects on Monday, February 21, 1898, and published in the *Journal* of the Royal Institute of British Architects.

[2] The tower of SS. Cosma e Damiano is shown on page 215 of Lanciani's "*Ruins and Excavations of Ancient Rome*." This was destroyed in 1612.

[3] "*Remarks on the Architecture of the Middle Ages*," page 145.

[4] "*Ruins of the Palace of the Emperor Diocletian at Spalatro*," by R. Adam.

[5] "*Pagan and Christian Rome*," by Rodolfo Lanciani, p. 264.

[6] *Transactions* (1868-69), vol. xix, p. 224.

[7] *Transactions* (1868-69), vol. xix, p. 223.

[8] "*Dictionary of Architecture*," W. I. and G. A. Audsley.

[9] "*Gregorovius*," vol. ii, p. 315.

Zoe, Heraclius and others. But the campanile built by Stephen and restored by the Leos can scarcely have been the one which was destroyed at that date. The campanile then standing, if Ciampini's [1] engraving be correct, must have been a different one, or else the upper stages had been rebuilt, much as have been those of St. Maria Maggiore; that is to say, the windows had been grouped, not merely of single lights, but two together under one outer arch, with some indication of tracery in the heads.

Besides the above facts, there is but little authoritatively stated fixing the date of any of the campanili, beyond the mention that some particular church was built by a certain pope, without any special reference to the tower. Thus we are told that St. Cecilia was built by Paschal I (817–823) and St. Michele in Borgo was built or restored by Leo IV (847–853), about the same time that he built the walls of his Leonine city. There is, however, one case in which, although there is no written account, there is painted evidence, which may, perhaps, be relied on with more security than architectural theorizing. This is the case of the campanile of St. Prassede. The interior of it is difficult to access; but Armellini [2] describes the paintings on the walls of an upper stage as representing incidents connected with the translation of the bodies of SS. Crisanto and Daria and others which took place under Pope Paschal I (817–823); and as the character of the paintings point undoubtedly to his epoch, the date of the tower must be earlier. In this belief both Cancellieri and Armellini agree; and in a conversation I recently had with Professor Lanciani I gathered that he also supported their views. With an agreement like this among such experts, we may be well justified in accepting the date of the campanile of St. Prassede as belonging to the end of the eighth or the very beginning of the ninth century.

Fig. 4. S. Giorgio in Velabro.

An abstract of the events which happened in Rome during the period which elapsed from the building of the first bell-tower of St. Peter's to the date usually accepted for the building or rebuilding of that of St. Maria Maggiore — 1143 — will enable us to define those periods during which peace and prosperity permitted, or devastation and trouble precluded, great building operations. From the time of the siege of Rome by the Lombards, in 580, to the accession of Gregory II, in 713, there had been alternations of inundations and earthquakes, of leprosy and pestilence, the ruin of the aqueducts, external war and internal tumults, and perhaps, worse than all, the visit of the Emperor Constans, who plundered the city of nearly everything still remaining of artistic or intrinsic value. Needless to say, during this period, destruction, not creation, reigned. The following period was not much better, but in some slight cessation of the troubles Gregory III (731–741) continued to build some few churches and strengthen the old walls to resist the Saracens, who were even then threatening the coasts. For a short time, by the aid of the Frankish kings, under Stephen II and Paul I, there was a return of a mitigated prosperity, during which, as we have seen, the tower of St. Peter's was erected and overlaid with gold; but it was not until the descent of Charles the Great into Italy, that, under Adrian I (772–794), new buildings were undertaken to any considerable extent. Adrian restored or patched up several of the aqueducts; he carried out extensive works at St. Peter's in additions, repairs and decorations, and at St. John Lateran he built a tower. Large numbers of workmen were employed in gold and silver work, in enamel and mosaic, and art in Rome commenced to revive under his care. The rebuilding both of St. Maria in Cosmedin and St. Giovanni a Porta Latina is ascribed to him, as is also the campanile of the former.

Fig. 5. SS. Giovanni e Paolo.

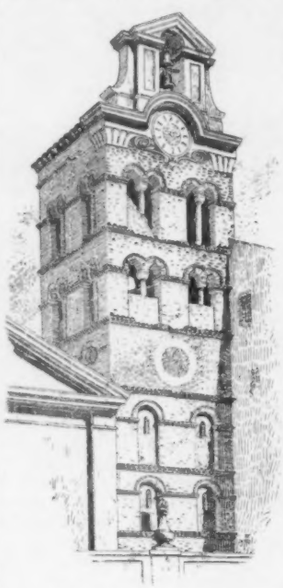

Fig. 6. S. Lorenzo in Lucina.

After his death there was further political trouble; but Paschal I was able to continue his building operations, and the following churches are attributed to him — St. Cecilia, St. Prassede and St. Maria in Domnica, whilst his almost immediate successor, Gregory IV, rebuilt the basilica of St. Marco. Of these four churches, three still retain their campanili.

This period of intermittent prosperity lasted for about ninety years, from Stephen II to the death of Gregory IV, when further troubles began, during which the Saracens captured and sacked St. Paul's beyond the walls and St. Peter's itself, and destroyed the Borgo, which was then defenceless, by fire. After the repulse of the Saracens, Leo IV fortified the Borgo, restored St. Peter's, and built the churches of St. Michele, SS. Quattro Coronati, and St. Maria Nuova (St. Francesca Romana). But after his death a cloud of misfortune, of blackness and horror descended upon the city, and the little that can be learned of its history during this period hints at, rather than relates, the degradation which had fallen upon it. It was during this period that the women governments of Theodora and Marozia flourished, when there were often two popes, and on one occasion there were three, one at the Lateran, one at St. Peter's and one at St. Maria Maggiore, whose followers and supporters were continuously fighting in the streets.[3] A report from the imperial agents to Otho I at this period informed him that "they lamented the desertion of the city and the ruin of the churches, through the decaying roofs of which the rain streamed upon the altars below."[4] During the short time the Emperor Otho I stayed in Rome there was a slight cessation of its misfortunes, and he found leisure sufficient to build the basilica of St. Adalbert, now known as St. Bartolommeo all' Isola. But from the time of his departure until the arrival of Robert Guiscard and his Normans misfortune again ruled in the city. The story of the Norman sack of Rome, in 1084, ranks among the worst in its history. Guiscard burned or destroyed the buildings of the Lateran Quarter, and of the Campus Martius, and reduced the basilica of SS. Quattro Coronati to ashes; and, retiring, left the city in a state of desolation and ruin.

(To be continued.)

[1] "De sacris Ædificiis," J. Ciampini, 1693.
[2] Armellini, p. 241.

[3] "*Gregorovius*," vol. iv, p. 53. The three popes were entitled Benedict IX, Sylvester III, and Gregory VI.
[4] "*Gregorovius*," vol. iii, p. 340.

THE LATE SIR HENRY BESSEMER.[5]

IT is with the deepest feelings of regret that we write the word "late" before the name of Sir Henry Bessemer. For some days past we have been receiving frequent accounts of the state of his health, and we were thus not wholly unprepared for his death, which occurred on Tuesday evening. Nevertheless, it is difficult to believe that we shall never again listen to the engrossing conversation of this splendid old man, who has written his name across the pages of our age in letters which will be fresh as long as the human race cherishes the memory of its great benefactors. To within a week or so of his death he retained the intellectual activity which was the prominent characteristic of his personality, and one could not realize that he carried the weight of eighty-five years. Although by no means a man of robust health, the burden of age lay but lightly on his bodily frame, while his mind disdained to regard as a trouble any part of the task of carrying it. Full of schemes and plans, ever experimenting and designing, each day was filled with interest, and he had not time to feel old. In listening to his projects one could imagine oneself in the company of a man barely entering manhood, while when the conversation turned to what he had accomplished, it seemed as if he must have had the gift of living three concurrent lives; it appeared impossible that so much could have been crowded into one existence. . . .

We do not propose to write a biography of Sir Henry Bessemer on this occasion. Such a record would demand space very far beyond that now available. How numerous and how varied were Bessemer's labors are matters known only to those who had the advantage of his intimate acquaintance, but those who have heard from his own lips the stories of his early life and of his never-ceasing

[5] Extracts from a paper in *Engineering* for March 18, 1898.

struggles with fresh problems will not soon forget the privilege. It is only in illustration of his character that we can refer to some of the episodes in his career. The time will come when his life will be dealt with at length; and we are glad to know that the materials for such a work are in existence. We have already referred to the well-known fact that, unlike many inventors, he reaped such a reward for his invention of steel, that he could spend the evening of his life in dealing with problems which so greatly interested him, and on which, up to the last, he brought so much inventive skill and energy to bear. We shall, however, dispel a generally-held opinion, when we add that his title was not bestowed in recognition of the work of his ripe manhood, but in tardy acknowledgment of a most important invention made voluntarily for the Government in the days when the fire of youth burned brightly, and he saw visions of an immediate fortune laid at its feet by a grateful country. The country, as represented by the Inland Revenue Department, appropriated the invention, but practically ignored the inventor, although at that time it was known that stamps were transferred from old deeds to new ones, and that they were forged in other ways to the probable extent of 100,000*l.* per year. One morning young Bessemer (he was then not twenty years of age) called at Somerset House with a number of stamps he had forged himself, and also with a method of impressing stamps which was practically proof against forgery. The Department jumped at his idea, obtained an Act to recall all unused stamps, and started afresh on a new plan. Promises were made to the inventor and not fulfilled, and after dancing attendance for a long time, he withdrew from the affair, sick with hope deferred. Years passed and probably the matter was forgotten by everybody but himself. But the spirit which enabled him to fight his way through many other difficulties kept alive the recollection, and eventually his chance came. The Emperor of the French offered him the Grand Cross of the Legion of Honor, on condition he could obtain permission from his Government to wear it. This permission was refused, and in 1878, other circumstances recalling this refusal, Bessemer wrote a scathing letter to the *Times* describing all the circumstances of the service he had once rendered the State. He also set to work to find the people who had been connected with the manufacture of dies for the stamps, and to collect other evidence. He then laid the matter before Lord Beaconsfield, and, after a fitting delay, he was informed that Her Most Gracious Majesty had been pleased to signify her intention of conferring the honor of knighthood upon him. The ceremony took place on June 26, 1879, and thus after some forty-six years Sir Henry Bessemer received the reward of his juvenile efforts. It is not often that a harvest is gathered so late, probably because it is seldom a man is found with so much energy as to push his claims for the payment of debt nearly half a century old.

Probably his attempt to get justice out of the Board of Inland Revenue was the only occasion on which Bessemer was defeated. It was his characteristic to attack a problem again and again, putting his whole soul into it, and proceeding as if success were certain. Had it not been for this, most of his ventures must have been failures, for they were generally matters of extreme difficulty in which he had no previous experience to guide him. He was not an iron manufacturer when he took up the great problem of his life, neither was he a trained chemist nor a metallurgist. Still earlier, when he commenced the manufacture of bronze powder, which laid the foundation of his fortune, he was entirely without knowledge of the subject, and could scarcely be called an engineer. But he believed in himself and his powers, and devoted months of steady work to his experiments at a period when he could not afford to waste time. For it must be remembered that Bessemer did not start in the world with money. His father was in comfortable circumstances, but the son had to make an income for himself as soon as he came to man's estate. He tried many things while yet little more than a boy, and in each of them he attained a fair measure of success. Among these was a means of consolidating plumbago dust into a solid block for the manufacture of pencil leads, an invention which he sold for the totally inadequate sum of 200*l.*, and which is still in regular use. Next he undertook the casting of types, introducing the use of a force-pump to drive the metal into a mould, as is done to this day. Messrs. Wilson, the well-known type-founders of Edinburgh, bought the invention, but, owing to the opposition of their workmen, they did not at the time carry it out. Next he went into the preparation of rollers for paper-embossing and printing, and the production of alloys used in the preparation of "forcers" employed in embossing cards and leather. One branch of trade led him into another, while all the time he was on the watch for some outlet for his ability that should absorb his time, and enable him to drop the many small manufactures which his versatile mind had originated. He was anxious to marry, and the responsibilities of matrimony could not be undertaken on the irregular sources of income which he had hitherto been alone able to procure. Still he persevered; he found a lucrative business in reproducing "Napoleon medals" in soft metal, and then he undertook to design a type-composing machine for a Mr. James Young. This was not his own venture, and although a considerable measure of success was attained, the machine did not oust the compositor.

In all these efforts we see the nature of the man. His confidence in himself was unbounded and was justified by the results that he achieved. It is noticeable that he never followed established lines. All his work was original, for he was an inventor to the tips of his fingers, and saw everything in a new light. Mere manufacturing had no interest for him. At this time he had not yet found the necessary outlet for his talents, and, one by one, he abandoned each enterprise, selling it for what he could get, and looking afield for something more worthy of his ability and promising more reward. His chance in life came by accident. The same incident had happened to hundreds of men before, but not one had had the intuition to see where it pointed, and to follow the path at all cost. He had occasion to purchase some "bronze powder," and was struck with the difference between its cost and the value of the raw material from which he assumed it was made. He paid 7*s.* an ounce for it, while he judged the metal was not worth more than as many pence a pound. Here was an opening indeed for a mechanical inventor, for it was evident that the powder was prepared by a slow and laborious hand process. Bessemer threw himself ardently into the matter, and produced a most ingenious device for reducing brass to grains of infinitesimal size; but, alas! they had no lustre, and were useless as bronze powder. The disappointment was great, and for a time no better idea was struck. Eventually an examination under the microscope showed that the bronze powder of commerce was in flakes, while Bessemer's powder was in grains. This put the matter in a new light, and the subject of our memoir saw before him the chance of his life. He devoted months to preparation of machines of a commercial size, and at length he succeeded in making bronze powder which would sell at a large profit in competition with that from Nuremburg. The road to fortune was now open, but it was still a most laborious road to travel. It was imperative that the process should be kept absolutely secret from all the world, except from three relatives by marriage who undertook to work it. Drawings had to be made, parts of machines were ordered from different manufacturers, then had to be put together by the inventor and his relatives without assistance, and so on. The machines were designed with a wonderful perfection of detail, and the drawings and gauges from which the various parts were constructed were throughout the work of his own hands. More than a year was consumed in this way, and still more time in perfecting the arrangements. It was a risk to undertake so much on the strength of a small scale experiment, and most men would have faltered at it. It is fortunate that Bessemer did not, for it was the profits of this manufacture of bronze powder which rendered it possible for him in after years to produce his steel. The bronze business soon began to run automatically, and he had leisure and money to experiment in many other directions. In fact, with him leisure and experiment were almost synonymous terms; as soon as his mind was free from one subject it turned to fresh fields. To do nothing was an impossibility with him, alike in his youth, his manhood, and his old age, and there was nothing he touched but he left on it the marks of his genius. Of course, all his discoveries were not remunerative in a financial sense, but there were several that were, particularly one for embossing velvet. For a time he obtained 6*s.* a yard for doing this work, and even when the price fell to 1*s.* it yet yielded a good profit.

With a mind so active and many-sided as Bessemer's, it is difficult to trace the birth of an idea. But in scanning his history we find that he had always a singular aptitude for the production and manipulation of alloys. Possibly he inherited this from his father, who made a great reputation as a type-founder. Certainly he was ever ready to produce new alloys for any particular purpose, and he was very successful in producing them with any particular physical characteristic. It can scarcely be said, however, that it was this favorite study which led him to experiment with steel. The matter seems to have had its origin in the Crimean War, when all men of mechanical tastes were considering the improvement of cannon. Bessemer endeavored to produce an elongated projectile which should be made to revolve in its flight, by the passage of powder gases and air through curved holes in its body. In this he made some progress, but only to find that the guns of the day could not stand the increased strain thus thrown upon them. He went to Paris and was encouraged by the Emperor Napoleon to persevere, with the result that he attempted to produce an improved cast-iron by successive refinings. This he did, until the idea seems to have struck him that he might refine the iron until it became steel, and from this arose his great invention.

It is not our intention to retell the tale of Bessemer's early triumph, his immediate disappointment, and his final victory when the Sheffield manufacturers found that he was systematically underselling them by 20*l.* a ton. All this has been related again and again, and can be found at length in our columns; it is little more than a year since we published a long account written by Sir Henry himself.[1] When his patents expired he was approaching sixty years of age, and was the owner of an ample fortune. He had the right to claim repose, and in a certain sense he did, for he gave up all commercial pursuits with their worries and anxieties. But as regards mechanical and scientific matters he never rested. At one time he was designing machinery for diamond polishing for the benefit of one of his grandsons; at another time he was busy on a large reflecting telescope with most complete mechanical arrangements for manipulating it; the polishing of plate-glass occupied him for a while, and, indeed, one never met him but that he had some scheme in hand. It is no idle compliment to say that if a reverse of fortune had happened to him at threescore and ten years of age, he could still have made a living by his inventions.

[1] See *Engineering*, vol. lxii, page 749.

BOOKS AND PAPERS

THIS is not a mere "art book"[1] appealing to a small number with an æsthetic hobby. On the contrary, in the most practical fashion, it deals with a subject that ought to be of the greatest interest and importance to the public at large, but still a subject in which the mass of people sadly need even the most elementary instruction. The book opens with a brief but sufficient account of the present position of modern architecture, and of the conditions that have so entirely separated modern from ancient building, points upon which there must be some definite agreement before there can be any useful detailed criticism. The most serious objection to modern architecture comes from what may be called the reactionary school, who believes that the only hope for an art of modern architecture is in the spontaneous upgrowth of a new and genuine style, to be initiated by making architectural design solely an expression of construction and material; as it was, they hold, in Greek and Gothic building. Every "feature" of previous periods is to be rejected and a return made to bare structure. Mr. Statham conclusively exposes the fallacy involved in this attitude by showing that there never has been a style of architecture which did not employ the features of preceding styles, and that, too, without reference to constructive needs, as for instance, the wall-arcades in the Romanesque and the Classic column, transformed, decorating the purest of Gothic piers. He contends that the really important difference between modern and ancient architecture consists, not in the imitation and adoption by modern architects of past forms, but in the entirely new conditions and requirements of our present civilization. Formerly the greatest buildings were temples and churches, their simple plans were practically integral parts of the design; whereas nowadays civil buildings are the more important and numerous, and, owing to the complexity and refinements of modern life, the planning of them is a completely different, and often very difficult, problem. It is the mere reproducing of ancient work that has discredited modern architecture, and not the changed relations of construction and design. The real remedy is suggested by one of these very reactionary critics, who said that, "out of a critical use of past tradition we must build up a tradition of our own."

The truth is that architecture having now become a personal art, gaining in scope for the expression of the individuality and invention of the gifted artist, it suffers immeasurably more than other personal arts, because there cannot, as with them, be the same suppression of bad work: it is, alas! impossible to avoid seeing the crowd of ugly and vulgar buildings, and we have not now the authority of a consistent style as a protection against ignorance and caprice. Nevertheless, if, as Mr. Statham puts it, there can no longer be "a style" in the older sense, there can still be "style" in a design as an abstract quality. What is more, he is convinced "style" must wholly originate with the architect, for any revival of the guild system for a class of trained artisans with freedom of initiative is now utterly impracticable.

With the exception of the preliminary vindication of modern architecture, the book is simply a concise and lucid commentary upon the æsthetic merits of a large number of modern buildings, and of some unexecuted designs, illustrated in almost every case by the elevation and plan; and it is from the examples selected that we can judge of the strength of the author's championship. Truth to say, they do not make a very brilliant array, not a few indeed are purposely chosen to show "how not to do it" — no demonstrations could be more convincing. Still there remains a fair number of good designs, and in secular buildings of moderate size, we venture to say some modern work, such as the State House, Minnesota, and the Paris Faculté de Médecine, will bear comparison with the same class of architecture in the past, especially in regard to unity of design and a delicate balance of parts. Beyond England and America almost all the examples are drawn from France and Germany, and, taking nationalities, it is interesting to note that French work shows the most knowledge and restraint, while the German is imitative and generally assertive and overloaded, — in fact German; the American is both the most imitative and the most experimental; the English more varied and picturesque. In at least street and domestic architecture England takes the lead.

Buildings are classified and criticised according to the purpose subserved. There is special insistence upon this purpose determining the design, its suggestion, if possible, by carrying some structural necessity into exterior expression; for example, the curved auditorium of a theatre, and also by symbolic treatment, so that buildings similar in requirements, such as Admiralty and War Offices, might yet have characteristic architectural distinction. Very properly, excellence of planning is highly commended, and it is instructive to see how good planning makes for fine elevations.

It will be a surprise to many that some of the most charming and successful of recent works of architecture (in England at least) has been that of churches. Without being distinctly novel, yet in the impress of personal thought and feeling it is in marked contrast with the dry, frigid effects of the Gothic-revival period. The rapid growth of municipal power and wealth has naturally given architects the most important of their opportunities, and a building such as the Sheffield Town-hall well shows the general improvement in feeling for style: how welcome is its combination of refinement and animation, after the dull pomposity of the old pseudo-classic erection that we are accustomed to think of as the town's senate-house! In spite of the superiority claimed for the architecture of English homes, Mr. Statham is right, in deprecating the present tendency to picturesque irregularity, especially in those larger houses, mansions, where a formal stateliness would be more appropriate and truly architectural. In the chapter on "Street Architecture" he makes some sensible suggestions as to flat roofs and narrow strips of blank wall, to avoid the clash of different detail in adjoining houses. Profusion and excessive projection of ornamental detail, fussiness, is the characteristic defect of English design.

Belonging to the modern school, the author is very emphatic about architectural truth, and special prominence is given to this principle, for the frontispiece illustrates his conception of a remodelling of the Tower Bridge, London. While approving the substitution of solid-masonry towers, we are amused at his bit of pedantry in extending the girders beyond the towers in order to disclose the connection with the chains. He here falls into the not uncommon mistake of the incorrect use of complementary opposites. Though it is right to avoid a deliberate deception, it is not necessary to visually assert a function: the ballasting of Gothic vaults was not expressed in the surface masonry, nor did Brunelleschi show the chains girding his dome.

After the close reasoning and robust good sense of the opening defence of modern architecture, the evident faith in its possibilities as a vital and progressive art, it comes as a disappointing surprise that in his last chapter, "A Note on the Influence of Iron," Mr. Statham should fail us just where, in regard to innovation, he might be expected to show some insight, if not active sympathy. Observing that iron and steel are used from motives of economy, and that even the Americans do not employ them for buildings in which dignity and beauty are the first consideration, he argues that there is a tacit recognition of the inherent unfitness of metal as an architectural material. But the inference is entirely mistaken, and ignores the laws of material and artistic progress. All decorative art must wait upon economic advances; once let steel be largely used for other than the ends of mechanical engineering — the tendency is already marked — and its artistic manipulation will inevitably follow. The advance in reduction of the cost of metal-work and in improvement of its form and non-corroding surfaces would reach a point at which a potentiality for new and beautiful forms, consistent with economic efficiency, would be perceived by the artist, and metal-construction might, as did the Gothic, once more give us a splendid series of great and noble buildings. One thing at least is certain: in America, the country of most importance for the future of architecture, the steel-frame sky-scraper has come to stay, and, with its tremendous mass overwhelming every street, it is almost puerile of Mr. Statham to express the pious hope that this system of building will be abandoned. His disbelief in the architectural use of iron is the more astonishing that in the October number of *Engineering* he is actually to be found strenuously advocating the "æsthetic treatment of engineering work."

Where there is much to praise and so little to dissent from, it is fairer and pleasanter to end with the first. The strength of the book lies in its admirable concrete criticism: notably free from the bias of personal sympathies with particular styles, it is so simple and direct withal, thorough in grasping essentials, that he is a dullard indeed to whom it cannot make clear, once and for all, the difference between good and bad architectural design. Altogether this is a book architects cannot disregard, and one invaluable to the many, who, bewildered by the contrasts, not to say contradictions, of unrestricted individualism in modern architecture, are yet interested by the evident sincerity of aim in those new buildings, which, if rarely attaining to beauty or impressiveness, assuredly bring some small measure of dignity, grace or gayety into the old meanness and monotony of our English streets and squares.

[1] *Modern Architecture*: A book for architects and the public. By H. Heathcote Statham, Fellow of the Royal Institute of British Architects, Editor of the *Builder*, etc. 1898. New York: Charles Scribner's Sons. Price $3.00.

SOCIETIES

THE ENGINEERS' CLUB OF PHILADELPHIA.

AT the regular meeting, April 2, 1898, there were sixty-five members and visitors present.

Dr. Henry Leffmann presented the paper of the evening, upon "The Engineering Chemistry of Boiler-waters." When the applicability of a water to steam-making purposes is to be determined the action of the dissolved gases becomes important, while the organic matter may be neglected, unless it is unusually large in amount or exceptional in character. Surface-water is well-adapted for boiler purposes, except for its liability to turbidity. Subsoil-water, or that obtained from springs and ordinary wells, is usually clear, and contains notable amounts of solid matter. Deep water is very variable in character, even within a limited area. It is often rich in dissolved solids, iron compounds and sodium chloride. The suitability of water for boiler purposes must be considered with reference to the two

properties of corroding and scale-forming, which are to some extent antagonistic, since the deposit of material on the iron will, of course, protect it. In general, it may be said that the corrosive qualities are due to the oxygen and carbonic-acid present in solution, and more rarely to organic or mineral acids, which are highly objectionable. The injurious action of water collected from swampy regions and from mines was touched upon, and examples of its use cited, and the character of injurious ingredients, with the chemical transformations that occur in the boiler, were explained with the aid of blackboard illustrations.

The scale-forming ingredients in water are principally the compounds of calcium and magnesium in the form of sulphates, carbonates and chlorides, and the amount and character of the scale will depend largely upon the form of combination. In the ordinary use of water the removal of the carbonic-acid is brought about by the heating; deposits in carbonates promptly take place to an amount which is independent of the concentration of the water by the conversion of a portion of it into steam. Calcium sulphate is one of the most objectionable ingredients in boiler-water. It is soluble in cold water to the extent of over one hundred grains to the gallon, and becomes less soluble as the temperature rises, until at about 300° Fahrenheit, which nearly corresponds to sixty pounds' pressure, it is almost insoluble. Although the various materials which deposit in boilers are often collectively designated as "scale-forming," yet there is a great difference in the character of the deposit. The carbonates produce soft scale, calcium sulphate a hard scale.

As engineers cannot control the laws of nature, and often have no choice of water, an important question is, What may be done to remedy the objectionable conditions? Turbidity may be easily remedied by filtration, but if filters using alum are applied care should be taken not to use an excess of it, as decided corrosion might be produced, or hard scale. When corrosion is due to free acid it may be easily overcome by the use of alkaline substances, among which caustic soda and soda-ash would be most generally applicable. The corrosion due to dissolved oxygen will be materially reduced by heating the feed-water, and also by arrangements for not allowing the water to come directly in contact with a highly-heated spot. The prevention of scale is secured in various ways. The magnesium and calcium carbonates that may be held in solution by carbonic-acid are all precipitated by the removal or neutralization of that acid. The former may be accomplished by the heating of the water, and the latter by the addition of some basic substance, such as slaked lime or caustic acid. Calcium sulphate being a most objectionable ingredient, much attention has been given to the methods of preventing it from forming hard scale. At the present day the tendency is to the use of direct precipitating agents, among which may be mentioned trisodium phosphate and sodium fluorid. Both these substances convert all calcium and magnesium compounds into insoluble flocculent precipitates, yielding also highly soluble and non-corrosive sodium salts. They seem to meet the practical issues very well, and are in extensive use.

In conclusion, Dr. Leffmann showed some experiments illustrating the formation of scale, and exhibited a number of samples of scale from waters in use in the neighborhood of Philadelphia and on trans-Atlantic steamers.

The discussion which followed was participated in by Messrs. John Birkinbine, E. M. Nichols, J. W. Ledoux, E. K. Landis, James Christie, Geo. B. Hartley, B. H. Coffey, W. S. Twining and W. C. Furber.

L. F. Rondinella, *Secretary.*

SKETCH-CLUB OF NEW YORK.

The annual meeting of the Sketch-Club of New York was held on Saturday evening, April 2d, at the Club-rooms, 3 East 14th Street.

The reports for the year of the President, Treasurer, Recording Secretary, Entertainment and House Committees were read and adopted.

Mr. Rose, the director of the Life Class, reported excellent progress for the class during the year. Some very creditable work was exhibited at the meeting. The class has been under the instruction of Mr. Moscovitz.

Mr. Nolan, the instructor of the Water-color Class, reported a very successful term.

The following officers were elected for the coming year: *President*, Mr. James Ross; *Vice-President*, Mr. H. H. Braun; *Treasurer*, Mr. Henry Van Cleef; *Recording Secretary*, Mr. H. Hausman; *Corresponding Secretary*, Mr. W. Ford Howland; *Chairman of the Entertainment Committee*, Mr. E. G. Moeller; *Chairman of the House Committee*, Mr. E. F. Herring.

A vote of best thanks of the Club was extended to the retiring board of officers for their untiring zeal and conscientious work in all things pertaining to the welfare of the Club.

Arthur M. Duncan, *Recording Secretary.*

Trajan's Bridge over the Danube. — Eighteen hundred years ago or thereabouts the Roman Emperor Trajan built a bridge across the Danube, the piers of which are found by the Rumanian engineers solid enough to sustain a new structure, which will unite the towns of Turnu Severin, in Rumania, and Gladova, in Servia. In the middle of the structure the statue of Trajan will stand four square to all the winds that blow, as it well deserves to do, perpetuating the memory of that great conqueror and bridge-builder for perhaps another score of centuries. — *N. Y. Tribune.*

ILLUSTRATIONS

[*Contributors of drawings are requested to send also plans and a full and adequate description of the buildings, including a statement of cost.*]

A CORRECTION.

We regret to have once more to ask our subscribers and librarians to correct a mistaken ascription. We so surely believed that we knew who were the designers of the "Tomb of Benjamin Warder," published in our issue for last week, that we made no attempt to verify our belief. In this way we have done an injustice to the real designers of the monument, Messrs. Shepley, Rutan & Coolidge, of Boston, which, if our subscribers will be good enough to make the correction on the plate itself at once, we trust will prove to be merely a momentary annoyance.

LADIES' STAIRCASE: CLUB-HOUSE OF THE EUREKA CLUB, ROCHESTER, N. Y. MESSRS. NOLAN, NOLAN & STERN, ARCHITECTS, ROCHESTER, N. Y.

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

A COMPETITIVE DESIGN FOR THE COLLEGE OF THE CITY OF NEW YORK, N. Y. MR. GEORGE MARTIN HUSS, ARCHITECT, NEW YORK, N. Y.

PLANS OF THE SAME.

THE MISSOURI BUILDING FOR THE TRANS-MISSISSIPPI EXHIBITION, OMAHA NEB. MESSRS. BARNETT, HAYNES & BARNETT, ARCHITECTS, ST. LOUIS, MO.

ST. JAMES'S CHURCH AND PARISH BUILDINGS, UPPER MONTCLAIR, N. J. MR. FRANK E. WALLIS, ARCHITECT, NEW YORK, N. Y.

[The following named illustrations may be found by reference to our advertising pages.]

LAW SCHOOL, PARIS, FRANCE. M. LHEREUX, ARCHITECT.

ENTRANCE TO THE LAW SCHOOL, PARIS, FRANCE. M. LHEREUX, ARCHITECT.

This and the preceding plate are copied from *La Construction Moderne.*

[Additional Illustrations in the International Edition.]

CLUB-HOUSE OF THE EUREKA CLUB, ROCHESTER, N. Y. MESSRS. NOLAN, NOLAN & STERN, ARCHITECTS, ROCHESTER, N. Y.

[Gelatine Print.]

This Club-house, which was erected at a cost of $100,000, in 1893, consists of three floors and basement. The basement and first floor accommodate the gentlemen's club quarters, the second the ball-room and the third the steward's quarters.

On the first floor a long hall runs the entire length of the building. To the left of this are the parlor, the reception-room, the billiard-room and two large card-rooms; to the right are the library, the directors' room, secretary's room, three dining-rooms and two card-rooms. On the same floor are also several wardrobes, lavatories, etc. In the centre on the right-hand side is the main staircase. Across the rear of this floor are large card-rooms.

The dining-rooms will accommodate easily from 75 to 100 people, and if necessary 125 can be served at the same time. Most of these rooms have inlaid ceilings. A ladies' entrance leads into the reception-room, from which there is a private staircase. In this way ladies can go to the ball-room, the dimensions of which are $78\frac{1}{2}' \times 63'$. The stage, occupying one end, is 21′ deep, giving the room a total depth of 84′. In connection with it there are four large dressing-rooms.

Opening from the centre of one end of the ball-room are large double doors leading into a hall 12′ wide, and at the front of this hall is the banquet-room, with a seating capacity of 400.

On the third floor are the large kitchen, pantries, etc. There are six or seven bedrooms for the steward and servants. Two rooms are reserved on this floor for club uses. In the basement are a bowling-alley, gymnasium, wine-room and several large storage-rooms. All the appointments are of the most elaborate kind.

The building is 176′ deep and 82′ wide in the widest and 62′ in the narrowest part.

LADIES' DINING-ROOM: EUREKA CLUB-HOUSE, ROCHESTER, N. Y.

[Gelatine Print.]

ROOD-SCREEN, OWSTON FERRY CHURCH. MR. HENRY G. GAMBLE, ARCHITECT.

FRONT AND BACK VIEWS: "BARON'S DOWNS," LEWES, SUSSEX, ENG. MR. ARNOLD MITCHELL, ARCHITECT.

NO. 76 FITZJOHN'S AVE., HAMPSTEAD, LONDON, ENG. MESSRS. WYLSON & LONG, ARCHITECTS.

STATUE OF ST. JOHN THE BAPTIST, BERKHAMSTED SCHOOL CHAPEL. MR. G. W. ILIFFE WILSON, SCULPTOR.

COMMUNICATIONS

[*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.*]

COST OF THE NEWARK HIGH-SCHOOL BUILDING.

NEW YORK, N. Y., April 11, 1898.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs, — In turning the pages of the *American Architect* for 1897, recently back from the binders, I came across a communication from Mr. William Atkinson, of Boston, relative to the Newark High-school Competition, which had at the time of his writing (January 11, 1897) been recently advertised in your pages. Mr. Atkinson in this communication warned his fellow-architects in general against having "anything to do with such an absurd affair," because of the absolute impossibility of meeting the requirements of the programme within the limit of cost stipulated by its conditions. This limit was the sum of $200,000; and Mr. Atkinson endeavored to prove by an elaborate array of figures that "the lowest possible estimate for which this building could be built" was "$299,999.99 (or, in round numbers, three hundred thousand dollars)."

It may interest Mr. Atkinson and your readers to learn what has been the actual result of the competition.

Fifty-one architects entered the contest, in spite of its absurdity, and the design of Messrs. Howard & Cauldwell of New York was, after some weeks of unsuccessful political manœuvring by certain members of the Board of Education who sought to overthrow the award made by the undersigned as expert adviser to the Board, finally adopted and bids invited upon it. The requirements of the programme had, however, been increased by requiring three fireproof floors instead of one; and the Board further insisted on dividing the contracts for its erection.

The contracts were finally signed for a total sum of $195,600; and the building is now under construction and well advanced towards completion. The work has so far been done in the most substantial and satisfactory manner, and there has been no trouble from skimped work or inferior materials. I need hardly add that there was no reduction in the original requirements to allow for the increased cost of the extra fireproofing, and that the completed building will in every respect meet the programme of the original competition.

As the question of requirements *versus* possibilities in competitions is so often difficult, and the outcome so often unsatisfactory, I think the above facts should be generally known in the profession.

Yours truly, A. D. F. HAMLIN.

NOTES AND CLIPPINGS

GERMAN FIREMEN'S ARMOR. — The German firemen's clothes can be inflated with water if occasion requires it. The blouse and trousers are made of a double layer of canvas, and by means of a tap attached to the hose for this purpose a fireman can fill with water immediately the waterproof space between the two layers. If too much water is poured in, the surplus escapes through a valve, and pours down over the wearer like a fountain, thus doubly protecting him from the flames. The smoke-helmet is also used by Germans, as, indeed, by all Continental firemen. It serves as an air-chamber, which is filled by an air-pump, with which the fireman is provided. By this means the lungs are supplied with air and the head kept cool, while the escaping air clears away the smoke and enables the fireman to see what he is doing. Thus the fireman is able to enter a burning room and fight the fire at close quarters. — *Household Word.*

A NEW ELECTRIC HEATER. — In a former note I wrote of the researches of M. F. Le Roy upon crystallized silicon and its applications in electric heating and cooking. At the February meeting of the Ingénieurs Civils de France, M. Le Roy entertained the audience with this interesting matter. . . . It results from his figures, not including coal in the comparison, that for the heating of rooms with the most perfect gas-stoves an expense of 100 francs is needed, as against an expense of 120 francs with electricity, and with apparatus such as the silicon electric heaters the expense becomes only half that for gas. For cooking, an expense of 100 francs for gas corresponds to a cost of 250 francs for electricity. M. Le Roy showed two pieces of apparatus typical of his system, a stove and a small cooking-range. This system consists essentially of "electric logs" or rods of silicon crystals properly agglomerated and enclosed in glass tubes to avoid oxidation. These tubes are brought to a temperature of about 1,000 degrees centigrade by the current. The utensils heated may be of any form and for any use, and one, two or more tubes can be connected according to the service desired. Their life is very long, experimental results of from 1,500 to 1,800 hours having been obtained. The work upon them is still in the laboratory stage of development, and has not yet reached a commercial scale. The price of the tubes will be about three francs 60 cents). The stove shown to the society contained twelve of the tubes, each consuming from eighty to one hundred watts, the total power absorbed being about 1,200 watts. The "electric logs" can be adapted to all sorts of heating and cooking utensils, and seem to have a high economy. — *Paris letter to The Electrical World.*

THE ARCHITECT TURNED ARTIST. — The quickest route to fortune is sometimes via folly. Many a man struggles for years in the most approved manner without getting an inch nearer his goal. Many a man abandons hope, and sinks and sinks till at last it seems that nothing short of a miracle can by any conceivable possibility restore his self-esteem. Then some freak of unfettered madness does what fixity of purpose and diligent application failed to do — it leads to peace, ease, and riches. Some years since a middle-aged architect threw up his practice and devoted himself wholly to art. His old profession had not been at all satisfactory from a financial point-of-view, but his new one proved to be worse. Truth to tell, he was a wretched dauber, and it was against the advice of all who were competent to advise him that he had turned to painting. He had consequently a struggle to exist, his work appealing solely to frequenters of auction-rooms. Eventually a dealer conveyed to him the glad tidings that he had sold one of his pictures, and that he would be pleased to order others on the same terms. Cheered by this news, he set to work resolutely, and for two or three years he had an unbroken run of success. Everything which left his easel was disposed of through the dealer, though the artist could not discover the identity of his patrons. One day a solicitor informed him that a certain gentleman — somebody whose name even was quite strange to him — had bequeathed to him a number of oil-paintings. Naturally, the artist took the earliest opportunity of inspecting his windfall. When he saw the works he nearly swooned. They were his own pictures — all that the dealer had sold! To this day the artist has not discovered why the deceased gentleman acted so strangely. The paintings which were returned to him were unsalable except through the old channels, and as a consequence the legatee, cured of his folly, burnt his easels, canvases, etc., and turned his back on art. Meanwhile, he had, thanks to his patron, saved a considerable sum of money. With this he started in business, and is now prospering. — *Invention.*

PARIS EXHIBITIONS. — The first Paris Exhibition was held in the year 1798; it comprised the modest total of 110 exhibitors, and the expenditure was in proportion, only 60,000 francs. The Exhibition buildings were of wood and decorated, and were located on the Champ de Mars, about the same place as the Great Exhibition of 1889. The number of medals distributed was 25! The second Exhibition was three years later, in 1801, held in the courtyard of the Louvre, and comprised 220 exhibitors, which put the former completely in the shade. A third Exhibition was held the following year on the same spot, the number of exhibitors having risen to 540. Napoleon the Great opened the fourth Exhibition, held at the Place des Invalides in the year 1806. There were 1,422 exhibitors, and several grand fêtes were held in connection with it. Number five of Paris Exhibitions was held in the year 1819, in the Louvre Palace, the number of exhibitors being 1,622. The sixth was held in 1823, but was not of much importance. Number seven was also held at the Louvre, in 1827, under the reign of Charles X, but, like its predecessor, it was on a more modest scale. The eighth, however, held during the reign of Louis Philippe, at Place de la Concorde, was a great success, the exhibitors numbering 2,447. This figure had increased to 3,381 at the Exhibition held in the year 1839 at Champs Elysées, and to 3,960 exhibitors at the one held five years later, also at Champs Elysées, which site also was chosen for the Exhibition in 1849. The State grant on that occasion rose to 600,000 francs, and the buildings covered an area of 22,000 square metres. The first world's exhibition proper was opened in the Industrial Palace in the year 1855, when the State grant had risen to 11,500,000 francs, and the area covered to 168,000 square metres. There were 23,954 exhibitors, and the number of visitors reached 5,160,000 persons. This exhibition gave an immense impetus to trade and industry. The next was held in 1867, for which 10,000,000 francs were subscribed, and there were 52,000 exhibitors, of whom 16,000 were French. It lasted from April 1st to November 3d, covered an area of 687,000 square metres, and resulted in a surplus of 2,719,000 francs. The Exhibition was visited by an immense number of persons, including no less than 57 princes. It was located on the Champ de Mars, and the Machinery Hall was the great attraction. The magnificent Exhibition in 1878 comprised the Champ de Mars, Quai d'Orsay, and the newly erected Trocadéro. There were 52,835 exhibitors, of whom about half — 25,872 — were French. The visitors numbered 16,100,000, but still there was a deficit of 38,000,000 francs on account of the expensive buildings, many of which were intended to be permanent. The last Paris Exhibition, of 1889, far outshone its predecessor, the number of visitors being 32,500,000, or more than twice that in 1869, whilst the number of exhibitors had risen to 55,486, of whom 30,122 were French, and no doubt this splendid record will be beaten by the one of 1900. — *Engineering.*

DEEP-WATER DIVING OPERATIONS. — Lake Huron divers have accomplished the feat of recovering a cargo of 600 tons of copper from a wreck submerged to a depth of 160 feet, where it had been for thirty-two years. — *Exchange.*

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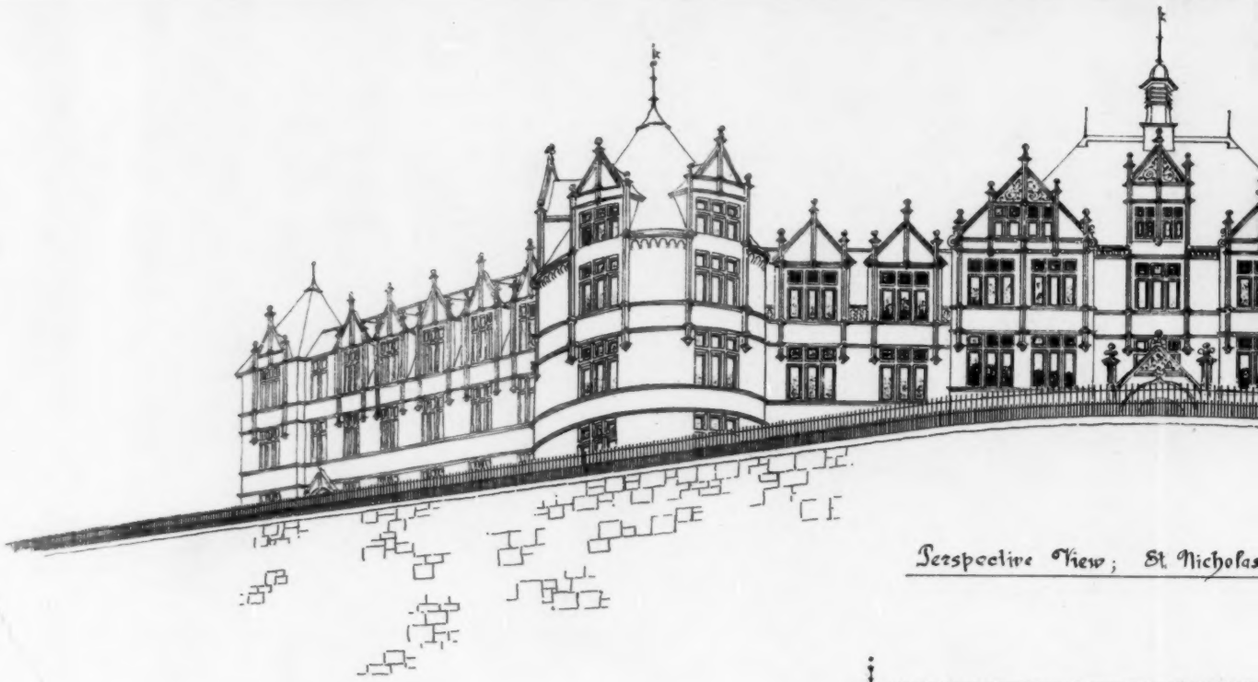
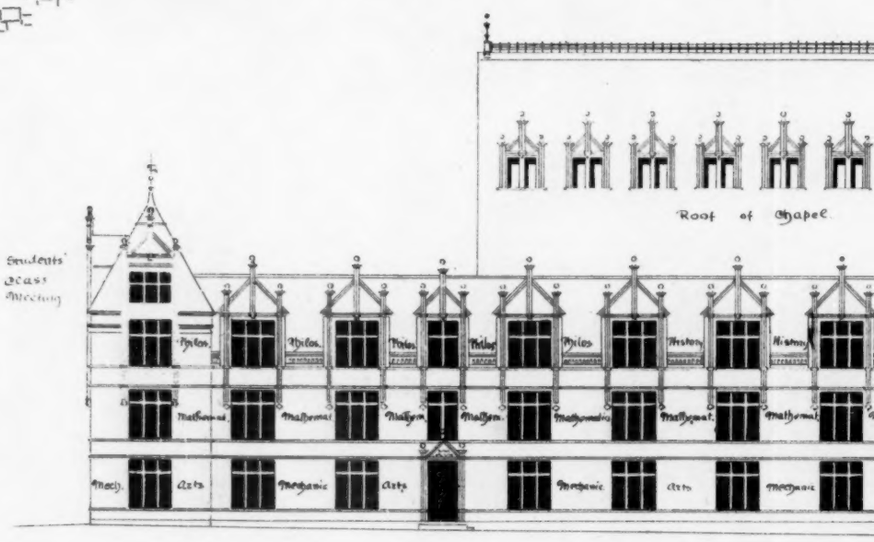
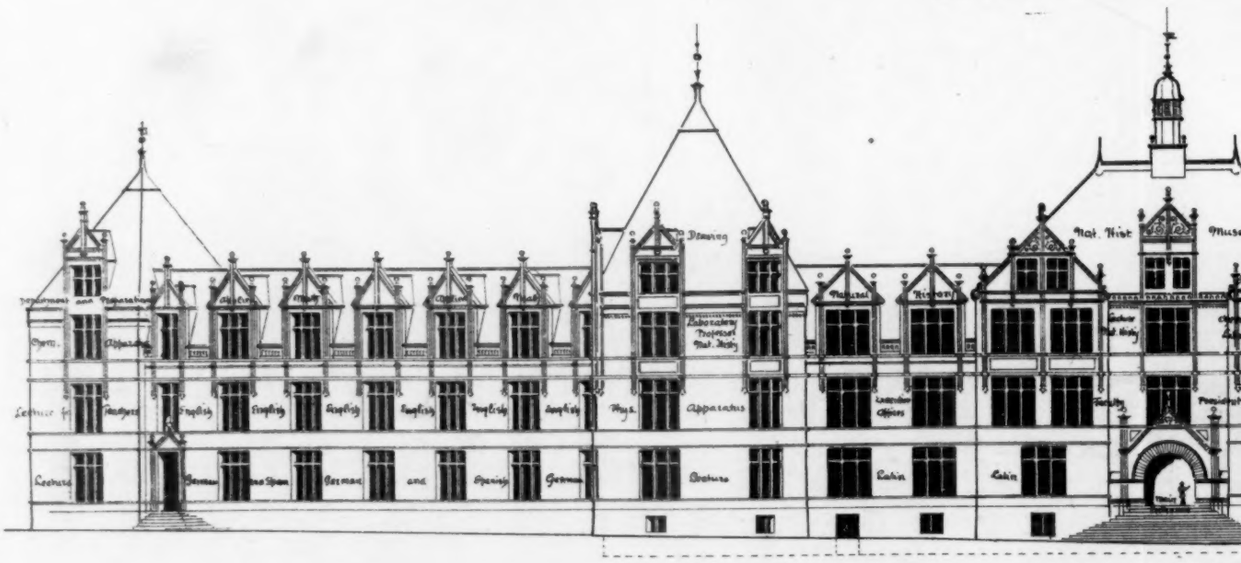


Perspective View; St. Nicholas



Elevation on 138th



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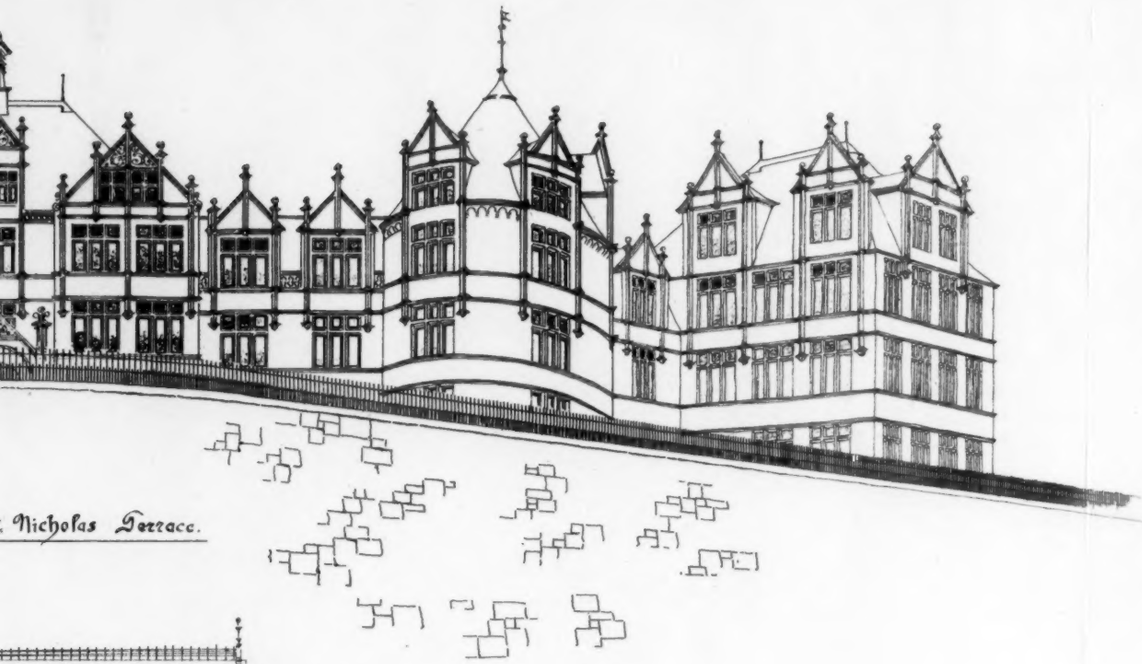

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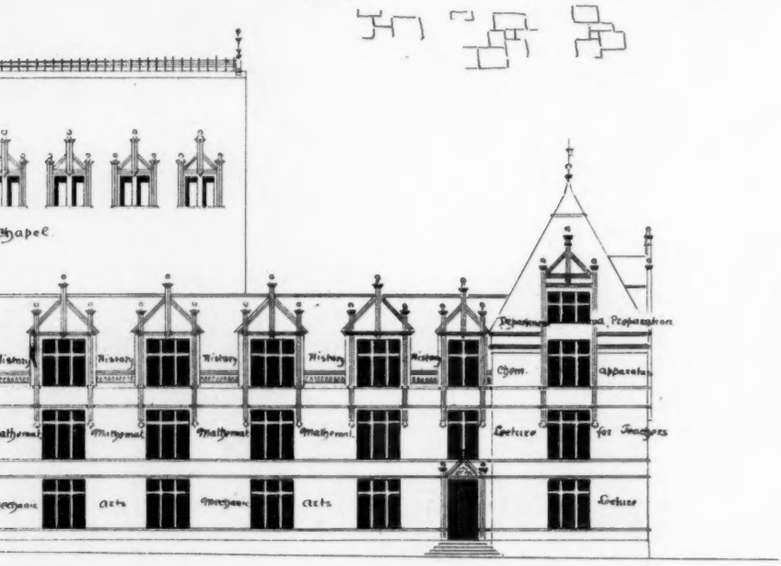

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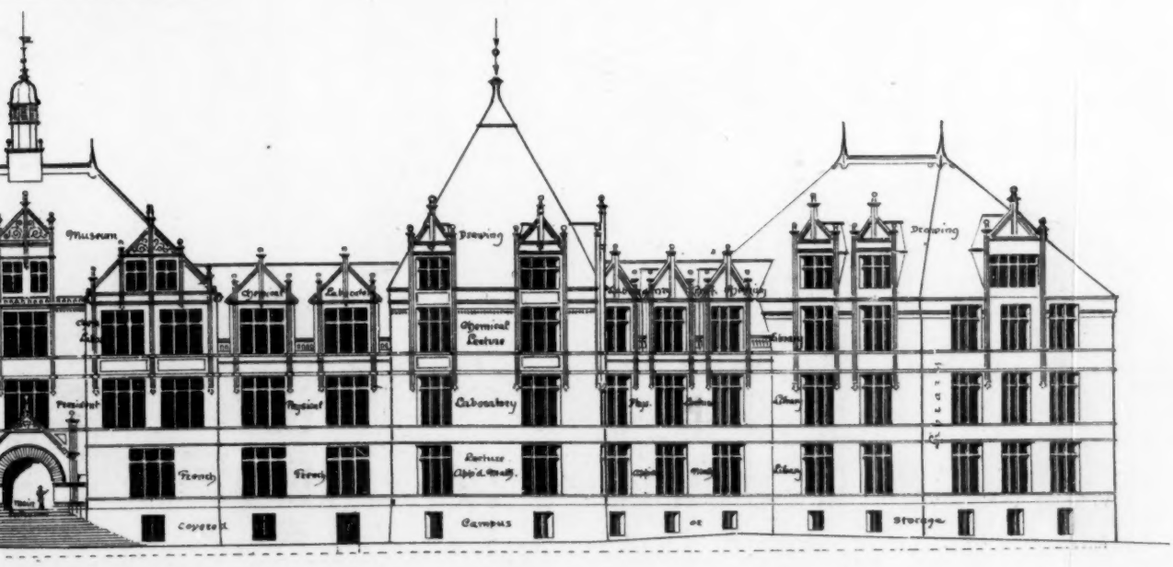

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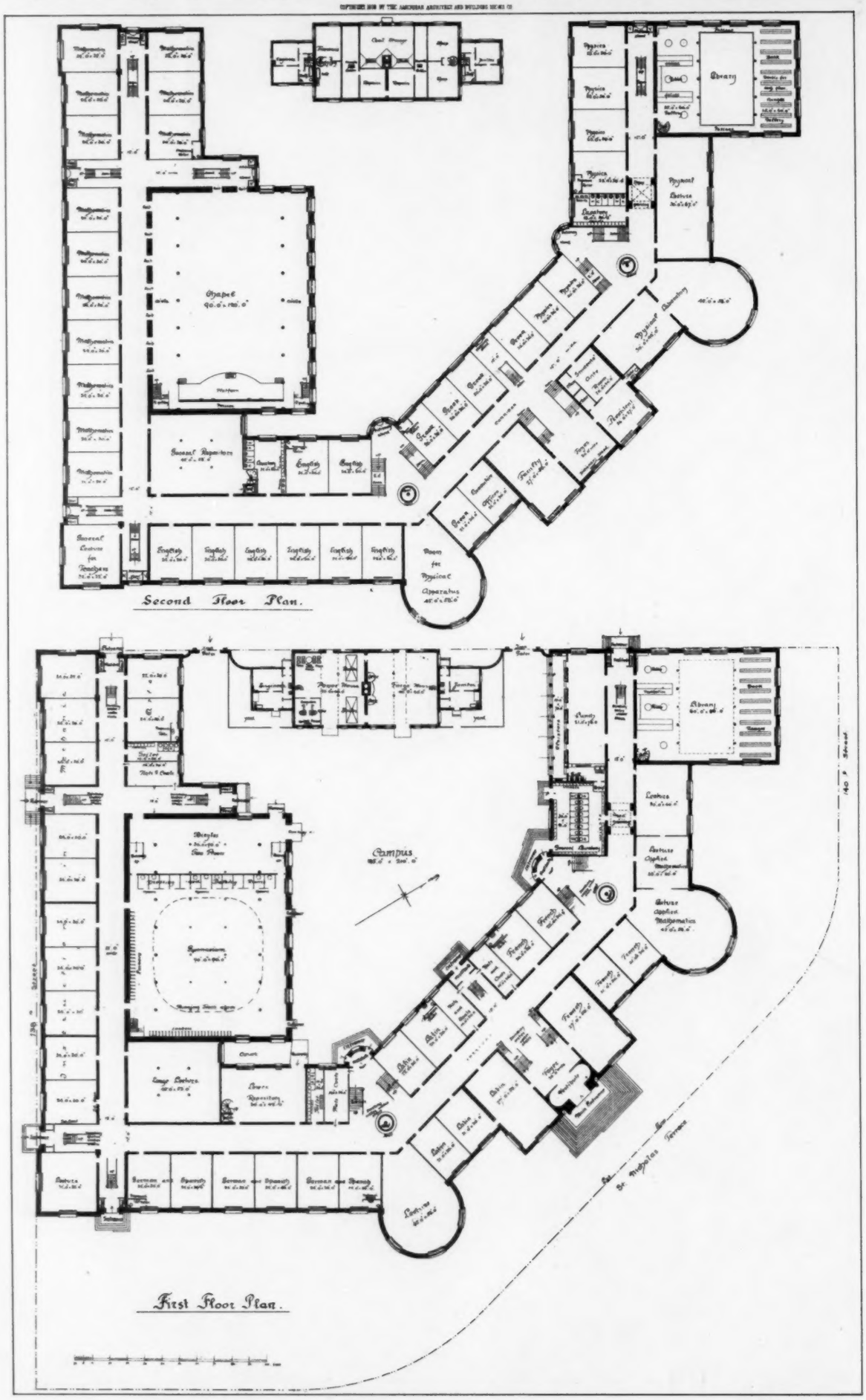

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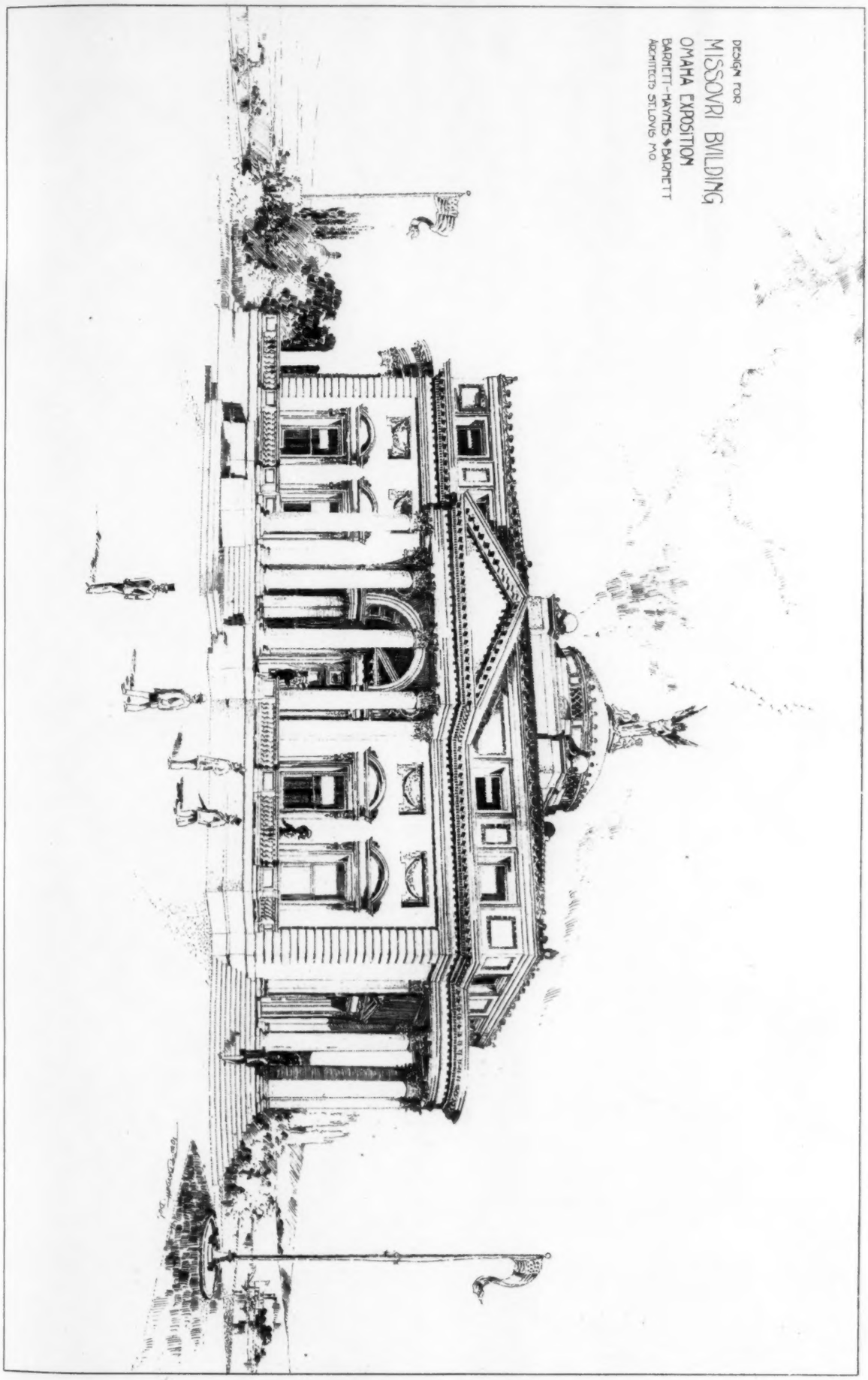

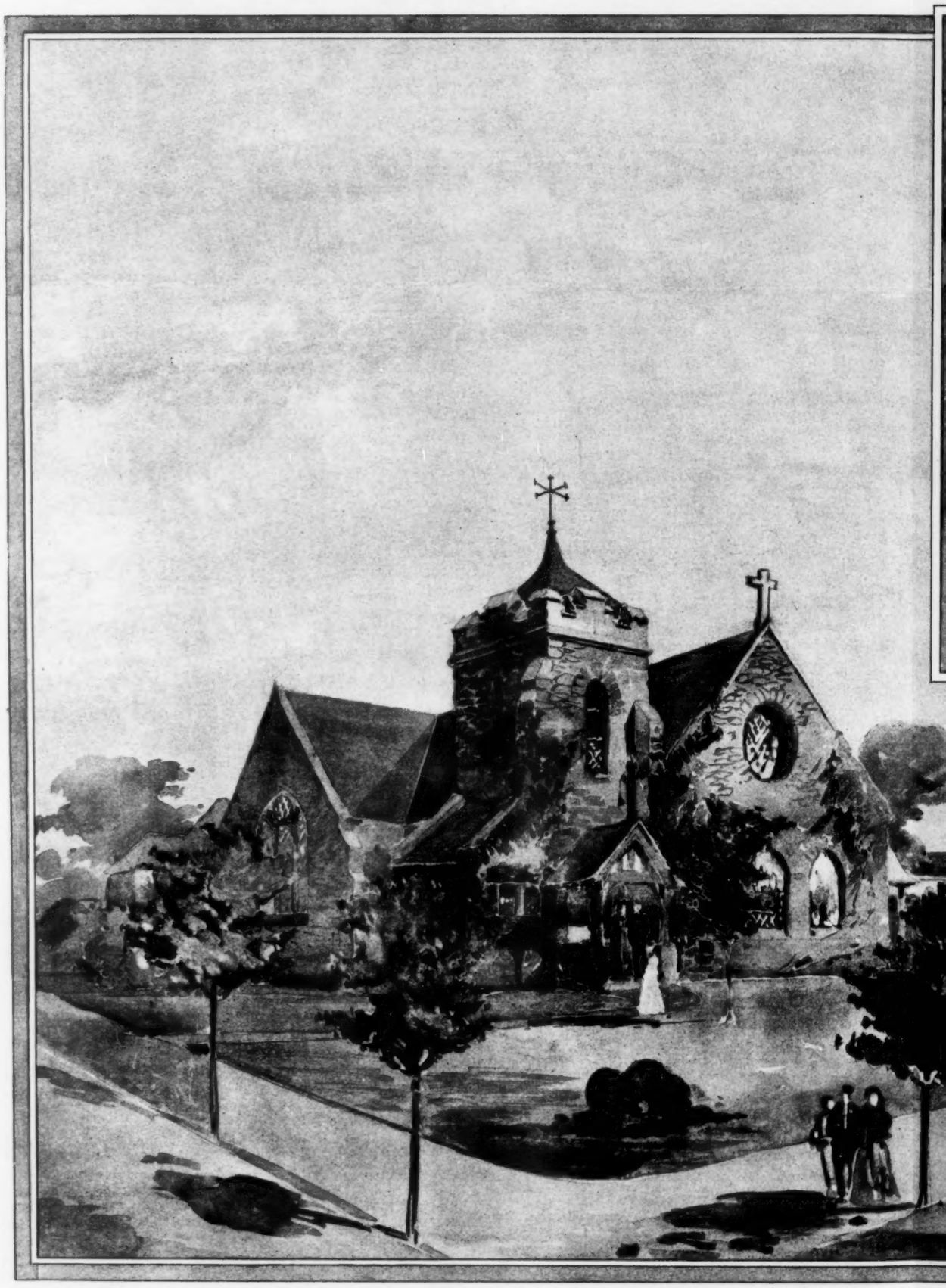

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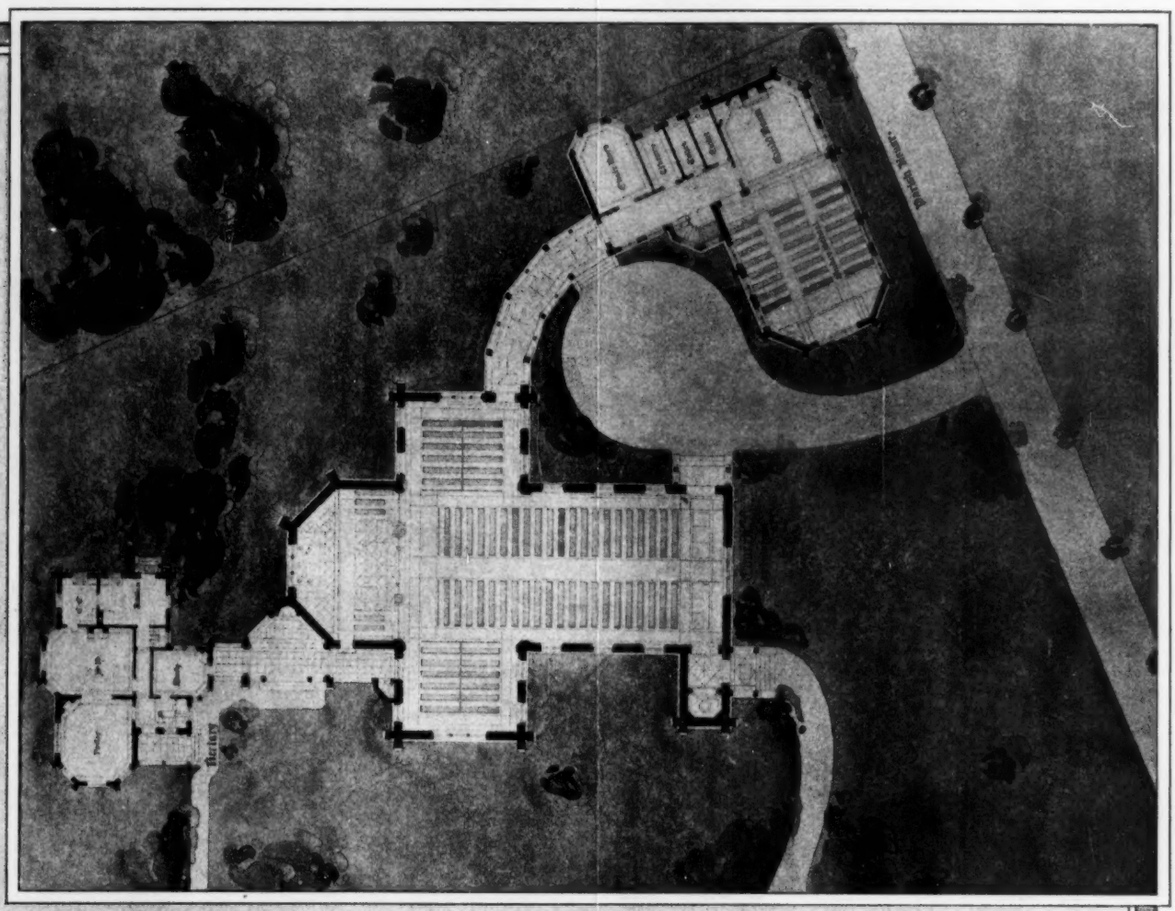

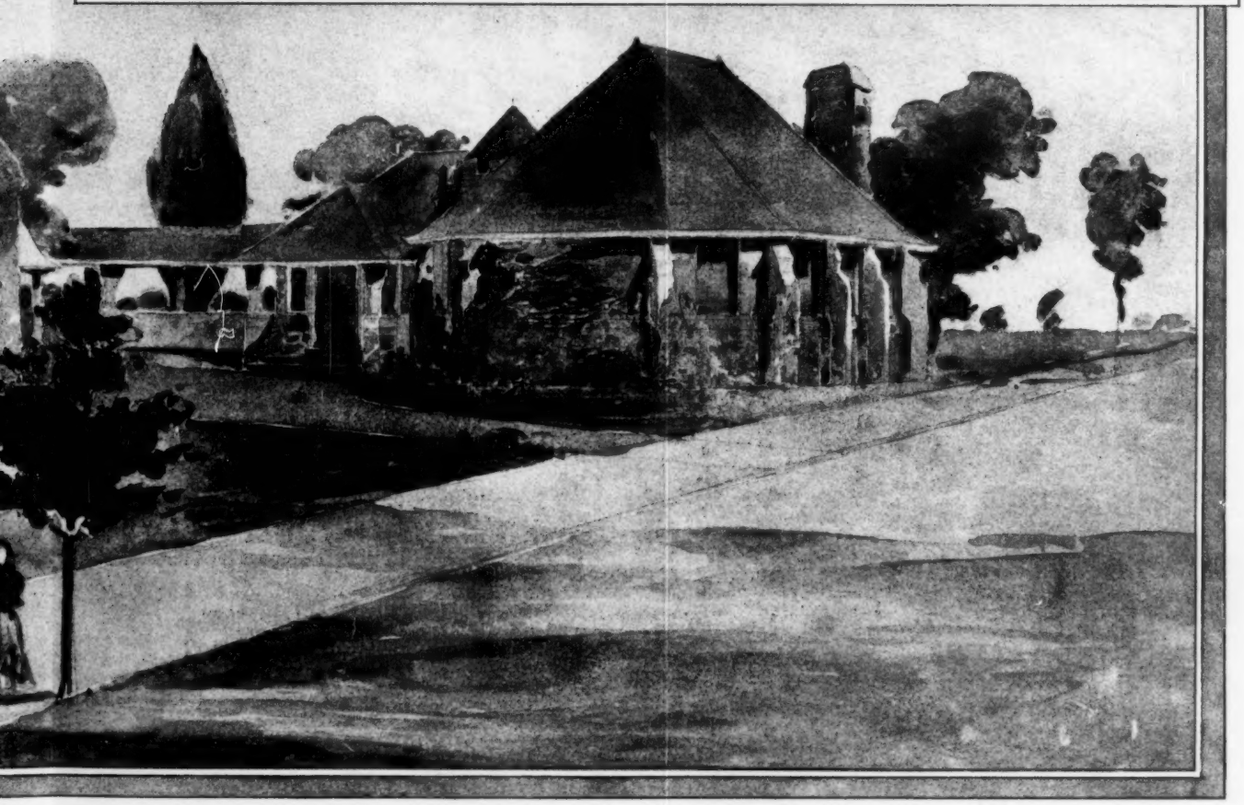

SH BUILDINGS, UPPER MONTCLAIR, N. J.

WALLIS, ARCHITECT.

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many houses and other structures in and about New York. He was one of the founders of the Mason Builders' Association of New York, and a member of the Catholic Club.

IT is always dangerous to place reliance on the reports of cases involving liability of employers or others for personal injuries, for the reason that the important questions, such as those of the contributory negligence of the person injured, or the insufficient care of the other party, are matters for the jury, which will draw almost any inference that it chooses from the testimony. Nevertheless, some information can be derived from decisions of courts on the subject, and this week's papers happen to record some interesting ones. In the case of Van Orden *vs.* Acken, the Appellate Division of the New York Supreme Court reversed the decision of a lower court, holding an employer liable for injury caused by the fall of a brick through an opening in the floor, and said that it was not shown that the fall of a brick, or fragment of other material, during the construction of a large building, was so unusual a thing that negligence could be inferred from the fact of the fall alone; nor did the evidence show any omission on the part of the defendant to provide the usual and proper safeguards; on the contrary, it was shown that safeguards were provided; that the plaintiff knew the condition of the building, and chose to take a position near the opening; and on this showing the decision of the lower court was reversed.

IN another case, Hannagan *vs.* Smith, a hod-carrier was employed to put hods on an elevator. The place where he had to work appeared to him insecure, and he told the foreman so, and the foreman told him to go ahead, and the floor should be planked over and made all right. The plaintiff, therefore, went to work, but the foreman did nothing to make the floor safe, and, two days later, it gave way, and the plaintiff was injured. The court below held that the plaintiff knew that the place was dangerous, as he had himself pointed out the danger to the foreman, and that if, knowing this, he continued to work, in the face of danger, he could not be said to have been himself free from contributory negligence, and could not recover; and the Appellate Division affirmed this decision. In a third case, the Otis Brothers & Company corporation was sued for negligently causing the death of George Lipp. It appeared that a man named Jurgensen, employed by the Otis Company, was at work on the pipes and valves of the elevator machinery in a new building. He turned steam into the exhaust-pipe, without looking to see whether the drip-valve from the exhaust-pipe was open. He knew, or should have known, that a little steam had been escaping into the exhaust through the previous night, and he knew, or should have known, that if the drip-valve was shut, the exhaust-pipe would probably be partly filled with water condensed from the escaping steam, and that to turn live steam into the pipe without clearing it by opening the drip-valve would thus result in driving a stream of hot water out of the upper orifice of the exhaust-pipe, above the roof, endangering persons who happened to be near. Lipp was, at that moment, fitting stone in a balustrade at the top of the building, and was struck by the stream of hot water, and so injured that he died; and the court, both in the first trial, and on appeal, held that the Otis Company, by the negligence of its servant, was answerable for his death. One of the judges of the Appellate Division gave a dissenting opinion, not upon the question of law, but simply on the ground that the evidence did not support the finding of the jury, that Jurgensen turned on the steam without examining the drip-valve.

A THIEF was overtaken by justice in New York the other day in what must have seemed to him a miraculous fashion. A policeman was standing, late one night, on Eighth Avenue, near a manhole of the Metropolitan Railway, when he saw the manhole cover fly into the air, followed by a flash of light, a report, and a dark object. When the dark object came down again, it proved to be a man. He gathered himself up, and ran away, and the policeman followed, and captured him, together with a saw and a lot of wire. As the aëronaut would give no account of his adventures, he was taken to the station-house, and locked up on a charge of stealing wire from the conduits. As a large amount of wire and lead pipe has been taken from the underground trolley conduits, it is supposed that the prisoner had been at work for a long time. On the night of his capture, the electric current was turned for the first time into the trolley-wires, and some short-circuit, perhaps caused by his operations, probably ignited gas in the conduits, propelling the sinner into the hands of retribution.

A NEW process for producing photographs in natural colors, which has been put in operation by the Messrs. Lumière, of Lyons, is simple enough to invite the attention of amateurs. Most of these know something of the Ives process, by which three negatives are taken of the same object, using three different colored screens, or "ray-filters," by means of which each negative represents a certain color only in the object. Usually, a plate for printing, in gelatine or half-tone, is then made from each negative, and the appropriate colors printed, one above another, from each plate. In the Lumière process, three negatives are taken, using screens of orange, green and violet, but the prints are made on a gelatine film, prepared in a novel way. A ten-per-cent solution of glue, or of gelatine soluble in cold water, is mixed with five per cent of bichromate of ammonia, and from five to ten per cent of bromide of silver, and the whole made into an emulsion, which is thinly spread on glass. A print is taken on this surface from one of the three negatives, the gelatine not rendered insoluble by the action of light washed away with cold water, and the plate dyed with a color corresponding to the negative used. The bromide of silver still remains in the film, but may be removed with hyposulphite of soda. A thin coat of collodion may then be spread over the film, followed by a second layer of the bichromated gelatine, on which an impression is taken from a second negative; and the process is repeated with the third negative. This completes the scale of colors, and the picture may remain on the glass, or be transferred to paper. The action of the bromide of silver consists simply in modifying the effect of light on the bichromated gelatine, so as to produce half-tints and gradation; and various precipitates insoluble in water, but soluble in other mediums, may be used instead of it.

WHERE is to be at the Paris Exposition of 1900 a wheel, somewhat similar to the Ferris Wheel at Chicago, but larger, to be used, like the Ferris wheel, for lifting passengers to a height of more than three hundred feet from the ground, to a point from which they can enjoy the view over the city. So far, the idea is not particularly novel, but the construction of the wheel presents innovations of a startling kind. In comparison with the Ferris wheel, the Paris structure is a very light affair, consisting of a rim, of lattice construction, the alternate verticals of which are extended outward, so as to form posts, forty swinging cars being suspended from the ends of these posts, so far out as to swing free of the transverse members of the latticed rim. This, in itself, must give very much the effect of a balloon ascension to a ride on the wheel, but a still more remarkable peculiarity of design is to be found in the fact that, as the affair is described and shown in *La Semaine des Constructeurs*, the rim is connected with the axle, which consists of a heavy forging, solely by wire ropes. It is evident that, as the whole weight of the wheel and its load hangs always suspended by the ropes which happen at the moment to be below the line of the axle, the affair cannot fall, provided the ropes are strong enough to carry the burden, and the latticed rim is properly braced to withstand the strains which would be produced in it by the shifting of the loads; but a factor of great, and, so far, undetermined, importance is to be found in the inevitable stretching of the radial ropes. Obviously, a very small stretching of these ropes will permit the deformation of the rim, introducing new and energetic strains into the lattice structure, at the same time that it will allow its lateral displacement, through the effort of the wind or otherwise, still further varying and increasing the strains on certain portions of the structure; and, although the wrapping of the ropes around the axle, consequent upon their stretching, would not prevent the rotation of the wheel, which is propelled by ropes passing around the rim, it would produce important additional strains, both on the ropes and the structure.

EARTHQUAKES continue in California, to the alarm of the inhabitants of the Pacific coast. In a shock at Mendocino, a week or so ago, many chimneys were thrown down, houses were cracked and monuments in the cemetery were thrown down or shaken out of place, while seams, a hundred feet long in at least one case, appeared in the ground. Careful measurements at the nearest observatory showed a horizontal movement of the ground of a quarter of an inch amplitude, but the motion was probably much greater in the districts particularly affected.

THE MEDIÆVAL CAMPANILI OF ROME.[1] — II.

Fig. 7. S. Marco.

SO far as this outline of the events occurring in Rome up to the time of the Norman arrival guides us, it is evident that the campanili can only have been erected during those intervals of peace I have mentioned, or at a period some time subsequent to the siege, when Rome had sufficiently recovered from its ruin and poverty; but only an examination of the details of these buildings, as apart from the statements of historians, will enable us to form an opinion as to the probability of their erection previous to the end of the tenth century, or the possibility of this having taken place after the middle of the twelfth century.

In referring to the buildings of the time of Leo III (705–815), Gregorovius[2]: —

"A certain littleness is therefore everywhere perceptible in buildings of the period The brick decoration of the friezes below the roofs, the composition of the usually small towers, with arched windows divided by columns, the ornamentation of the tower façades with round plates of various colored marbles — all give evidence of a lowered standard of design. Such appears to me the character of all the churches belonging to the Carlovingian period: St. Maria in Cosmedin, Francesca Romana, Nereo and Achilles, the tower of St. Cecilia, St. Maria in Domnica."

The quotation I have already given from Professor Willis aptly described the general form of the towers, and this quotation from Gregorovius as well describes their details and decoration.

If we examine the cornices we shall find that, although there is great variety in the detail, in their form and general aspect they differ in no respect from those of later imperial times. They are simple in the extreme — two, three, or four courses of bricks, one perhaps a horizontal zigzag supported on rounded marble corbels with the brick courses repeated below. Such cornices remain intact round the Baths of Diocletian to this day, and they must have been numerous enough in Rome, in the early mediæval times, to supply those corbels used in the campanili, most of which were undoubtedly taken from ancient buildings.[3] The architraves are similar to the cornices, of two or three courses of bricks, generally with a zigzag course; but the archivolts, in their section, approach even more nearly to the Roman type, executed in brick instead of in stone. They are slightly recessed to form two orders, and have, in the place of the usual moulding, a projecting course of one or two thin tiles carried round the arch.

The columns and capitals which support the arches of the arcades appear to be a departure from the older style of building, although the shafts by themselves appear to be of the ordinary type, with the usual entasis. Many of them are fluted, as at St. Maria in Cosmedin, or scored, as at St. John Lateran. Others may have been worked for the positions they now occupy, as in St. Pudenziana, St. Salvatore della Corte, and other towers. But the capitals which they all carry, and on which the arches directly rest, are of a novel and peculiar character, without a parallel in earlier Roman work; and are neither more nor less than a lintel resting directly on the shaft, the length of which was made equal to the thickness of the wall; and it thus forms a bracket capital resting on a mid-wall shaft.

Fig. 8. Sta. Maria in Cosmedin.

The necessity for some such expedient is obvious as soon as the use of the mid-wall shaft was adopted; but there being no precedent for such a feature in earlier work, a rude imitation of an architrave was devised and set directly on the shaft. The first use of this form cannot now be determined, but the germs of the arrangement appear in the arcades of the golden gateway of Diocletian's palace at Spalato, where the architraves, supported by detached shafts, form a corbelling to carry the arches above.[4] According to Hübsch, similar capitals are to be seen at St. Apollinare in Classe, at Ravenna, dating about the middle of the sixth century; but these appear to be even more shaped and finished than the Roman examples. But, whatever their origin, their use seems to have been abandoned in Rome before the end of the eleventh century, for we find that in the tower of SS. Quattro Coronati, which was rebuilt by Paschal II, about 1117, that is, after its destruction by Guiscard, both the bracket and shaft have disappeared, and in place of them is found a pier, oblong on plan, with concave sides carrying a capital moulded of the same plan as the pier.[5] In the cloisters of St. Paul beyond the walls, and in those by Vasilectus at St. John Lateran, erected, in all probability, between 1150 and 1200, the shafts are coupled longways on plan to the width of the walls, with perfect capitals, and with the moulded abaci forming the springing of the arches. It seems incredible that these most beautiful and finished arcades should be contemporary with the comparatively coarse and rude constructions of the normal campanili. . . .

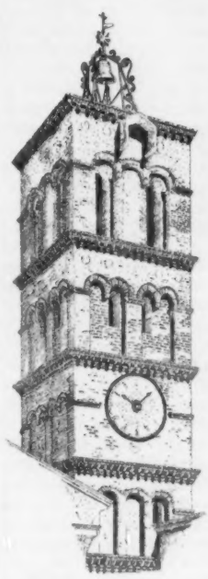

Fig. 9. Sta. Maria in Trastevere.

The proportion of the stages into which the campanili are divided varies considerably. The stages, above the lowest one, generally form a cube, the height of the story, including its cornice, being equal to the width; such are St. Pudenziana and St. Michele. Sometimes they are less in height, as St. Silvestro in Capite and St. Prassede; or higher, as in St. Eusebio. In the cases of St. Maria in Trastevere and St. Francesca Romana the top stage is higher than those immediately below it. The dimensions of these towers vary very much in height, but not in width, which may be taken to average about 15 feet, the widest being St. Cecilia and St. Maria in Trastevere, and the smallest St. Maria in Capella, which is only 8 feet square. One of the loftiest of the towers, St. Maria in Cosmedin, which has eight stages, is 112 feet high, and St. Maria in Montecelli, which is five stages high, about 80 feet.

The disposition of the openings of the arcades, although the details differ, may be divided into two groups, omitting two or three of the smaller towers in Trastevere. The first group has, on the highest stage, two pairs of openings, each pair with a central shaft, and with a pier separating them. Of the campanili thus arranged there are nine, of which St. Francesca Romana is an example. The second group has the openings arranged as a triplet, with two shafts, and of these there are nineteen, of which St. Pudenziana is a good example. The stages below the upper one frequently repeat its arrangement, but the arches become less in number and cease to be coupled before the lowest stage is reached.

Before describing the decoration of these campanili, I should like to point out the great difference they present, in their general design, to the towers erected in other parts of Italy. We may take as a fair and well-known example of a dated north Italian tower the one to the left of the front of St. Ambrogio at Milan. This was built, according to Cattaneo,[6] in 1129. Here, as in all north Italian towers of this period, all the lines are vertical, formed of flat pilasters repeated four times on each face, insignificant corbel-tables of small arches, no window openings or arcades, and no cornices anywhere to break the vertical lines; save that it is square on plan, nothing more unlike the Roman examples could be imagined. Again, at St. Satiro,[7] in the same city, is a campanile which has the same vertical pilasters, the same corbel-tables, and absence of all cornices, but with this difference, that there are double openings in the two upper

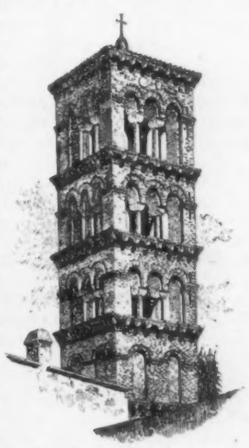

Fig. 10. S. Michele in Borgo.

[1] Continued from No. 1164, page 20.

[2] *Ibid*, vol. iii, p. 25.

[3] Lockyer's description of the cornices of St. Maria in Cosmedin is: "Cornices composed of nine courses of bricks one inch thick, with small marble consoles three inches high and four inches broad introduced between the fourth and seventh courses. The mortar joints are generally as wide as the brick courses."

[4] Adam; also Fergusson's *Handbook*, vol. i, p. 379, fig. 247.

[5] The brackets to be seen in German Romanesque architecture are not to be confounded with the Roman examples, as the former have a complete capital to the shaft of the ordinary character of the style, and the corbel or bracket capital is superimposed upon this. One of the best examples of this treatment is to be seen in the gallery surrounding the upper church of Schwarz-Rheindorf (1149–151).

[6] "*Cattaneo*," p. 228.

[7] *Ibid*, p. 236.

FRONT AND BACK VIEWS: "BARON'S DOWNS," LEWES, SUSSEX, ENG. MR. ARNOLD MITCHELL, ARCHITECT.

NO. 76 FITZJOHN'S AVE., HAMPSTEAD, LONDON, ENG. MESSRS. WYLSON & LONG, ARCHITECTS.

STATUE OF ST. JOHN THE BAPTIST, BERKHAMSTED SCHOOL CHAPEL. MR. G. W. ILIFFE WILSON, SCULPTOR.

COMMUNICATIONS

[*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.*]

COST OF THE NEWARK HIGH-SCHOOL BUILDING.

NEW YORK, N. Y., April 11, 1898.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs, — In turning the pages of the *American Architect* for 1897, recently back from the binders, I came across a communication from Mr. William Atkinson, of Boston, relative to the Newark High-school Competition, which had at the time of his writing (January 11, 1897) been recently advertised in your pages. Mr. Atkinson in this communication warned his fellow-architects in general against having "anything to do with such an absurd affair," because of the absolute impossibility of meeting the requirements of the programme within the limit of cost stipulated by its conditions. This limit was the sum of $200,000; and Mr. Atkinson endeavored to prove by an elaborate array of figures that "the lowest possible estimate for which this building could be built" was "$299,999.99 (or, in round numbers, three hundred thousand dollars)."

It may interest Mr. Atkinson and your readers to learn what has been the actual result of the competition.

Fifty-one architects entered the contest, in spite of its absurdity, and the design of Messrs. Howard & Cauldwell of New York was, after some weeks of unsuccessful political manœuvring by certain members of the Board of Education who sought to overthrow the award made by the undersigned as expert adviser to the Board, finally adopted and bids invited upon it. The requirements of the programme had, however, been increased by requiring three fireproof floors instead of one; and the Board further insisted on dividing the contracts for its erection.

The contracts were finally signed for a total sum of $195,600; and the building is now under construction and well advanced towards completion. The work has so far been done in the most substantial and satisfactory manner, and there has been no trouble from skimped work or inferior materials. I need hardly add that there was no reduction in the original requirements to allow for the increased cost of the extra fireproofing, and that the completed building will in every respect meet the programme of the original competition.

As the question of requirements *versus* possibilities in competitions is so often difficult, and the outcome so often unsatisfactory, I think the above facts should be generally known in the profession.

Yours truly, A. D. F. HAMLIN.

NOTES & CLIPPINGS

GERMAN FIREMEN'S ARMOR. — The German firemen's clothes can be inflated with water if occasion requires it. The blouse and trousers are made of a double layer of canvas, and by means of a tap attached to the hose for this purpose a fireman can fill with water immediately the waterproof space between the two layers. If too much water is poured in, the surplus escapes through a valve, and pours down over the wearer like a fountain, thus doubly protecting him from the flames. The smoke-helmet is also used by Germans, as, indeed, by all Continental firemen. It serves as an air-chamber, which is filled by an air-pump, with which the fireman is provided. By this means the lungs are supplied with air and the head kept cool, while the escaping air clears away the smoke and enables the fireman to see what he is doing. Thus the fireman is able to enter a burning room and fight the fire at close quarters. — *Household Word.*

A NEW ELECTRIC HEATER. — In a former note I wrote of the researches of M. F. Le Roy upon crystallized silicon and its applications in electric heating and cooking. At the February meeting of the Ingénieurs Civils de France, M. Le Roy entertained the audience with this interesting matter. . . . It results from his figures, not including coal in the comparison, that for the heating of rooms with the most perfect gas-stoves an expense of 100 francs is needed, as against an expense of 120 francs with electricity, and with apparatus such as the silicon electric heaters the expense becomes only half that for gas. For cooking, an expense of 100 francs for gas corresponds to a cost of 250 francs for electricity. M. Le Roy showed two pieces of apparatus typical of his system, a stove and a small cooking-range. This system consists essentially of "electric logs" or rods of silicon crystals properly agglomerated and enclosed in glass tubes to avoid oxidation. These tubes are brought to a temperature of about 1,000 degrees centigrade by the current. The utensils heated may be of any form and for any use, and one, two or more tubes can be connected according to the service desired. Their life is very long, experimental results of from 1,500 to 1,800 hours having been obtained. The work upon them is still in the laboratory stage of development, and has not yet reached a commercial scale. The price of the tubes will be about three francs (60 cents). The stove shown to the society contained twelve of the tubes, each consuming from eighty to one hundred watts, the total power absorbed being about 1,200 watts. The "electric logs" can be adapted to all sorts of heating and cooking utensils, and seem to have a high economy. — *Paris letter to The Electrical World.*

THE ARCHITECT TURNED ARTIST. — The quickest route to fortune is sometimes via folly. Many a man struggles for years in the most approved manner without getting an inch nearer his goal. Many a man abandons hope, and sinks and sinks till at last it seems that nothing short of a miracle can by any conceivable possibility restore his self-esteem. Then some freak of unfettered madness does what fixity of purpose and diligent application failed to do — it leads to peace, ease, and riches. Some years since a middle-aged architect threw up his practice and devoted himself wholly to art. His old profession had not been at all satisfactory from a financial point-of-view, but his new one proved to be worse. Truth to tell, he was a wretched dauber, and it was against the advice of all who were competent to advise him that he had turned to painting. He had consequently a struggle to exist, his work appealing solely to frequenters of auction-rooms. Eventually a dealer conveyed to him the glad tidings that he had sold one of his pictures, and that he would be pleased to order others on the same terms. Cheered by this news, he set to work resolutely, and for two or three years he had an unbroken run of success. Everything which left his easel was disposed of through the dealer, though the artist could not discover the identity of his patrons. One day a solicitor informed him that a certain gentleman — somebody whose name even was quite strange to him — had bequeathed to him a number of oil-paintings. Naturally, the artist took the earliest opportunity of inspecting his windfall. When he saw the works he nearly swooned. They were his own pictures — all that the dealer had sold! To this day the artist has not discovered why the deceased gentleman acted so strangely. The paintings which were returned to him were unsalable except through the old channels, and as a consequence the legatee, cured of his folly, burnt his easels, canvases, etc., and turned his back on art. Meanwhile, he had, thanks to his patron, saved a considerable sum of money. With this he started in business, and is now prospering. — *Invention.*

PARIS EXHIBITIONS. — The first Paris Exhibition was held in the year 1798; it comprised the modest total of 110 exhibitors, and the expenditure was in proportion, only 60,000 francs. The Exhibition buildings were of wood and decorated, and were located on the Champ de Mars, about the same place as the Great Exhibition of 1889. The number of medals distributed was 25! The second Exhibition was three years later, in 1801, held in the courtyard of the Louvre, and comprised 220 exhibitors, which put the former completely in the shade. A third Exhibition was held the following year on the same spot, the number of exhibitors having risen to 540. Napoleon the Great opened the fourth Exhibition, held at the Place des Invalides in the year 1806. There were 1,422 exhibitors, and several grand fêtes were held in connection with it. Number five of Paris Exhibitions was held in the year 1819, in the Louvre Palace, the number of exhibitors being 1,622. The sixth was held in 1823, but was not of much importance. Number seven was also held at the Louvre, in 1827, under the reign of Charles X, but, like its predecessor, it was on a more modest scale. The eighth, however, held during the reign of Louis Philippe, at Place de la Concorde, was a great success, the exhibitors numbering 2,447. This figure had increased to 3,381 at the Exhibition held in the year 1839 at Champs Elysées, and to 3,960 exhibitors at the one held five years later, also at Champs Elysées, which site also was chosen for the Exhibition in 1849. The State grant on that occasion rose to 600,000 francs, and the buildings covered an area of 22,000 square metres. The first world's exhibition proper was opened in the Industrial Palace in the year 1855, when the State grant had risen to 11,500,000 francs, and the area covered to 168,000 square metres. There were 23,954 exhibitors, and the number of visitors reached 5,160,000 persons. This exhibition gave an immense impetus to trade and industry. The next was held in 1867, for which 10,000,000 francs were subscribed, and there were 52,000 exhibitors, of whom 16,000 were French. It lasted from April 1st to November 3d, covered an area of 687,000 square metres, and resulted in a surplus of 2,719,000 francs. The Exhibition was visited by an immense number of persons, including no less than 57 princes. It was located on the Champ de Mars, and the Machinery Hall was the great attraction. The magnificent Exhibition in 1878 comprised the Champ de Mars, Quai d'Orsay, and the newly erected Trocadéro. There were 52,835 exhibitors, of whom about half — 25,872 — were French. The visitors numbered 16,100,000, but still there was a deficit of 38,000,000 francs on account of the expensive buildings, many of which were intended to be permanent. The last Paris Exhibition, of 1889, far outshone its predecessor, the number of visitors being 32,500,000, or more than twice that in 1869, whilst the number of exhibitors had risen to 55,486, of whom 30,122 were French, and no doubt this splendid record will be beaten by the one of 1900. — *Engineering.*

DEEP-WATER DIVING OPERATIONS. — Lake Huron divers have accomplished the feat of recovering a cargo of 600 tons of copper from a wreck submerged to a depth of 160 feet, where it had been for thirty-two years. — *Exchange.*

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