THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL XII. Copyright, 1882, JAMES R. OSGOOD & Co., Boston, Mass. No. 364.

DECEMBER 16, 1882.

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

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THE complaints about the obstruction caused to travel in New York by the work of laying steam-pipes in the streets grow louder and more frequent; but as the Department of Public Works has forbidden any further disturbance of the pavements until spring opens, the citizens will have a respite from their troubles; unless, indeed, the packing of a valve should blow out, or some other accident should happen which would render it absolutely necessary to dig down to the pipes. So great is the inconvenience, in some cases, caused by these operations, that a popular demand has arisen that the companies should be compelled, on resuming their work, to confine their labors in the streets to the night, leaving them unobstructed during the day; but the franchises granted by the city government are so liberal that it would be impracticable to curtail them now by any such restriction. Mr. Hamlin, however, the Deputy Commissioner of Public Works, makes the suggestion that it might be within the power of the city authorities to insist upon the speedy completion of the work, and for that end to require that it should be prosecuted by night as well as by day. This would at least shorten the time during which the companies will hold possession of the streets, and so much the citizens, it would seem, might justly require. In view of the multifarious circumstances under which thoroughfares in towns are now obstructed or torn up altogether, it might perhaps be worth considering whether such a city as New York would not find it profitable to construct subways through at least the more important streets, with the idea of renting the use of them to such individuals or corporations as may be willing to pay for the privilege. If, for instance, a conduit were built under Broadway, Sixth Avenue, Fourteenth or Twenty-third Street, its value as a drain for surface-water would go far to pay the expense of constructing it, while sewage proper could be carried through it, with great advantage in all respects, in small, tight, but accessible pipes. Besides these public purposes, it would be available for conveying gas, steam and water pipes, and pneumatic tubes, such as are now employed for various uses; while telegraph, telephone and electric-light wires, which must before long be banished from the streets, would find the best possible accommodation in the same space. As the gas and steam-heating companies would save an immense sum, both in cost of laying pipes and in maintenance, by being allowed to carry their lines through an open and convenient passage-way, they could afford a high price for such accommodation, and the proprietors of electrical wires would be eager to share their privileges; while the public, by a judicious outlay, might thus in the end gain, not only a certain return on its investment, but a great further advantage in the abolition of overhead wires, and the substantial prevention of street excavations, with their consequent injury to pavements and discomforts of all kinds.

A REMARKABLE paper was read at a recent meeting of the Massachusetts State Board of Agriculture, by Professor C. S. Sargent, upon the importance of devising some means to prevent the forest fires which every year lay waste thousands of acres of land, covered with valuable timber, in every State of the Union. During the year 1880, according to the census returns, the loss of property by forest fires in Pennsylvania alone was more than three million dollars, and even in the small manufacturing State of Massachusetts it was over one hundred thousand dollars in the same time, while the actual destructive effects of such conflagrations, according to Professor Sargent, far from being confined to the mere waste of a given amount of salable timber, extend through a long series of years, during which the charred soil is slowly recovering its capacity for producing another growth of wood. The succession of crops upon land which has once been burned over is very interesting. In the case of a forest of white-pine, the most valuable timber that we have, many years elapse before any tree-growth whatever springs up on the scorched surface. The vegetation which first appears consists of low herbs, particularly the so-called "fire-weed," whose light seeds will germinate even in the poorest ground. As successive growths of this decay, and vegetable mould accumulates, blackberry vines and raspberries make their appearance, springing from seeds brought by birds, and later the birches and mountain cherry-trees, sheltered in their early stages by the shade of the vines and shrubs, obtain a foothold. These are short-lived trees, but they serve to protect the ground, and as they decay are succeeded by oaks and maples, which retain possession of the territory for an indefinite period. The annual fall of their leaves steadily enriches the soil, and after a certain number of years, usually from fifty to a hundred, after the original burning, it becomes fitted to produce again the original white-pine, for which, however, the land must be cleared with the axe and subjected to cultivation.

SUCH fires, then, not only consume the trees over which they pass, but destroy for generations the value of the soil itself, and more than this, the constant danger of them continually menaces all timber-land, and drives away capital from an investment which would otherwise be both safe and profitable. This, in the words of the paper, "is a matter of special interest to New England to-day, because upon it largely depends the country's future supply of white-pine, and the greatly enhanced value in the early future of much New England land." Already, in some portions of the Eastern States, the second growth of pine upon land no longer profitable for agriculture has become of great value, and in Massachusetts alone about one million dollars' worth of this wood was cut and sold in 1880 from land once used for tillage. According to Professor Sargent, the climate and soil of New England are better suited to the production of white-pine than those of any other portion of the country, and if the young trees, of which more are already growing in this than any other section, can be protected from fires, the annual yield will, he predicts, in a few years exceed in value the net profits upon all the other crops which its farms can produce. Such a prospect as this should be, and we doubt not will be, a very pleasant one for the owners of the exhausted farms which cover so large a portion of all the New England States, and if the millions of acres now given up to useless weeds and brush-wood can as easily as Professor Sargent thinks be transformed into nurseries for the cultivation of a timber which, it is not too much to say, commands a market more steady and certain than that of any other vegetable product, a great future is in store for the landed property of that portion of the country. The only important requisite, he says, for making such territory more valuable than the best agricultural land, is a provision for securing reasonable immunity from conflagrations, and this is a matter in which stringent laws can do much, and care still more, to promote the desired end. The principal cause of forest fires is, it seems, the fall of sparks from locomotives among the trees; next to this is the carelessness of hunters, or of charcoal or brush burners, while malicious incendiarism is of rare occurrence. As a remedy against the first danger, he advocates the compulsory use of spark-arresters on all locomotives, while the accidents which arise from the other causes can be very much diminished by systematic removal of brush-wood and fallen twigs, which soon become as dry as tinder, and spread a fire rapidly through the woods.

The noble palace of the Tuileries, or rather, the piles of shattered stone which stand in its place, have been sold for thirty-three thousand francs, under the condition that the ground shall be cleared in six months. The ruin is already in a dangerous condition, and the great Salle des Maréchaux can only be entered with great risk, but everywhere can be seen the remains of the splendor which even the malice of the Commune could not entirely destroy. The original palace of the Tuileries was begun in 1564, from the designs of Philibert Delorme and Jean Bullant, as a residence for the Queen dowager, Catherine de Medici, and was then of comparatively small dimensions, comprising only the central part of the present range of buildings. The north and south wings, with the Pavillon de Flore, and the Pavillon de Marsan, which form the terminal points of the façade as it now exists, were added by Ducerceau, under Henry of Navarre, after the long wars of religion which followed the massacre of St. Bartholomew, but these were partially rebuilt and altered during the Second Empire. At present both the corner pavilions are in good repair, and are occupied by public offices, so that only the portion between them will be removed. This is chiefly remarkable for the beauty of its sculptured detail, which surpasses in delicate richness that of any other portion of the vast assemblage of buildings to which it is attached; the most famous portion of all being perhaps a range of columns, the lower part of whose shafts is covered with a network of interlacing vines. These are still standing, or were standing a few years ago, although badly broken; and it is to be hoped that some of them may be preserved for the benefit of art.

The project for a ship-canal across Cape Cod appears, if we may trust the correspondent of the St. Paul *Pioneer Press*, to have been revived in Boston. According to this journal, Mr. Nathan Appleton, a gentleman well known in Boston and in Paris, where he contracted an intimate friendship with M. de Lesseps, has filed a notice of an application to be made to the State Legislature of Massachusetts the present season for the incorporation of a company, with a capital stock of two million dollars, to complete the work which has been so many times attempted in vain. The account goes on to say that M. de Lesseps, as well as General Turr, the projector of the canal across the Isthmus of Corinth, will interest themselves in the new scheme. The real question in regard to the Cape Cod Canal seems to be, not whether it can be constructed, but whether the profits to be derived from it will ever pay interest on the outlay. The distance from the Monument River on one side of the Cape to the Scusset River on the other side is only about a mile, and the greatest elevation of the ground between them is a little over twenty-five feet; the soil is sandy, and it is thought that no rock excavation whatever will be needed. Under these circumstances, the cost of construction will be comparatively small, but the distance saved by passing through it instead of going around the Cape is so unimportant that coasting vessels will in fair weather hardly be willing to pay a heavy toll for the privilege.

Two more ship-canal schemes are in process of organization by private associations, one of which is for the construction of a passage between the Delaware and Chesapeake Bays, at a cost of some six million dollars, while the other contemplates the cutting of a canal across the peninsula of Florida, connecting the Gulf of Mexico with the Atlantic Ocean, at an expense of about five million dollars. Both of these enterprises, besides their obvious benefit to the ports of New Orleans and Baltimore, will be of advantage to the general coasting trade of the country, which now reaches very large proportions, and the Florida Canal may possibly derive some benefit from the freight traffic which will pass over the Tehuantepec ship-railway, if that should ever be constructed, as its projector, Captain Eads, thinks will certainly be the case.

The question of accepting the gift of the State of Massachusetts to the city of Boston, of land for a public library building has received attention in the municipal government, and two reports have been presented by the Committee charged with its consideration. The majority report favors the acceptance of the land, and the erection upon it of a building which will contain eleven hundred thousand volumes, at an estimated cost of six hundred and fifty thousand dollars. The minority report urges a different scheme, which is, in substance, after asking the consent of the State authorities to the change, to remodel the new High School building, just completed, so as to fit it for the reception of the library, and build a new High School on the lot presented by the State. The ground of this rather startling recommendation is that the new High School building is unnecessarily large, and that the present opportunity is a favorable one to get rid of it, by turning it over to the trustees of the library to adapt it to their purposes as best they can, while the School Board is making new experiments on the library land. The cost of remodelling the school building is estimated at about two hundred and fifty thousand dollars, and it is thought that a new school of a size better suited to the wants of the city, can be built for about the same sum. If there is really any economy in this remarkable scheme, it will probably be made evident in due time; for the present it would perhaps be indiscreet to comment upon it.

Shortly after the discovery of the remains of a Roman city near Poitiers, in France, explorations at Eining, in Bavaria, brought to light the ruins of another villa, or as some think, a "casino," or military club-house, attached to a permanent fortified camp. The town of Eining is situated very near the wall which was built by the Romans to resist the inroads of the Germanic tribes, and the camp at Eining was probably a part of the line of defences. The building is about one hundred by two hundred feet on plan, and is built of brick, the bricks being stamped with the names of the soldier-workmen who made and used them. These stamps fix the date of erection at the time of the reign of the Emperor Marcus Aurelius, about 170 A. D. The pavement and the hypocausta, or underground flues for heating, are in good condition, and a large quantity of thick window-glass has been found, together with many small objects, such as cups and cooking utensils, bracelets, rings, knives, scissors, keys, bells, and so on. The excavations are now discontinued for want of funds to carry them on, but contributions have been asked for, and will doubtless be readily obtained. After reading about these interesting discoveries in Europe, it is gratifying to learn that the American expedition at Assos has met with unexpected success in its labors for the past season, although particulars are reserved for the regular report of the Archæological Institute. The announcement is made that the Turkish government has decided to permit no more excavation or archæological investigation of any kind within its territory, so that the concession enjoyed by the Assos expedition is the last that will be granted, and as the labors of Dr. Humann at Pergamon have ceased, it is, with the exception, perhaps, of that held by Dr. Schliemann, the only one now in force.

A rather comic trial is going on in London, in which a sculptor, very prominent in the newspapers and general conversation, but not particularly popular among his artistic brethren, brings suit for libel against the proprietor of a newspaper which some time ago asserted that he was not really the author of the works attributed to him, but that he employed some one more skilful than himself to design and execute the statues for which he obtained the credit and remuneration. This charge is so frequently brought against sculptors that Mr. Belt was perhaps right in thinking it at first unworthy of notice, but it was reiterated so persistently as finally to threaten the entire ruin of his reputation and business, and in self-defence an action at law was brought. The evidence brought forward in the earlier portion of the trial seemed decidedly favorable to the plaintiff; many persons testified to having seen him shaping and altering his clay models, under circumstances which made deception impossible, and the assistance which he would need in roughly cutting the marble to the lines of the model was evidently legitimate enough. The opposing party, however, produced a witness, a Belgian named Verhyden, who professed to be employed by Mr. Belt, not only to do the more laborious part of the work of carrying out the master's design, but also to sketch out and model the design itself in many cases, and a diary which he kept showed the payments which he had received for such services. The most suspicious circumstance about the connection of the two sculptors seems to have been that Verhyden came to Mr. Belt's studio mostly at night, and that even then a trap-door was arranged by which he could escape unobserved in case visitors were announced; as if Mr. Belt, at least, desired to conceal the extent of his indebtedness to the skill of his assistant. What will be the result of the trial, no one can guess.

WATER-CLOSETS.[1]

WATER-CLOSETS as conveniences are so necessary, and in their proper construction are so important to our comfort and health, that we think any research into their history will repay us by increasing our knowledge on the subject.

It will be necessary in this paper to review, cursorily, other modes of convenience in countries where, and at times when, water-closets properly speaking were not in use.

Naturally, we first examine the ruins of Egypt, where existed the earliest traces of civilization, for remains of water-closets. The small private and detached rooms which we find in the remains of Egyptian houses were probably used as privies. Ewbank, in his work on hydraulics, calls the summer chamber[2] of Eglon, king of Moab, a water-closet.

If we thought proper to follow the example of Ewbank we would call water-closets the private rooms which were in an isolated position in one of the halls, being near a door communicating with the other chambers. Sir J. Gardner Wilkinson says: "These rooms bear a striking resemblance to the before-mentioned private room of Eglon."[3]

That the Greeks[4] made use of privies in their houses is proved by an old writer[5] from a passage in Aristophanes (Ecclesiaz., verse 1050). This was about four hundred years before Christ.

The Romans, if not the first in art, the leaders in all that pertained to luxury and comfort, were the first, as far as we can ascertain, to use water-closets. In Rome we find four kinds of receptacles for excreta. Close stools (*lasana*), in which the rich ancients sometimes used gold or silver bowls; vases (*gastra*) which were stationed on the roadways; public privies (*cloacina*), of which Sir William Gell tells us there were one hundred and forty-four in Rome; privies (*latrina*), probably for private use.

From their derivation we would infer the two classes last mentioned to be water-closets, *cloacina* being derived from *cloaca*, a sewer or drain, and *latrina* being a diminutive of *lavatrina*, a wash-bowl or basin. No doubt, as at the present day, the name included the room as well as the basin or receptacle contained in the room. Pompeii was covered with ashes and lava by an eruption of Mount Vesuvius more than eighteen hundred years ago, and among its ruins were found the most perfect remains of an ancient water-closet. Pompeii being a small town and a province of Rome, we would suppose the water-closets to have been more numerous and more elaborately ornamented in the capital city.

In the *Pompeiana* Sir William Gell,[6] describing a privy, writes of an arched recess about three feet deep discovered in the kitchen of one of the ruined dwellings of Pompeii, most inconveniently placed, according to American ideas (Fig. 1). The wood-work was gone when discovered, about 1819, but the marks of the hinges and fastenings were still visible. Three or four feet to one side were the remains of brick ovens. It would appear, according to a quotation from Pretonius, that in ancient Italy it was considered desirable to have in close proximity the place for the preparation of the food and the receptacle for the excreta. The privies in or adjoining the kitchen were probably for the women, while others which have been discovered at the back of the house were for the men. These chambers were sometimes finished beautifully, having tesselated pavements, and in some instances windows looking into small interior courts, an example which the moderns seem injudiciously prone to follow.

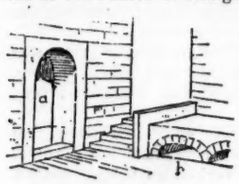


Fig. 1.
Privy in kitchen in Pompeii.
a, Niche. *b*, Ovens.

Fosbroke says, under the head of ancient water-closets,[7] "That of the Palace of the Cæsars is adorned with marble and mosaick. At the back of one is a cistern, the water of which is distributed by cocks to the different seats. The pipe and bason of one still remains at Pompeii and is like ours." (1825 A. D.)

In a paper read before the Society of Antiquaries in 1775, relating to discoveries in Pompeii, Sir William Hamilton[8] says: "Close to the Temple of Isis is a theatre, no more of which has been cleared than the scene and corridor which leads to the seats. In the corridor was a retiring-place for necessary occasions, where the pipe to convey the water, and the bason like that of our water-closets (1775) still remain, the wood of the seat only having mouldered away by time."

The above-mentioned remains, seen by Sir William Hamilton, conclusively prove the existence of water-closets more than eighteen hundred years ago, with basin, water-supply and waste for the water, and excreta must necessarily have been carried off by a drain of some kind.

In all descriptions of ancient baths we find a latrina, that near the entrance of the ruins of the one in Pompeii, mentioned and shown in the illustration, but it is in no case fully described.[9]

According to Olympiodorous there were in the Thermæ of Antoninus (about 200 A. D.) sixteen hundred seats of marble with holes like a close stool for the convenience of those who attended either the baths or the gymnasium.

Vitruvius, strange to say, does not mention water-closets or privies in his description of private houses. Both ancient and modern writers seem to avoid the subject. Ewbank states that a number of water-closets were erected near the mosques and temples in Old Rome, Smyrna, Constantinople, and probably all ancient cities. He does not give his authorities for the statement, and it would appear as if it were a little overdrawn.[10] With the decline of the Roman empire, water-closets, following her other luxuries and comforts, seem to have gone out of date.

Giving a cursory review of the privies used in the middle ages we leave unaccounted for nearly a thousand years, during which time there seem to have been no privies used inside houses. The castle of Rochester, designed in part by Bishop Gundulph about 1088, has outlets for privies and sinks similar to the outlets for smoke, in the first instance going downward, instead of upward as in the case of their chimneys.

In a paper read by Edward King[11] before the Society of Antiquaries (1782 A. D.) in relation to a Saxon castle, he says: "In one of the corners is a narrow passage to a small closet in the wall, which served for a privy, having the usual kind of an outlet through a loop." (Fig. 2.) Diagonally across from the privy is a similar passage and closet supposed to have been a well. This tower or castle was undoubtedly Saxon, having been given by William the Conqueror to William de Peverel and called the Castle on the Peake. We learn from Viollet-le-Duc[12] that castles (*châteaux*) at the commencement of the thirteenth century had privies (*latrines*) on each floor, constructed so as to avoid the inconveniences attached to these necessities. They were generally found projecting on corbels, from an angle formed by a buttress and the main wall (Figs. 3 and 4) so the fæcal matter might be cast well out and down the precipice into the woods which usually surrounded these buildings.

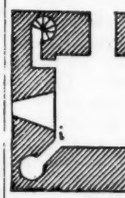


Fig 2.
Plan of Castle on the Peake.
h, Privy. *i*, Well.

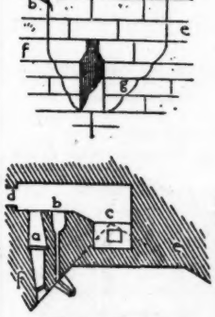


Fig. 3. — Elevation.
Fig. 4. — Plan.
Thirteenth-Century Privy.
a, Window. *b*, Urinal. *c*, Seat. *f*, Wall. *e*, Buttress. *d*, Door. *g*, Corbels.

Fig. 5. — Section.
Fig. 6. — Plan.
a, Seat. *b*, Window. *c*, Hanging T-shaped stone *d*, Corbels. *e*, Door.

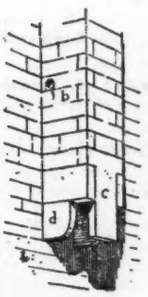


Fig. 7. — Perspective Sketch.
Landsberg Latrine.

He describes one which is corbelled from the wall and buttress in the usual way. The seat is concealed and protected from missiles by the corbels, and it communicates with the halls and stairways by a door. In the same closet there is a urinal with drain, and a drip on the outside, and also a window opening into the outer air. In the castle of Landsberg on the Lower Rhine, which dates from the twelfth century, there is one (Figs. 5, 6, and 7), that differs from the above. The seat is guarded by a rectangular projection from the wall which is supported on corbels. The seat is protected from arrows and other projectiles by a stone shaped like a T, which hangs on and below the corbels. In garrisoned castles they always had projections reserved for privies, and they were separated from the main building by small passage-ways. There are privies of this kind in the castle of Chauvigny, while the castle of Northumberland, England, has them, almost monumental in charac-

[1] A paper by Mr. Glenn Brown, architect, read at the Sixteenth Annual Convention of the American Institute of Architects, held at Cincinnati, October 26-27, 1882.

[2] *Judges*, iii, 20-25.

[3] *Egypt*, Sir J. Gardner Wilkinson, Vol. II, page 104.

[4] Viollet-le-Duc has given the Egyptians', Greeks' and Romans' privies (*latrines*) in their houses in the *Habitations of Man*, pages 92-102, 197 and 231.

[5] *Hiem de l' Academy des Sciences Inscriptions nouvellement établie à Troyes èn Champagne*. A. Troyeset, Paris. 1756.

[6] *Pompeiana*, Sir William Gell, Vol. II, page 171; illustration, page 151.

[7] *Encyclopedia of Antiquities*, Rev. Thomas Dudley Fosbroke. Page 348. 1825.

[8] *Archæologia*, Vol. IV, page 168. 1777.

[9] *Encyclopedia Britannica*, Vol. III, page 435.

[10] *Hydraulics*, Thomas Ewbank, pages 261, 562. New edition, 1876.

[11] *Archæologia*, Vol VI, page 242.

[12] *Dictionaire d' Architecture*, XIIth au XVIth siècle, Vol. VI, pages 163-170.

ter or design. The castle of Marcousis has an extension devoted to latrines, a set of four for each story (Figs. 8 and 9). There is a passage-way extending from the main building with solid stone balustrade to prevent people from falling. There is a chute or drain from each seat leading to a double-arched cesspool. This part of the building is ventilated by a large window above the highest tier of latrines. The castle of Pierrefonds was constructed in the fourteenth century. It has a set of latrines arranged for each story in a semi-circular projection (Figs. 10, 11 and 12). The cesspool, as we will call the place for the receptacle of the excreta, has a door for cleaning out the filth, and a window for ventilation. In the centre

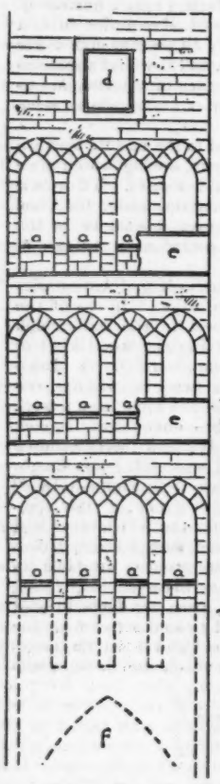


Fig. 8. — Elevation.

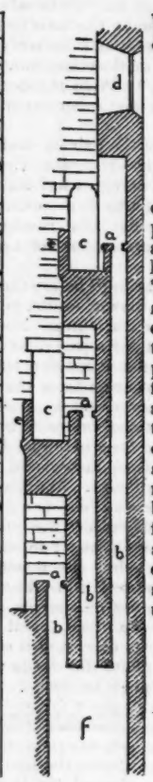


Fig. 9. — Section.

Fig. 10. — Plan of Cesspool.
h, Door. *i*, Window. *g*, Stone.

of this chamber is a large piece of cut stone on which a man can stand conveniently while cleaning out the pit. The chute or drain leads directly from the seats to the cesspool and is carried through the roof for the purpose of ventilation; the first instance, probably, of a soil-pipe being carried through the roof. These closets, and it was nearly always the case at this period, as we have mentioned before, were separated from the main building by a short hall with a door at each end. This idea, in some instances, has been utilized in modern times.

Fig. 11. — Plan of Principal Story.

Latrines, Marcousis Castle.

a, Seat. *b*, Chute or Drain. *c*, Entrance from Main Building. *d*, Window. *f*, Cesspool. *e*, Balustrade.

a, Seats. *b*, Chute or Drain. *e*, Vent. *c*, Window. *d*, Small Entrance-hall.

These closets also have windows and vents in each story.

Sometimes latrines were directly adjoining dungeons with drain running to the cesspool (Fig. 13).

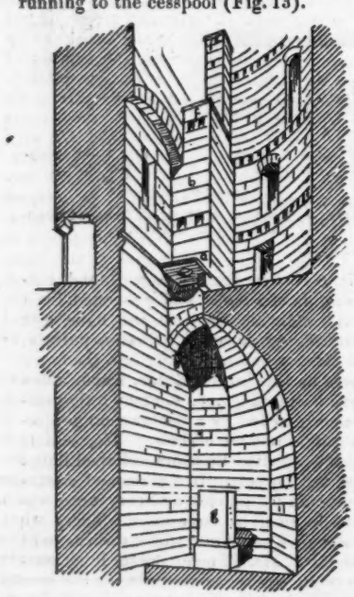


Fig. 12. — Perspective Sketch.

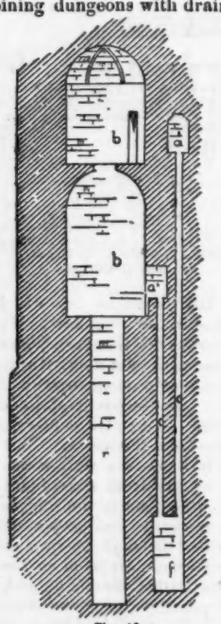


Fig. 13.
a, Latrine. *b*, Dungeon. *c*, Chute or Drain. *f*, Cesspool.

Sight-seers are frequently shown through these latrines, and are informed that the cesspools are dungeons, the agonies which have been endured by prisoners in their depths being graphically depicted by the guides.

Curiously enough the first mention we have of a water-closet, properly speaking, after the ones used by the Romans, is connected with the publication of a poem by Sir John Harrington on the "Metamorphosis of Ajax" (a close stool or commode), published in 1596. This poem was occasioned, as Henry Harrington reports, by the author having invented a kind of water-closet for his house at Kelson.[1]

In the East water-closets, or what may be called water-closets, seem to have been used at an early date.

Ogilby, in a description of the city of Fez, says: "The river Fez subdivides into many clear-running channels through the streets, serving not only each private house, but churches, inns, hospitals, and other public places, to their great convenience. Round about the mosques are one hundred and fifty common places of ease, built four-square and divided into single stool-rooms, each furnished with a cock and marble cistern, which scoureth and keepeth all neat and clean, as if these places were intended for some sweeter employment."[2]

Tavernier, in his "Relations to the Seraglio," says: "The places for the easing of nature are on the right hand divided into four little rooms, which are always kept very clean, and paved with square pieces of white marble. The Turks do not sit down as we do when we are in those places, but they squat down over the holes, which is not half a foot, or a little more, above the ground. The hole is covered with an iron plate, which rises and falls by a spring, and turning one way or the other, at the falling of the least weight upon it, resumes the station it was in before as soon as the ordure has fallen from it. I have observed that the Turks and generally all the Mohammedans do not use paper in such cases, or upon any indecent occasion, and when they go to those kind of places they carry along with them a pot of water, to wash themselves withal, and the iron plate is also made clean at the same time, and so the hole being always covered, and the iron plate always kept clean, there can be no ill smell in the place, and that the rather for the small current of water that passes under that place carries away all the ordure."

. . . "A little gallery which lies to the left hand of the bath, leads to places designed for the easing of nature, and every seat has a little cock which supplies them with water to wash themselves after they are done."

Baldwin Latham, quoting from Ewbank, would lead us to suppose the above-mentioned cocks were primarily for the purpose of washing the bowl of the closet, if there was one, while it was for the purpose of washing the person using the closet.

We see no mention of water-closets in Europe again until 1770. During the intervening period, while art had professedly entered into a new life, the useful arts seem to have been ignored.

In England a close stool or commode, called an ajax, or jakes, was generally used. According to Viollet-le-Duc and other writers, cleanliness, the first principle of sanitation, was thought of very little importance during this period.

Privies were used in Germany before they were in France. In Paris people were allowed to throw their excreta from the windows into the street, provided they gave the verbal warning, "*Gare l' eau*" three times. In Edinburgh the same custom prevailed; parties walking the streets had necessarily to cry "Haud your han," for fear of what might befall them.

The above practice was forbidden in Paris in 1395, but seems to have continued in Edinburgh until 1750. It was during this period also, that men walked the streets of Edinburgh carrying pails or buckets for the public convenience, and wearing a cloak large enough to envelope their customers and apparatus, crying "Wha wants me for a bawbee."

The Parisian code of laws improved in 1513 expressly ordered that every house should have a privy, but as late as 1700 A. D. the police were instructed to close all houses whose occupants did not provide one within a month.

During the reign of Louis XIV of France the courtiers found it necessary to ease themselves in the halls of the palace of Versailles because there were neither privies nor water-closets. Viollet-le-Duc tells us that close stools were used in the palace of Versailles in the eighteenth century. He also writes of an old lady belonging to the court of Louis the XV of France, who passed through the halls of St. Cloud with him when a young man. The odor of an offensive vessel caused her to exclaim with pleasure, "This smell recalls the good old times." Some of our modern closets would have delighted the old lady.

Privies were not used in Spain until about 1770, and have not been used in Warsaw more than fifty years. As late as 1846 we find in Berlin "small closets located on the landings of the stairs, which require to be emptied every other night, to the no great satisfaction of the olfactory nerves."[3]

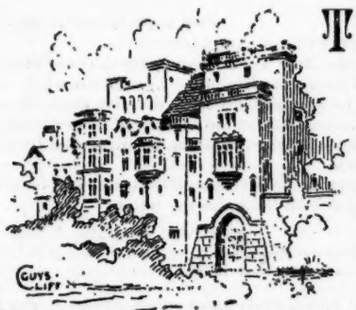
Aubrey, writing in 1718, describes a water-closet which he had seen. He says: "Here (at Sir Francis Carew's, Beddington, Sur-

[1] *Nugæ Antiquæ*, page xi. 1804. New edition.
[2] Ogilby's *Africa*, page 188. 1670.
[3] *Inventions*, John Beckman, pages 269-282. 1846.

rey) I saw a pretty machine to cleanse an 'house of office,' viz.: by a small stream of water, no bigger than one's finger, which ran into an engine made like a bit of a fire-shovel, which hung upon its centre of gravity, so that when it was full a considerable body of water fell down with some force and washed away the filth."

This must have been very much like the closet seen in the city of Fez by Ogilby.

THE EXPLORATIONS AT ASSOS. — I.



THE adventurous trip of the little sail-boat *Dorian* in 1879 will be fresh in the recollection of such at least of our readers as were interested in its object — a survey of the remains of Greek architecture, and especially of Doric, which exist on the borders of the Ægean Sea. It was on this trip that Mr. Clarke selected Assos as a point where a thorough investigation was likely to be especially fruitful. His strong recommendation determined the Archæological Institute of America to send out under his direction an expedition which should explore as completely as possible the site of Assos. Mr. Clarke's Notes on Greek Shores, printed in the first annual report of the Institute (for 1880) as a record of the *Dorian's* cruise, gave his first observations at Assos; the report lately published,[1] gives a detailed account of the first year's work of his expedition. Of this work Mr. Clarke had given a brief sketch, dwelling mostly on the great temple, in a paper which was read a year ago before the convention of the American Institute of Architects, and printed in the *American Architect* (December 11, 1881).

A very old Lesbian colony, Assos had become by the sixth century B. C. the most important city of the Troad. It prospered through the Lydian and Persian monarchies, and the Roman dominion, until the early Christian centuries, after which it fell apparently into insignificance and was perhaps dismantled, but served for a military stronghold under Genoese adventurers in the fourteenth century, and later under the Turks, without recovering its commercial importance; for, excepting its few early Byzantine buildings, the remnants of mediæval walls and Turkish fortifications, and its decrepit modern Turkish village, it shows no remains of later than classical date. This history and the fact that its chief building material, being volcanic stone, was no temptation to the greatest ravager of architectural remains in Turkish countries — the lime-burner — have left Assos, till a comparatively recent time, full of interesting memorials, though because of its isolation and its remoteness from the lines of main interest in Greek history, it has not hitherto attracted any zealous exploration. But, first and last, a good many travellers have called attention to the promise which it offered. Colonel Leake noted this promise as long ago as 1800, and later called attention to it in his published journal, from which Mr. Clarke quotes the judgment that the remains of Assos give the best picture that now exists (or then existed) of a Greek town. Since Colonel Leake, a number of travellers, English, French, German, have noticed the ruins; but our chief knowledge of them has come from the plates and description of Texier, in the voluminous report published by the French Government, of his too extended explorations of Asia Minor. But Texier's examination, though recorded with every appearance of precision, was hasty, and the accounts of subsequent travellers have thrown doubt on his report. Mr. Clarke, indeed, who now and again overhauls him with considerable asperity, roundly ascribes to him *le génie de l'inexactitude*. Unfortunately the Mahommedan depredations, which between Leake's time (1800) and Texier's (1835) had added materially to the injuries of earlier generations, have been carried on energetically down to our own days. So late as in 1864 the Turkish Government sent a detachment of soldiers to Assos, to quarry from its ruins material for some large works that were going on at Constantinople, and though the demolition seems to have been suddenly interrupted, it seems also to have been systematic and considerable. But enough remains to mark nearly the whole line of the original enclosure, and give us, says Mr. Clarke, our best opportunity to study Greek fortifications. Besides this, the remains of the temple, so singularly restored by Texier, called for farther examination, and there were many ruins of public buildings scattered up and down the slopes of the hill on which the city was perched.

This hill, the explorers tell us, is volcanic, and rises abruptly seven hundred and fifty feet above the northern shore of the Gulf of Adramytium, looking southward to the island of Lesbos, half a dozen miles off. The acropolis, girt by a double circuit of walls, is set in the very crater, and from it we can see down into the holds of the little vessels inside the modern mole which apes the old one. Around the hill and up its steep slopes the city was built, enclosed in an irregular lower circuit of wall about two miles long. The only building now to be traced on the summit of the acropolis is the famous temple. A mass of ruins as yet mostly undeciphered, and the miserable Turkish village of Behram, occupy the rest of the enclosure. The explorers, after making a survey of the whole site which they have recorded in a handsome map, began their work with the temple, following with the other buildings, which the first season's work did not exhaust, and leaving the fortifications for the later examinations, which are still going on.

Of all the interesting things that have hitherto been discovered at Assos, none have attracted so much attention and so much discussion as the remarkable series of bas-reliefs which Texier illustrated in his report, and which, brought to Paris by M. Raoul Rochette, are now in the sculpture gallery of the Louvre. They figure in the histories of art as among the most archaic examples of Greek sculpture, and are assigned by pretty unanimous consent of archæologists to a period not later than the sixth century B. C. They have served, moreover, as a striking illustration of the interpenetration of Greek and Oriental art, being very Asiatic in treatment and partly in subject, while they seem to embody myths of purely Greek origin. All this is no more, indeed, than might well have been effected in a colony of Greek race whose greatest prosperity was under the dominion of the Lydian monarchy. But what was, at least to an architect, the most striking peculiarity of these sculptures was their position in the temple itself, if we were to believe Texier's story. He had confidently assigned them to the architrave of the Doric order of the temple, and they are so shown in his restoration. This paradoxical restoration, absolutely unlike anything known in Doric architecture, was so little welcomed by the learned that Texier asked the French Academy to make a formal examination of the grounds for it. Accordingly the whole architectural section of the Academy was appointed a committee to look into the question. But this committee never reported, and Texier interpreted their silence to mean that they could not impugn his restoration, for which his arguments were: that the carved blocks, where he found them whole, were just long enough to cover an intercolumniation, and half as thick as a column; that they bear the *regulæ*, or, as he considered it, the uncut guttæ-band of the triglyph; and that these regulæ are just the width of a metope apart. It should be said, also, that there are among Texier's blocks two or three of the metopes themselves, sculptured in the same style as the long stones which he assigns to the architrave.

Among the important discoveries of the American Expedition are several blocks which are manifestly of the same series with those that are preserved in the Louvre, and it is curious to note that one of the blocks found completes the fragment in the Louvre which bears a recumbent sphynx. The two parts, when their irregular fracture is fitted together, make a symmetrical composition of two sphynxes facing each other, each with one fore-paw raised to the top of a short pillar that stands between them—a composition which reminds one of the sculpture over the lion's gate at Mycenæ. It is again curious that the Americans have discovered the greater part of a second composition, the exact counterpart of the first. In this second case the whole of one sphynx is recovered, the column, and the head and raised paw of the opposing sphynx, so that the repetition is unquestionable. It may be noted also that in one of the metopes in the Louvre is an analogous composition of two sitting sphynxes, but with nothing between them. Several other blocks of this series were found, the most important of which, a broken stone long enough to answer to a whole intercolumniation, contains a combat between a bowman and some centaurs. German archæologists are pretty well agreed in considering the relief in the Louvre of an archer struggling with a sea monster, to represent the combat of Hercules with Triton, and Mr. Clarke, with equal probability, assumes his archer to be Hercules interrupted by centaurs in his feasting with their brother centaur, Pholus. Several other stones were found, both from the architrave and the metopes, carved with groups of men or animals,—among the latter one which calls out Mr. Clarke's admiration for artistic cleverness, and repeats the motive common among those first found, a lion attacking an inferior animal, in this case a boar. Our readers will find the Louvre sculptures illustrated in the number of the *American Architect* referred to above, which contains Mr. Clarke's paper. We give in this number reductions of Mr. Bacon's admirable drawings from the new ones. We notice, by the way, that Plate 20 of the report is entitled "Fragments of a Temple Metope," but is described in the text as part of the relief of the architrave, or, as Mr. Clarke prefers to call it, the epistyle.

According to Mr. Clarke's description, and Mr. Bacon's drawings, which have every mark of fidelity, the sculptures vary considerably in execution, and some are more primitive than others, as if by inferior workmen, as indeed is seen in almost any accumulation of sculpture over a large surface. But they are all strikingly archaic, and in their arrangement very suggestive at once of Assyrian sculpture, and of the figured zones of the oldest Greek vases, which are believed to owe their ornament to Oriental influence; what German archæologists call *Asiatisirende Vasen*, for instance, and the so-called Tyrrhenian Amphoræ. Mr. Clarke, induced by certain peculiarities of the temple's plan, ascribes the building to the second quarter of the fifth century, a time when Phidias was already learning, if not practising, his art, and gives it even date with the The-

[1] Papers of the Archæological Institute of America, Classical Series. — I. Report on the Investigations at Assos, 1881. By Joseph Thacher Clarke. With an Appendix containing Inscriptions from Assos and Lesbos, and Papers by W. C. Lawton and J. S. Diller. Printed at the Cost of the Harvard Art Club and the Harvard Philological Society. Boston: A. Williams & Co. London: N. Trübner & Co., 1882.

seum at Athens. But the naïvely pronounced archaism of the sculpture, as well as of the architectural detail, is certainly a stumbling-block in the way of his theory.

There are plenty of examples to show us that archaic characteristics lingered, and were deliberately affected in works of art that were applied to religious uses or to those which were sanctioned by long tradition, after the actual progress of the art had left them behind. This was the case both in sculpture and painting, and is notably instanced by what are called the Panathenaic Amphoræ, whose affected archaism is discountenanced in the dates plainly indicated by their inscriptions. It is a recognized fact, too, that provincial art in all places and times lags behind metropolitan art in its developments. Allowing, nevertheless, for all this, it seems to us that the discrepancy between these sculptures and Mr. Clarke's date is greater than can be accounted for by both these influences combined. The low relief of the figures, the primitive form of most of the centaurs, which have human fore-legs, the profiled faces with eyes shown as in front view, the lean and naïvely designed figures, the superiority in general of the animal sculpture to the human, are all irresistibly archaic in their effect. From the fact that some of the centaurs have horses' fore-legs the work would seem to have covered a time of transition from extreme to modified archaism, whenever that transition may have occurred at Assos, and indeed was itself possibly the occasion of the transition. Mr. Clarke's opinion is entitled to the respect due to his knowledge, but appearances do not seem to favor it, and he very candidly acknowledges that German scholars who have examined his discoveries do not agree in it.

Mr. Clarke follows Semper's theory of the relation of these reliefs to the so-called empaistic work of the Phenician, Etrurian, and other ancient workmen, — that is, metal-work beaten up from sheets over a form, of which we lately have seen abundant examples in the findings of Dr. Schliemann at Mycenæ. He thinks we may trace in the sculptured architrave of Assos a survival of the primitive habit, familiar to readers of the Bible, as well as to archæologists, of overlaying the beams of temples and palaces with metal. As to the position of the reliefs, one theory suggests itself which seems to have been passed by, perhaps for good reasons, perhaps by default, but which would not have suggested itself until Mr. Clarke's examination had made clear the peculiarity of the plan of the temple. He shows that the front of the cella, with its columns *in antis*, is in line with the third column on the flank. Mr. Clarke thinks this peculiarity, — a rather unusual one, found also in the Theseum, — proves conclusively that the main architrave crossed the front of the cella and the side porticoes in one straight line, so marking off in the ceiling a vestibule which occupied the whole front of the temple. This is at least probable, but in the Theseum, the only temple in which such a disposition of the roof remains, this vestibule is set apart for special decoration; a continuous sculptured frieze runs across the front of the cella, answering to the Panathenaic frieze which surrounds the cella of the Parthenon, and to the Phigalian frieze (at Bassæ) which encircles the inner court or *hypæthrum*. Mr. Clarke, finding that there remained of the sculptured architrave at Assos a good deal too much for one front of the temple, and deciding against the idea that the flanks of the temple were sculptured, assumes that the sculpture was on both ends of the building, and naturally places the two similar groups of sphynxes over the central intercolumniations of the two ends. But it is the peculiarity of the temple at Assos that it has neither *posticum* nor entrance at the back, a peculiarity very rare among peripteral temples, and only shared by the little temple at Cadacchio, early in style, and of less than half the dimensions of that at Assos, and the three most archaic temples at Selinus, those called C, D and S. The rear of the temple was then essentially a back elevation and, we may suppose, less important than the front and the sides. There was no entrance to be marked by the two sphynxes, and it is difficult to see why this elevation should have been distinguished by sculpture. But there is a possibility, unless there is something to disprove it, that the vestibule which Mr. Clarke finds in front of the cella was itself surrounded by the carved architrave, or that the sculpture on the outer front was echoed on the face of the cella in a band analogous to that of the Theseum. Mr. Clarke is sure that none of the blocks which he has found were upon the cella wall. He is convinced that these stones were the exterior architrave by the dowel-holes which he found beneath the ends of the blocks, as if to dowel them to the abaci of the columns. He does not say whether these holes were found in all the blocks whose ends were to be seen, or whether they were in the unsculptured architraves as well. The blocks in the Louvre, as he says, have unfortunately been sawn down to thin slabs that they might be inserted in the wall; so that in them the indication is lost. In all other Doric temples, so far as we know, the triglyphs, regulæ and all, are omitted on the inside of the order of the peristyle. In the Theseum, for instance, the architrave and frieze are both unbroken, and the sculpture on the front of the cella is a continuous composition. The existence of the regulæ on the slabs would therefore suggest that they must have been on the outside; but we find that his internal section shows the regulæ, though not the triglyphs, on the inside, from which we infer that he did not find any architrave blocks without the regulæ. The fuller account of the temple to be published later may contain data which will be decisive of these questions. The report does not give room for all the reasons that may have determined the restoration, but without them the questions naturally suggest themselves: if there were regulæ on the inside of the main entablature, why not triglyphs? why not, also, sculpture? perhaps, even, on the metopes? This would be altogether an anomaly, but no greater than the anomaly of the carved architrave which we have to acknowledge. This, however, is mere conjecture; the actual description of the temple we must reserve for a second article.

REPORT OF THE NEW YORK CHAPTER, A. I. A.

New York, October 21, 1882.

To the American Institute of Architects: —

The routine business of the New York Chapter for the year 1881–82 has again been carried on by the Executive Committee, while its duties under the Building Law, in concert with the city authorities, in the matter of unsafe buildings, and in the exercise of discretionary power as regards new structures have, as usual, been fulfilled by its Committee on Examinations.

A draught of amendments to its By-Laws has lately been issued to its members in conjunction with the following letter:

New York, September 28, 1882.

Dear Sir, — I am entrusted by the Executive Committee to submit to you the amendments to the By-Laws proposed in the accompanying printed draught.

The experience of the New York Chapter (more or less parallel, it would appear, with that of all the other Chapters connected with the Institute) seems conclusive on the following points:

1. That while it was natural and commendable that in the inception of the Chapter, a high standard should have been assumed for its functions and responsibilities, its work was, nevertheless, begun on too ambitious a scale in relation to its means, as shown, *e. g.*, in the superfluity and too cumbrous organization of its Standing Committees, and in the heavy rental for a long time incurred without corresponding results, on the theory that ample room and appliances would be needed for its various schemes of education, collective display of members' work, etc.

2. That it is extremely difficult to get members away from the routine of engagements prescribed by their individual interests, as often as twice a month during eight months of the year.

The remedy for the existing defects in our autonomy would appear to lie in limiting ourselves — at least temporarily, and until our resources, by some good fortune, perhaps, increase — to a narrower field but surer aims, to fewer engagements, and to that concentration of responsibility, and minimum of working *personnel* which will tend to remove at once the cause of and excuse for neglect of associative duties.

By combination with the Secretary's personal appliances, the Executive Committee has reduced the rental to about a third of its figure some years ago, at 225 Broadway; while the charges for clerical service connected with the duties of the Secretary and Treasurer have been put at a merely nominal figure. This enables the Committee to follow the example of the Institute, and — as will be seen in the accompanying draught — to risk the experiment, even though the roll of Chapter names is so meagre, of a conditional reduction of dues.

Early notice will be given of a meeting for the consideration of the amendments herewith submitted as ameliorative of a condition of things which it is desirable should be improved; though the mere existence of the various branches of the Institute, with legal title, local habitation, official representatives, and accepted rules of professional procedure, is a patent and important fact, which largely controls the estimate and the dealings of the public and the courts, as regards architecture and its practitioners in this community.

Yours respectfully,

(Signed) A. J. Bloor, Sec'y.

At a meeting of the Chapter held on the eighteenth inst., the By-Laws thus amended were adopted with modifications of the article on finance, embracing with some minor points, a reduction of the annual dues of practising members to $20, and of the initiative fee for juniors to $2, while an annual assessment of $1 is to be levied on the latter. The Secretary of the Chapter, for the information of the sister Chapters, had previously forwarded to the Secretary of each a copy of the draught and accompanying letter, and this will be followed by the By-Laws as adopted, after they shall be received from the printer.

The roll of the Chapter has been increased by the accession of four Practising Members, Messrs. H. G. Knapp, J. M. Slade, Douglas Smyth (the last advanced from junior membership), and Stanford White; while the grade of junior membership has lost by death one member, Mr. E. M. Kemp, a young man of amiable qualities, and of great professional promise, and considerable achievement under several full members of the Institute.

Respectfully submitted, A. J. Bloor, Sec'y.

REPORT OF THE PHILADELPHIA CHAPTER, A. I. A.

Philadelphia, October 23, 1882.

To the American Institute of Architects: —

The Philadelphia Chapter respectfully submits the following report for the year 1881–1882.

Meetings have been regularly called and fairly attended, and many have been made interesting and beneficial to our members, owing to the plan adopted of each and every professional member bringing drawings for general discussion. We have had an addition of three professional members to our roll.

The Chapter exerted its influence and had changed for the better our "Building Statutes" relating to bay and oriel windows, and this, we think, shows what can be done by united action, though it be of a few. Some of our City Fathers, having been much annoyed by applications from their constituents asking the privilege of erecting bay-windows, decided on a radical measure to protect themselves from further vexation; so some months back an ordinance, a copy of which we enclose, was sent to Councils. . . .

CHAPEL FOR THE SISTERS
OF S. MARGARETS.

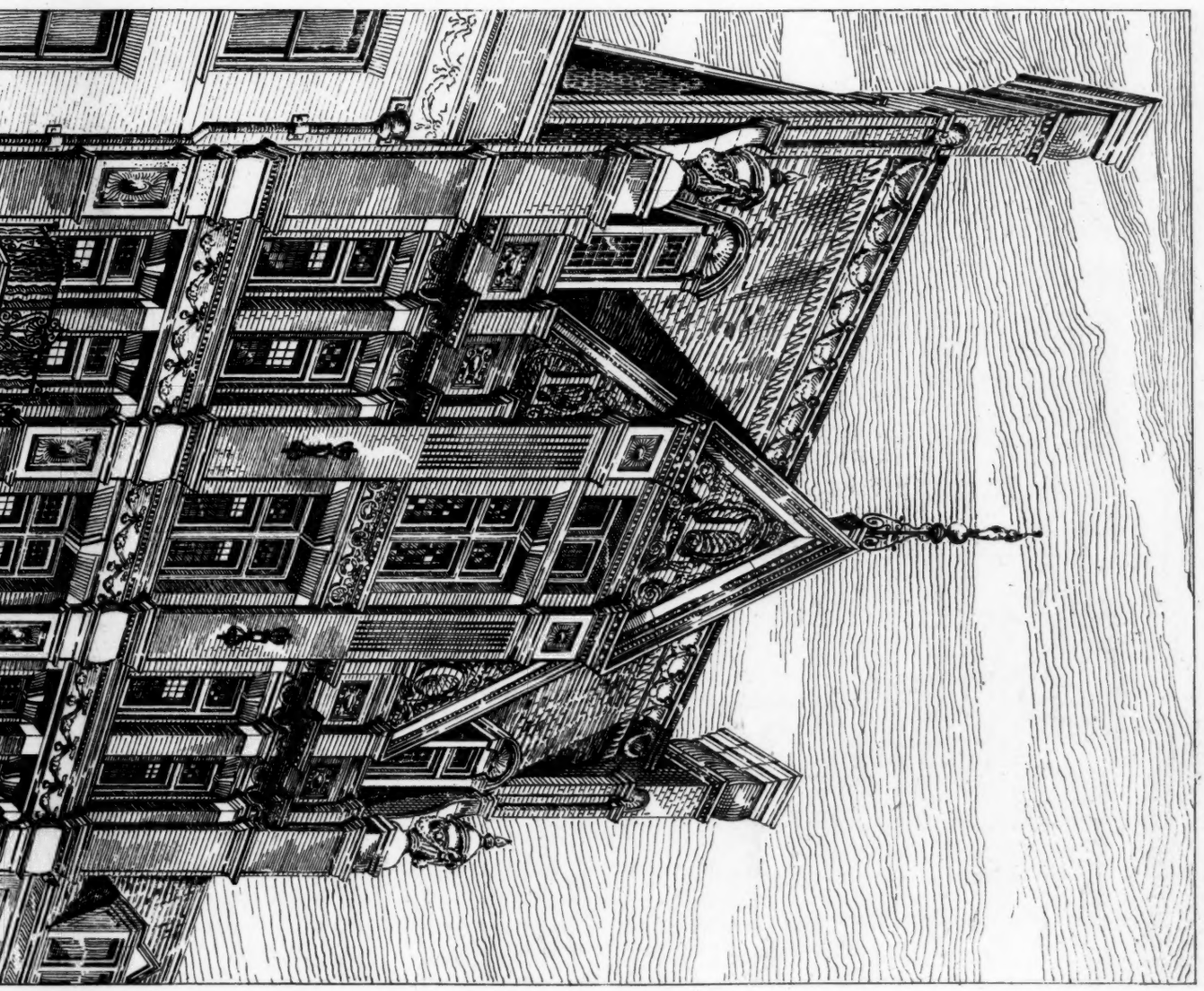
LOUISBURG SQUARE
BOSTON. MASS.

Heliotype Printing Co. 211 Tremont St. Boston.

HENRY VAUGHAN ARCHITECT. 10. PEMBERTON SQUARE.

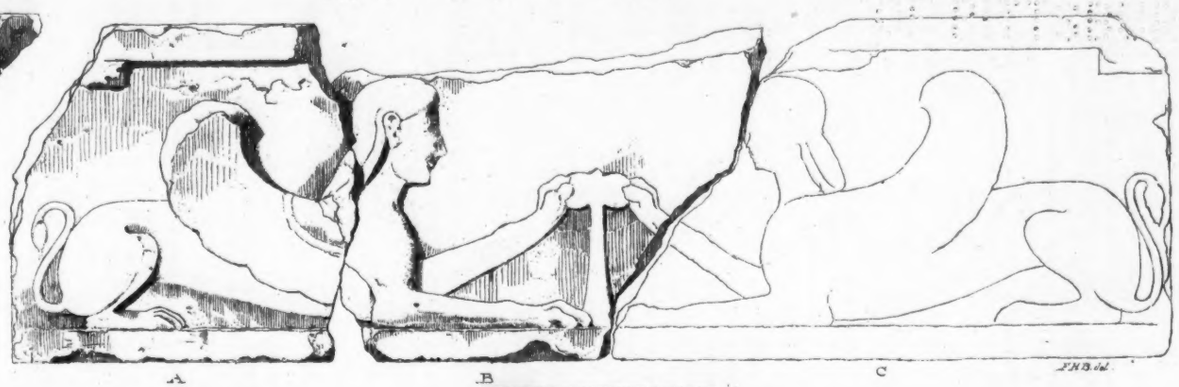
Liverpool and London and Globe Insurance Company · submitted by Hazlehurst & Huckel, Architects, Philada.

Heliotype Printing Co. 211 Tremont St. Boston



A ....Fragment of Temple Relief discovered at Assos April 6th 1882
B .... " " " " " Sept. 19th 1881
C .... " " " in Louvre, Paris

Fragment of Temple Relief Assos
discovered Oct. 4th 1881



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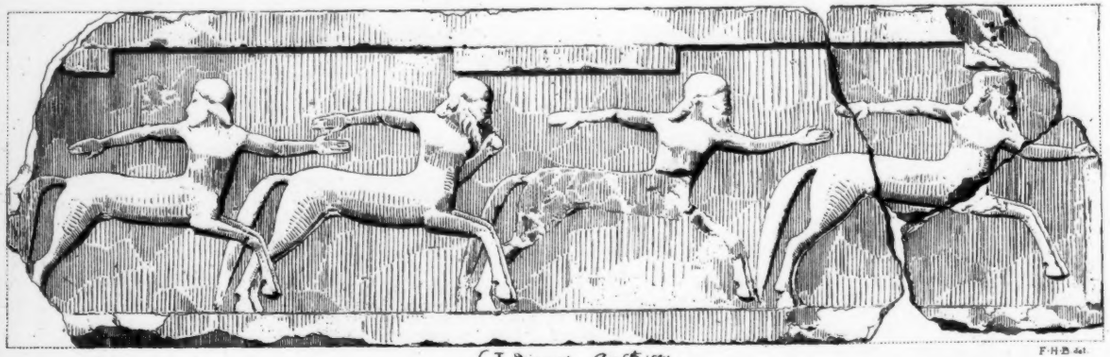

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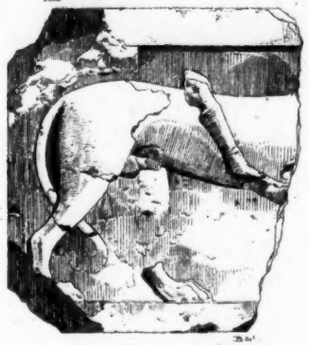


Fragment of Temple Relief Assos
Found on Acropolis Oct. 4th 1881

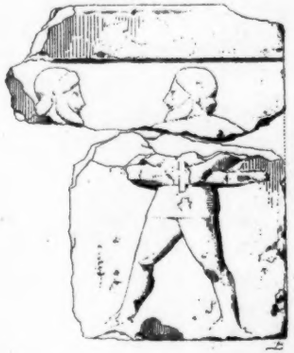
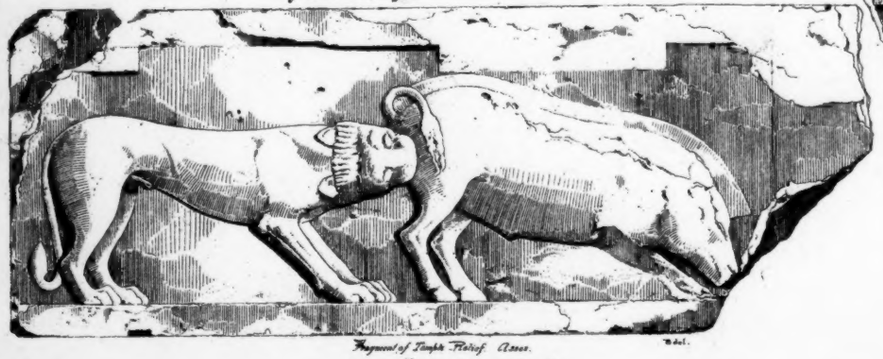


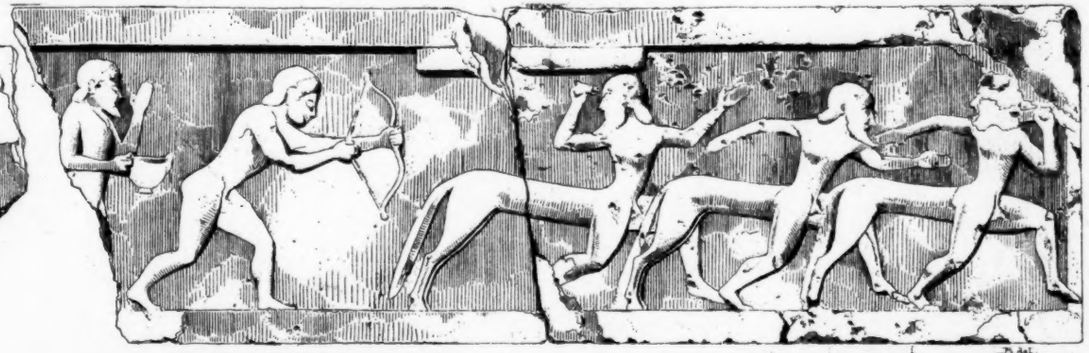
Fig. 22. Fragments of a metope.

I Discovered Aug 5th 1881.
II " May 1st 1882
III " " 2nd "

Block of Temple Epistyle



Fragment of Temple Relief Assos.
Found on Acropolis Oct 13th 1881



Fragment of Temple Relief, Assos.
Found on Acropolis Aug 5th 1881

Fragment of Temple Relief Assos.
Found on Acropolis Oct. 13th 1881

Heliotype Printing Co.

The Chapter, hearing of this high-handed outrage, sent to Councils a request that we might be heard before final action was taken on this bill. To our surprise the request was granted, and we were notified to appear before the police committee, to whose tender mercies the matter had been entrusted. Presuming that the ups and downs of the conflict would not be interesting to you, we omit the details, but take pleasure in stating that, notwithstanding violent political opposition, success attended us at every point. We drafted an ordinance which gives to every one so disposed the right to contribute toward the improvement of our city. . . . The enclosed ordinance was passed on June 1, and approved on June 7, 1882.

COPY OF ORDINANCE NOW BEFORE COMMITTEE ON POLICE.

AN ORDINANCE

To regulate the erection of oriel windows.

SECTION 1. *The Select and Common Councils of the City of Philadelphia do ordain*, That no bay or oriel window projecting beyond the building-line of any street shall hereafter be erected by any person upon the front of any building.

SECT. 2. Oriel windows may hereafter be erected upon the sides of buildings occupying corner lots, extending over the pavement of the street, from any story except the first, and to a distance of not more than four feet beyond the building-line.

SECT. 3. No oriel or bay windows, other than such as are specified in Section 2 of this ordinance shall be erected upon any buildings bounded by any of the streets in the city of Philadelphia.

SECT. 4. That whenever it shall come to the knowledge of any of the building inspectors or police officers of the said city, that any person or persons are erecting or causing to be erected, or are about to erect or cause to be erected, any bay or oriel window that shall project into the public highway from the front of such building beyond the building-line, it shall be their duty to report the facts to the Mayor, who shall forthwith notify the City Solicitor thereof, and the City Solicitor shall thereupon take such steps, by injunction or otherwise, as may be proper to restrain such erection, or to cause the removal of the same, if already erected or in process of erection.

SECT. 5 All persons who shall, after the passage of this ordinance, erect and maintain, or cause to be erected and maintained, any bay or oriel window from the front of any building shall be subjected to a penalty of five hundred dollars, to be recoverable as debts of like amount are now by law recoverable, and such bay or oriel window shall be removed as is hereinbefore provided. All ordinances or parts of ordinances inconsistent herewith shall be, and the same are, hereby repealed.

PROPOSED SUBSTITUTE.

AN ORDINANCE

To regulate the erection of oriel windows.

SECTION 1. *The Select and Common Councils of the City of Philadelphia do ordain*, That no bay or oriel window projecting beyond the building-line of any street shall hereafter be erected by any person upon the first story of the front of any building.

SECT. 2. Oriel or bay windows may hereafter be erected upon any fronts, sides, and rear ends of buildings, extending over the pavement of the street, from any story excepting the first, within lines drawn from the intersection of the party-lines and building-line, at an angle of twenty degrees with the latter, and to a distance of not more than four feet beyond it. That all oriel or bay windows already erected or being erected in conformity with the provisions of this section shall remain or be completed the same as if they were commenced after its passage.

SECT. 3. No oriel or bay windows, other than such as are specified in Section 2 of this ordinance, shall be erected upon any buildings bounded by any of the streets in the city of Philadelphia.

SECT. 4. That whenever it shall come to the knowledge of any of the building inspectors or police officers of the said city that any person or persons are erecting or causing to be erected, or are about to erect or cause to be erected, any bay or oriel window that shall project further into the public highway from the front of such building beyond the building-line than allowed by Section 2, it shall be their duty to report the facts to the Mayor, who shall forthwith notify the City Solicitor thereof, and the City Solicitor shall thereupon take such steps, by injunction or otherwise, as may be proper to restrain such erection, or to cause the removal of the same if already erected or in process of erection.

SECT. 5. All persons who shall, after the passage of this ordinance, erect and maintain, or cause to be erected and maintained, any bay or oriel window from the front of any building, other than allowed by Section 2, shall be subjected to a penalty of five hundred dollars, to be recoverable as debts of like amount are now by law recoverable, and such bay or oriel window shall be removed as is hereinbefore provided.

All ordinances or parts of ordinances inconsistent herewith shall be, and the same are hereby repealed.

It is our painful duty to report the sad death, on May 20, from apoplexy, while working at his table, of our lamented late associate, James P. Sims. At a meeting of the Chapter held May 26, the following action was taken: —

Whereas, our highly-esteemed member, James P. Sims, having been removed by death, on the 20th inst., it becomes us to express the profound sorrow with which we are moved in view of the loss we have sustained by this great calamity; therefore,

Resolved, That in the intercourse, professional and social, that we have enjoyed with James P. Sims, his broad and genial nature, his noble bearing, and the generous impulses with which he was ever moved, lead us deeply to deplore his loss.

Resolved, That a copy of these resolutions, with an expression of our sincerest sympathy, be transmitted to his relatives.

Very truly, EDWARD HAZLEHURST, Sec'y.

THE ILLUSTRATIONS.

DESIGN FOR THE LIVERPOOL, LONDON AND GLOBE INSURANCE OFFICES, PHILADELPHIA, PA. MESSRS. HAZLEHURST & HUCKEL, ARCHITECTS, PHILADELPHIA, PA.

INTERIOR OF THE CHAPEL FOR THE SISTERS OF ST. MARGARET, BOSTON, MASS. MR. HENRY VAUGHAN, ARCHITECT, BOSTON, MASS.

SCULPTURES FROM THE TEMPLE OF ASSOS. DRAWN BY MR. F. H. BACON, ARCHITECT.

FOR description, see article elsewhere in this paper.

HOSPITAL CONSTRUCTION. — II. [1]

IN all efficient hospitals which have, within a recent date, been provided for the isolation and treatment of cases of different infectious fevers the buildings are so constructed that patients suffering from each separate disease may be in a separate building, having no enclosed means of communication with any other hospital building. This result is, as a rule, obtained by the construction of pavilions, standing at a proper distance from each other, and from the administrative building. In the case of a one-storied building, each pavilion contains, as a rule, two wards, one at either end, for each sex, the wards being separated in the centre by an entrance lobby and certain administrative apartments. In the case of a two-storied building the pavilion has a male ward on the ground floor, and a female ward upstairs, each floor having a separate lobby and administrative rooms.

In the arrangement of the buildings it has been found that the distance between the several pavilions, and between them and the administrative block, should, if possible, be equal to one and a half times their height when the buildings are of equal height, and, if otherwise, at least equal to the full height of the higher of the two adjacent buildings; also that the means of communication between them should be limited to a roofed passage, either entirely open at the sides or having permanent openings facing each other in the opposite side walls, or again, to a roofed passage fitted with a central partition and being completely open on both sides of the partition, the persons using the passage walking on the lee side of the partition.

In the case of a small-pox pavilion, it has appeared to me that the separation between it and the other hospital buildings should, if possible, be even more complete, and where such an arrangement can be carried out, that the administrative apartments it contains should be such as to reduce communication with the administrative block to a minimum. Especially should there be in connection with the pavilion separate sleeping accommodation for nurses. In some districts, as at Folkestone, the small-pox hospital is an entirely separate institution, situated at a distance from the hospital for the other infectious fevers. In several hospitals visited small-pox is not admitted.

With reference to the construction of the pavilions, regard has, in all good hospitals, been had to the conditions deemed necessary in the construction of a good dwelling-house. The foundations have been laid in a soil free from animal or vegetable matter; the whole ground surface of the site has been underdrained when necessary, and in some of the better examples of hospital buildings it has been covered with a layer of cement-concrete or asphalt, or it has been otherwise prepared so as to exclude both dampness and also emanations from the soil, which might subsequently become contaminated, as by accidental leakage from a drain. The walls have consisted of good bricks, of hard stone, or of a combination of the two, or of some similar material, such as concrete; they have been provided with an efficient damp-course; and with a view to the maintenance of an equable ward-temperature, it has been found necessary that they should be at least fourteen inches in thickness. It has also been found necessary to provide windows in each of the opposite side walls. The roof, whether of slates or tiles, has been in a great part or entirely ceiled within. Where, as in Sheffield, flat roofs have been made, they can conveniently be constructed of concrete, asphalt, or other similar material.

The floors, provided beneath with means of ventilation into the outer air, have in all cases consisted of wood, and when this has been both well-seasoned and so laid as to prevent the occurrence of spaces between the planks, the result has been fully satisfactory. Where such interspaces have taken place, they should at once be filled in with wood, or some other suitable material. The internal surface of the walls is best made of glazed bricks or of cement, so that they can be at regular and frequent intervals washed or otherwise cleansed. The glazed-brick walls, as in the Delancey Hospital, Cheltenham, are attractive, and admit of easy cleansing; and Parian cement when put on as at Weymouth, so as to present a hard, impervious, porcelain-like surface, is well adapted to the purposes of

[1] From the *Architect*.

hospital wards. Ordinary brick or cement walls which are periodically lime-washed and then covered with a slightly-toned wash, are also neat and cleanly.

Architraves and cornices or other projections in connection with the walls have often, as at Weymouth, very properly been avoided, for they all tend more or less to harbor dust containing infective matter. For a similar reason flat ceilings are found preferable to any pitched roofs which need to be supported by projecting beams or rods.

The windows should be made for the purposes of ventilation as well as of admitting light, a point that has been overlooked in some of the more modern buildings, where I found that only small portions of the several windows were made to open. Having these objects in view, I am of opinion that a double-hung sliding-sash window is the one which is best adapted to the purposes of a hospital ward. These sashes are often surmounted by a third and smaller hinged-sash, fitted with side flaps, so the air entering from without shall be directed toward the ceiling. The lower frame of each sash-window may also, as in the Berkhamstead rural and the Weymouth port hospitals, be with advantage made with a deep bottom rail so that the sash may be opened to allow of the entrance, in an upward direction, of air between the meeting rails, whilst the window remained closed above and below. With a view of securing a cheerful appearance the bottom of the windows should not be more than about 3 feet above the floor level, and to ensure adequate movement of air in the upper parts of the ward, it has been found necessary that the top should not be less than some six inches, at the most, from the ceiling or the wall-plate, as the case may be. The best arrangement of windows is found to be that which provides for one between every two adjacent beds, and one near the angle of the ward beyond each end bed. Movement of air, and such ample light as tends to secure cleanliness, is thus ensured in those parts of the wards standing most in need of those requirements.

The amount of window-surface which it is desirable to ensure for a ward is a subject which has received some attention. Having regard to cheerfulness, to adequate means of lighting and ventilation, as also to the maintenance of an equable and sufficient ward-temperature, it has appeared to me that in a well-constructed and efficiently warmed building the amount of window-surface to cubic space should not vary much beyond the limits of 1 square foot to from 60 to 80 cubic feet; a proportion of about one square foot to every 70 cubic feet being, as a rule, the most advantageous. The experience obtained in the Children's Hospital at Pendlebury in this connection deserves special consideration, for, due regard being had to ventilation, the failure to maintain the ward air equably warm, and at the same time sweet, was to a great extent due to the excessive window-surface, which there amounts to 1 square foot for every 35 cubic feet.

Windows in the opposite side walls, whilst affording the principal means of ward-ventilation, and constituting indeed the only effectual means by which thoroughly and in a short time to change the entire ward air, as, for example, when all the windows are opened on the occasion of cleaning out the wards, do not, however, suffice for this purpose. The space between the floor and the bottom of the patients' beds is found always to require independent ventilation, as by openings into the outer air situated just above the floor level, and each capable of being closed by means of a small sliding door, on one or other side of the ward, according as the weather may temporarily necessitate. Similar openings near the ceiling level are also, as a rule, provided. "Tobin" tubes have occasionally been usefully resorted to. One or more vertical enclosed shafts passing from the ceiling through the roof are also, as a rule, requisite to carry off such air as is either too hot or no longer pure. But it must be regarded as certain that the provision of even excessive facilities for the escape of impure air, as by roof-shafts, should in no case be allowed to interfere with the provision of ample means for admitting fresh air into the wards, at a lower level.

Open fireplaces have, under most circumstances, been regarded as best adapted to ward purposes, and the additional means of ventilation they afford may be looked upon as especially useful in the case of wards occupied by patients suffering from infectious diseases. At least one such fireplace is found to be required for every 25 to 30 feet of ward length, and, where this limit is approached, those fireplaces which are provided with an air-chamber behind, by means of which warmed air from outside is passed into the ward, are, as a rule, used, because of the additional facilities they afford for maintaining a sufficient and equable temperature. Where wards exceed 30 feet in length, stoves occupying a position in the central line of the ward, and having an open fireplace both in front and behind, or similarly situated closed stoves so made as to throw warmed air into the wards, are mostly used to maintain a fairly equable and a sufficient ward-temperature. Apparatus for combined warming and ventilation was only met with in one instance; it is referred to in connection with the Children's Hospital at Pendlebury, near Manchester.

The ward-space which should be allotted to each patient is a matter of first importance in a hospital where the patients are themselves centres of infection. In the Board's Hospital Memorandum it is stated that the ward-space for each patient should approach, as nearly as circumstances allow, to 2,000 cubic feet and 144 square feet of floor-space. In most of the modern hospitals visited this amount of ward-space was nearly or quite reached; in a few instances it was somewhat exceeded; and, with one exception, I have found no reason to suggest that it should be exceeded. The exception relates to wards containing small-pox patients. In such wards a larger space between the beds seems indicated than is necessary for other patients, especially when many severe cases are under treatment. Under such circumstances it has been found difficult, even when the means of ventilation appeared ample, to keep the air in all parts of the wards quite sweet.

I am disposed to regard a standard of floor-space as necessary to be appointed quite independently of the standard of cubic space, and I should not consider a material excess beyond the required 2,000 cubic feet per bed as compensating for a material shortcoming in the required 144 square feet of floor-space; nor yet should I regard a more ample floor-space as compensating for an insufficient cubic space. In other words, it appears to me that the height ought habitually to be about 14 feet in wards that are intended to have rows of beds on their two opposite sides, or if it be more than 14 feet, the space above that height should not be taken into account in reckoning the cubic space.

The question as to the maximum of beds which should be allowed in any one ward devoted to infectious cases was borne in mind during the inquiry, but where large wards were met with they either lacked the adequate ward-space per patient, or they had not for some considerable time been in full use. Hence no experience on this point was available.

On several occasions the question arose whether children, whilst in a hospital for infectious diseases, needed the same amount of ward-space as is deemed necessary for adults, and it has appeared to me that the subject called for consideration quite apart from the more general one as to the air-space which should be allotted to children in dwelling-houses, or in general hospitals. The circumstances, indeed, are not analogous. Having regard to the general experience acquired, I am of opinion that if any reduction in ward-space is made in the case of children, the reduction should be but small, and that in no case should the space for a child in an infectious hospital be less than three-fourths of that which is deemed necessary for an adult.

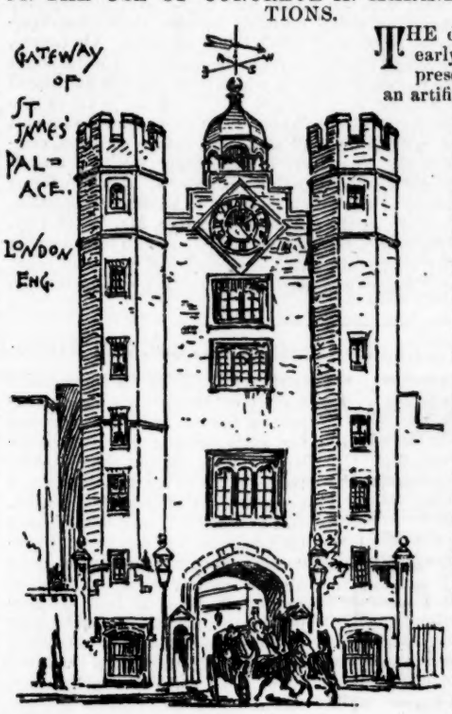
In connection with each ward there must be one or more water-closets, or dry-closets, and a ward-sink. In all well-constructed hospitals both these apartments are contained in a building projecting from the main pavilion, being separated from the ward itself by means of a lobby, provided with a door leading into the ward, and having means of cross-ventilation by openings in its two opposite side walls. As a rule, windows made to open are relied on to secure this cross-ventilation, but they are, except in very warm weather, nearly always kept shut, and hence measures should in every hospital be adopted to ensure that this cross-current of air shall not be stopped by any action on the part of patients or nurses. This can be effected in several ways, as by the substitution of a fixed louvre for a part of or for the whole of one of the upper panes of glass. The closets and sinks may conveniently be placed side by side with doors facing the door leading from the lobby into the ward. The partition above the closet and sink doors should rise to the ceiling so as to shut these offices entirely off from the lobby; whereas the partitions separating them from each other should not be more than about 8 feet high, so that, by means of windows placed in the opposite side walls of the projecting building, an independent cross-current of air may be secured through them. Where water-closets are used both the apparatus known as a "container," as also the "D-trap," have in modern hospitals been carefully avoided, as tending to retain infection and cause nuisance. Wherever any form of dry-closet is in use, it is fitted with a movable receptacle, which needs to be emptied and cleansed at least once every day, the removal being effected through a doorway from without; this form of closet also requires to be subjected to frequent inspection, and an ample supply of the dry material used should be available for application. Dry earth and charcoal have both been found to answer this purpose. Ward-sinks require to be provided with means of flushing, and having regard to their use for ward slops, etc., water drawn from the taps with which they are fitted should not be resorted to for domestic or other allied purposes.

A separate bath-room is provided in most hospitals. If the bath be a fixed one, it is found expedient that the head alone should be fitted in contact with any wall, both sides being left free, in order that the attendants may have easy access to the patient using it. A movable bath is, however, as a rule, found necessary as well as a fixed one, especially in scarlet-fever wards, where bathing often forms an important part of the treatment adopted. One movable bath at times serves all the requirements of a small pavilion, and in some of the smaller hospitals, where no separate bath-room has been provided, the bath is made to stand in a lobby over a sink, to which hot and cold water are laid on, and over which it can be emptied. Bathing in the wards is, however, not as a rule desirable, except when the circumstances of the patient render it necessary.

In connection with each ward-pavilion an entrance lobby and certain administrative apartments have in nearly all cases been provided. In the one-storied pavilions these occupy, as a rule, a central position, and the minimum they consist of is (1) a nurse's room fitted with fixed windows, commanding a view of either ward; (2) a room in which to store such food and other articles as are in constant use; and (3) a linen store. Where no additional rooms are provided, the nurse's room is often fitted as a ward-kitchen, in which articles, such

as beef-tea, etc., can be cooked or kept warm, and it is also provided with a scullery-sink, an arrangement which is the less objectionable because nurses should not, unless under very occasional and exceptional circumstances, sleep in the rooms adjoining the wards. In the two-storied pavilions similar apartments occupy that end of the ward which adjoins the entrance lobby, and in which the staircase is fixed.

ON THE USE OF CONCRETE IN MARINE CONSTRUCTIONS.



THE discovery in the early part of the present century of an artificial cement suitable for building purposes, and possessing in addition to great power of adhesion the extremely valuable property of developing its adhesive strength most favorably when submerged in water, forms probably the most important incident in the history of marine construction; and when it is further considered that such a material in the form of Portland cement has been readily obtainable at moderate cost it is only natural to expect that a great revolution should occur in the mode of constructing breakwaters, quay-walls, and other similar structures. That a considerable change has taken place, is indicated by the now general use of large artificial blocks involving various forms of heavy machinery for their manipulation.

A review of some of the more recent harbor works in this and other countries leads, however, to the conclusion, that while the superior adhesive power of cement, and the rapidity of its development have been duly recognized and made use of, as, for example, in the building of concrete blocks on shore above high water, the more characteristic and not less important property, so far as hydraulic work is concerned, of setting after submersion does not seem to have received quite as much attention as it deserves, or to have been hitherto sufficiently taken into account in modifying the design not only of marine works, properly so called, but also of many other structures of equal importance, the foundations of which are laid under water. Nor does it appear improbable, when full advantage is taken of the hydraulicity of cement, that increased skill in the manipulation of plastic concrete under water, will enable the larger rivers and estuaries to be economically bridged over, and will diminish the necessity either for excessively long spans, such as have in many cases been adopted for tunnels, the length of which and other circumstances render the cost of their healthful ventilation all but prohibitory.

Much has been written regarding Portland cement, and many elaborate investigations have been made of its tensile and compressive strength, the former being used as a test of quality. In most cases, however, and particularly in that of concrete, the chief function of cement is to convert a quantity of loose material into a solid mass, and the excellence of properly proportioned concrete will, other things being equal, depend almost entirely on the *adhesive* strength of the cement used. It therefore appears somewhat remarkable that the test of *adhesion* has not been employed to determine the quality of neat cement in preference to the much less appropriate, and in some cases, misleading tests of *cohesion* now so generally adopted.

As evidence that Portland cement possesses the property of developing adhesive strength under water to an extent calculated to meet all the requirements of practice, it may be stated, that in the case of the softer building stones, as for example, Portland and sandstones, we have found from repeated experiment that on forcing asunder pieces of these stones which had been cemented and *immediately* afterwards immersed in water, the adhesive strength developed in twenty-eight days was sufficient to tear out small fragments from the cemented surfaces of the specimens. It will perhaps be more convenient to reserve further remarks on this and some other parts of the subject relating to the submersion of plastic concrete until we have briefly reviewed the modes of construction adopted in some of the more recent harbor works, selecting a few representative examples.

The South Breakwater at Aberdeen furnishes an instance in which concrete was used in four different forms, involving different modes of deposition.

At eight hundred feet from the shore end the foundation course consists of jute bags filled with concrete, and varying in weight from 5 tons to 16 tons each. The bottom on which they rest consisted for the most part of gravelly clay, covered with large stones; the latter were removed by divers, and the bags lowered into place in iron skips, furnished with hinged bottoms and triggers; the bags were submerged while the concrete was in a plastic condition, and the divers were thus enabled to manipulate them so as to accommodate the inequalities of the bottom, and at the same time form a level surface on the top to receive the superstructure. The proportion of cement used in this part of the work was one part cement to six parts of a mixture of sand and gravel.

On this foundation course, concrete blocks 4 feet high by 6 feet wide, and varying in weight from 7½ to 24 tons each were laid in courses to a level of one foot above low water of neap tides; these blocks were lifted and lowered by two 25-ton steam travelling-cranes supported on a strong timber staging, and were set in position by the divers. In the block-yard a 25-ton steam and two overhead hand-cranes of 15 and 20 tons respectively, working on suitable gantries, were employed to handle the blocks. The proportion of cement in this part of the work was one part cement to nine of sand and gravel. The upper portion of the breakwater above low-water of neaps was formed of concrete *in situ*, filled in between suitable frames, and laid in such lengths that the filling could be carried up in advance of the rising tide, so that the upper surface of the concrete was always kept above water; the proportion of cement in this part of the work was one part cement to seven parts of sand and gravel; occasionally in fine weather, and when not likely to be injured by the wash of the sea, the proportion was decreased to one of cement and nine of sand and gravel.

To prevent the toe of the breakwater from being undercut, an apron was provided, consisting of long bags of plastic concrete, weighing 100 tons each, and dropped into place from a box about 8 feet wide by 6 feet deep, having a hinged bottom, and supported on brackets fixed to the side of the finished part of the breakwater, some feet above high water. This method of protecting exposed footings had never before been adopted, and would no doubt prove extremely effective, provided the bags retained their form and were not burst before their contents had hardened. The concrete for this and the other portions of the work was made by four of Messent's mixers, driven by an 18-horse-power engine, each mixer turning out twelve cubic yards per hour; materials for the concrete and also stone were obtained within easy distances. The number of divers employed was thirty-two, their wages averaging 66*s* per week, viz., eleven shifts of four hours each at 6*s*.

The breakwater has a length of 1050 feet, and the total cost of its construction given by Mr. D. Cay, in the revised statement of expenditure following his lucid description of the work,[1] has been about £78,000; the cost of plant, temporary buildings, etc., was somewhat under £30,000. Deducting £10,000 for the estimated selling value of the plant, etc., after completion of the work, and dividing the balance of £20,000 over the different items, their relative amount and cost is stated to be approximately as follows, omitting interest on the first cost of the plant, which will be further alluded to.

Excavating foundations £4,904

	Cubic Yards.	Cost per Cubic Yard. £ s. d.
Concrete in foundation course	3,202	1 15 5
" apron	1,336	1 17 0
" blocks	22,851	0 16 1
Block setting	"	0 11 5
Concrete *in situ*	23,972	0 18 7

The cost of the timber staging is put down at £10,292, which although considerable, can scarcely be regarded as excessive, when it is remembered that heavy crane machinery and blocks had to be carried at a considerable elevation above high water and in an exposed position. Portland cement stored at the works cost 43*s* per ton.

The most noticeable feature in the construction of the Aberdeen breakwater is the use of the 100-ton bags of concrete, and the method of depositing them; their cost, however, as well as that of the smaller bags in the foundation-course does not compare favorably with the other portions of the work; the superior economy of concrete *in situ* is also well illustrated. The total contents of the breakwater below low water amounted to a little over 27,000 cubic yards, of which about 23,000 cubic yards had been allowed to harden or "set" in air, the remainder in water. Preparations for commencing the work were begun in May, 1869, and the breakwater was completed in September, 1873; during this interval 51,361 cubic yards of material were deposited at the average rate of nearly 1,000 cubic yards per month, or taking three hundred working days to the year, an average of about 40 cubic yards were deposited per day, If larger blocks, say, for example, of fifty tons each had been used, the rate of progress would, no doubt, have been somewhat greater,

[1] Minutes of the Proceedings Institution Civil Engineers, xxxix.

but on the whole, the experience gained at Aberdeen cannot be considered as favorable to the use of moderate-sized blocks, the cost of fixing them in place exceeding two-thirds of the cost of the block itself; a similar comparison with respect to the concrete in bags shows the setting to cost rather more than the material set. These comparisons are to some extent admissible, as the price of concrete —allowance being made for differences in the proportion of cement —should not vary much beyond moderate limits, for sand and gravel can generally be obtained close to the site of the works, and the difference in the cost of cement in other countries is frequently compensated by the reduced price of labor.

It is a matter of importance in marine constructions to provide means for the rapid deposition of the building material, particularly under water, so as to enable full advantage to be taken of the comparatively limited intervals of calm weather, during which the work can be most satisfactorily and economically proceeded with. One of the weak points of the system adopted at Aberdeen — and noticeable also in similar works at other places—was the large amount of diving-work required. In even moderate depths and particularly when exposed to tidal or other currents, diving operations are so extremely slow and expensive that any system involving much work of this description must be considered more or less defective and unsatisfactory.

The method of building with blocks is open to this general objection, that it always involves the accurate levelling of the foundation, whether natural or artificial, which is a tedious and costly operation in the great majority of cases; each block has also to be carefully placed in its proper position under water, and this can rarely be accomplished without the assistance of divers and their attendant encumbrances. It is further objectionable that under such circumstances the engineer is placed to an undesirable extent in the hands of his divers, whose reports he must as a rule accept, and carelessness on the part of the diver, to which on account of his encumbered condition there is considerable temptation, can seldom be detected in time to have it properly remedied.

A system therefore in which the employment of divers was reduced to a minimum, or practically dispensed with — and that such a system is in many cases possible there is little reason to doubt— would, other things being equal, have much to recommend it, and would probably supersede many of the methods at present adopted.

It has been a frequently expressed opinion that blocks of a much larger size than those used at Aberdeen would have been preferable; this, however, if they were manipulated in a similar manner would necessitate an extremely massive sea-staging, and very heavy machinery requiring almost a prohibitory outlay, the cost of the former item in the case under consideration amounting to over £10,000.

Other methods of lifting and lowering large masses of built concrete, in which the use of a sea-staging is avoided, will be subsequently referred to, but that they are capable of being economically employed in exposed situations is extremely doubtful.

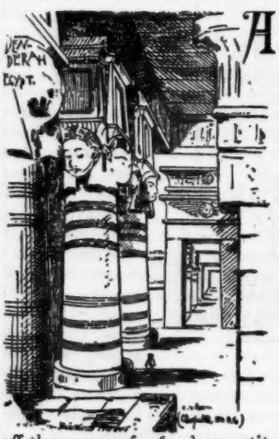
With respect to the statement of expenditure on the Aberdeen works, we should be disposed to suggest the following modification: as before noticed, the total expenditure on the breakwater amounted to £77,973; of this £29,723 was expended on plant, including sea-staging, etc., the estimated value of which, after the work was finished, is assumed to have been £9,878; from this sum, however, is to be deducted for the purpose of comparison with other works, interest on the first cost of the plant, amounting to about £6,300; making the net total cost about £74,400. The following is a summary of the approximate quantities and prices connected with the work, adopting the modification referred to:

Total length of breakwater	1,059 lin. ft.
" contents of breakwater	51,361 cub. yds.
Quantity per lineal foot	48.91 "
Total net cost	74,400*l*
" " " of plant	25,145*l*
Cost per lineal foot of breakwater about	70*l*
Cost per cubic yard of finished work	29*s*

The selling value of old plant and materials is difficult to estimate and liable to be overrated, particularly if the former is of special construction or design. For the purpose of instituting a comparison in such cases it will perhaps be sufficiently near the truth if the average selling value of the plant is taken at one-fourth of the first cost.

In comparing the cost of special plant with that of work executed it is expedient, in order to avoid complication, that the latter item should be confined to the amount actually effected by the direct use of the special plant, and that other parts of the structure which may have been built quite independently should not be included. For example, if the superstructure in one case was of rough concrete extending only a few feet above high water, and in another it consisted of a large quantity of expensively dressed ashlar, carried from low water to a considerable height above high water, although in each case the special plant may have done the same amount of work, it is obvious that a comparison which referred to the whole cost of each of the finished structures would be misleading. Applying these restrictions to the case of the Aberdeen works, and limiting the special plant to "cranes," etc., and "sea-staging," we may assume the united first cost of these items to be about 20,000*l*., which, with interest at 5 per cent. for 4¼ years (the time occupied in construction) amounts to 24,300*l*., from which is to be deducted one-fourth of the first cost as the selling value when the work had been completed; the approximate net cost would therefore be about 19,000*l*. The special plant was directly employed in all the work except the superstructure deposited while plastic above low-water containing 23,972 cubic yards, which being deducted from the gross quantity of material in the breakwater, makes the total work done by the direct use of the special plant to be 27,400 cubic yards which were lifted and lowered into place under water, at an approximate cost for plant alone of about 14s. for each cubic yard deposited. The accuracy of these figures may be questioned on the ground that all the cranes may not have been exclusively used with the blocks and bags. Any discrepancy on this account, however, would probably be more than counterbalanced by other items, the cost of which is not included. Of course, other things being equal, double or treble the quantity of work might have been done by the same plant, in which case only the additional interest for the increased period of use would have to be taken into account. The cost of the special plant as given above, and the amount of work executed, will, as we shall show on a future occasion, compare favorably with the same items in some other works of a similar character. On the whole the south breakwater at Aberdeen forms an important example of marine construction in an exposed position, and reflects much credit on the engineer in charge, Mr. W. D. Cay, the difficulties of the case being met and overcome with considerable skill and originality. In a future article we shall deal with some other modes of employing concrete in marine construction.—*Engineering.*

AMMONIA FOR EXTINGUISHING PETROLEUM FIRES.



A COMMITTEE of the Polytechnic Society of Munich has issued a report on the means to be employed for extinguishing burning petroleum. They say that since concentrated water of ammonia evolves a great amount of gas when heated, and as this gas is unable to sustain the combustion of any burning substance, burning petroleum must also be extinguished for want of oxygen if brought into a space filled with ammonia-gas, and it may be safely asserted that petroleum will not continue to burn even in a room filled with atmospheric air, when there is a considerable quantity of ammonia-gas mixed with the air, assuming, of course, that the place is closed so as to prevent a free interchange of air and cut off the access of a fresh quantity of oxygen to support combustion.

A second condition necessary for success, which is intimately associated with the first, is that the space be not much larger than that of an ordinary house-cellar, so that there shall be only a small number of barrels of oil, as is the case with a retail dealer. It may be assumed with certainty that it would be in vain to attempt to put out a fire in a large storehouse with ammonia.

Finally, the third condition is that the ammonia be used in large amount and of sufficient strength. The ordinary commercial aqua-ammonia has a specific gravity of 0.906, and contains nearly ten per cent by weight of ammonia-gas; but it can be made a good deal stronger, for *cold* water absorbs so much ammonia-gas that when the water is perfectly saturated with this gas the solution contains nearly forty-seven per cent of ammonia. The stronger it can be used, the more gaseous ammonia will be evolved on heating it, and the more efficient it will be for extinguishing a fire; but in no case should ammonia-water be used that has a higher specific gravity than 0.960, and hence contains less than ten per cent of gas.

Unfortunately it is impossible to say definitely how much ammonia ought to be kept in a petroleum room as a precaution against fire; for while it is easy to determine the cubical contents of the room, experience is lacking to tell what volume of ammonia must be mixed with a given volume of air to extinguish a flame in it. Nor is it possible to tell how much of the ammonia which is there will be evaporated if a fire breaks out, and how much ammonia-gas will be evolved and mixed with the air; yet there will only be a greater or smaller portion of ammonia liberated according to how much heat is produced.

In 1881 Schlumberger proposed to extinguish a fire in a petroleum store quickly at the outset by keeping a large, closely-stoppered bottle of concentrated ammonia on every barrel, so that in case of a fire or explosion the bottles would break and the evolved fumes of ammonia prevent the fire from spreading any further. Schlumberger employed this simple method with the best results in his extensive experiments on the distillation of petroleum.

Assuming that a large bottle held 10 litres of water of ammonia, and this contained but 10 per cent of gas, so that in the 20 litres there is dissolved not quite 2 kilos (1.920 grammes) of ammonia, and if on the breaking out of a fire only half of it vaporizes or is converted into gas, it would still fill quite a large space with ammonia-gas. The weight of a litre of ammonia-gas is at 0° C. and under the normal pressure only 0.7617 gramme, so that one litre of liquid ammonia would produce 1.313 cubic metres (48½ cubic feet) of gaseous ammonia, measured at the freezing point of water. At

the high temperature produced by the burning oil the gas would naturally expand and fill a much larger space.

It must also be remembered that Schlumberger's proposition to put a large bottle of ammonia on each barrel could be easily carried out without interfering at all with business. The cost of ammonia can scarcely stand in the way of its use for prevention of petroleum fire from spreading, because at retail 100 kilos (220 pounds) can be had for $9.25. If no fire takes place none of it is lost, and when it is no longer needed it can be easily dispensed with.

The use of water of ammonia as a prevention of petroleum fires, or rather to extinguish a fire that breaks out in a small store of it, ought to attract the attention of companies and societies conce ned in extinguishing fires, and although the matter has not yet been so thoroughly tested that the owners of these storehouses can be *compelled*, as Schlumberger proposed, to keep closed bottles full of ammonia in the cellars where petroleum is stored, it might be well to recommend that this should be done, leaving it to the owners, if they would consult their own interest, to carry it out. — *Deutsche Industrie Zeitung.*

An illustration of the action of ammonia-gas in extinguishing flame was afforded, says the *Scientific American*, recently at a fire in Scharmann's brewery, in Brooklyn, E. D. While repairing the Delamater ice-machine the ether vapors took fire, and an explosion followed which enveloped the whole building in flames. As a result of the heat the ammonia-machine exploded and liberated such an enormous amount of ammonia-gas that it checked the fire and prevented it from spreading to the neighboring buildings.

ANCIENT SALAMIS.

THIS hole, Famagusta, Cyprus, containing some five hundred starving wretches, was the famous city with its six hundred churches, and 800,000 inhabitants over which Greeks, Romans, Turks, Venetians, Egyptians, and a host of other nations fought so desperately. This is the port which contained a fleet of three hundred war-ships, and was the most prosperous commercial one in the then known world. This is part of the ancient Salamis, whose kings were mighty and whose maidens were "most beautiful to see," and it was from this city that the oppressed sought assistance. Herodotus tells us that when Pheretime and her son Archisilaus, ruler of Cyrene, were driven out of their country the mother fled to Salamis, in Cyprus, and to use his own words: "At that time Evelthon bore rule over Salamis, the same who dedicated the curious censer at Delphi, which is deposited in the treasures of the Corinthians. Pheretime, having come to him, asked for an army which should reinstate them in Cyrene, but Evelthon would give her anything rather than an army; but she, accepting what was given, said: 'This indeed is handsome, but it would be still more handsome to give the army she asked for.' This she said at every present that was made. At last Evelthon sent her a golden spindle and distaff, and some wool was on it, and when Pheretime again made the same speech, Evelthon said, 'that women should be presented with such things and not with armies.'" That greatest of historians would indeed be astonished if it were possible for him to revisit Salamis, for not only would it be impossible for him to find a king, a queen, a city and valuable presents, but he would have great difficulty in finding a spindle and distaff, and greater difficulty in discovering the woman to use them.

There is something unnatural in the sudden fall of this city, as only two hundred years ago its glory was great, and nothing but Turkish misrule, massacre, plunder and neglect, the latter of which subjected the district to terrible pestilences, can have caused the precipitous ruin of Famagusta. As I rode down the mountains and through the dreary Messaria plain, which reminded me so much of my native Egyptian desert, I could see what indeed appeared to be a magnificent and enormous town. Two long solid breakwaters, which would now cost millions of pounds sterling to build and which have, without any repairs whatever, withstood the action of the mighty sea for centuries, stretch far out from the shore, another smaller one forming the inner harbor, which gave refuge to more than three hundred battle-ships, but is now full of mud, while massive and beautiful architectural fortifications several miles in circumference surround the city, which in the distance appeared to be covered with gigantic buildings. The nearer, however, I approached to this place the more I could see of the ruin, as, although the breakwaters and fortifications lost nothing by proximity, the town itself resembled a place that had just been bombarded and then burnt. It makes one sad to see these things, and the nearer one approaches the sadder one feels. My own feelings as I rode over the drawbridges, of which three have to be passed before the inner circle is reached, were those with which I have always been seized on entering catacombs, and Famagusta is nothing more nor less than an enormous burial-ground beneath which lie its past glory and greatness.

Upon entering the town I found the old streets to be intact, and superbly paved with large square granite flagstones, and although few, very few, of the old habitations are left standing, all the foundations are intact, and being built of large marble and granite blocks, they stand firm about ten or twelve feet above the surface. I often fancy that some mythological or Buddhist giant has taken an enormous razor with which he shaved this city, and then allowed the beard a few days' growth, as, with the exception of a few churches, all the ruins stand at the same height, their tops being wonderfully even. It is evident that the upper parts of these structures could not have been as solid as their bases, and that earthquakes, time and sacrilegious hands have destroyed them, leaving the massive foundations intact. The Commissioner of the district tells me that before the British occupation these buildings were being barbarously pulled down and the material carted off to other towns in the island, or actually shipped to foreign ports. The stone is of excellent quality, and is cut into nice square blocks, and the Turkish Caimakam sold millions of tons to M. de Lesseps for the Suez Canal, and Messrs. Greenfield & Co. for the Alexandria Harbor works, and in a very few more years not a stone would have been left to guide the archæologist in his search for the remains of the once famous town which was a kingdom in itself. The very fortifications were sold to a French company in Smyrna, but happily the Turks gave up the island before a stone had been touched, and one of the very few beautiful intact Venetian monuments may now remain as a wonder to architects, engineers and artillerymen forever. It would take a volume to describe these tremendous works, on the top of which ten carriages may be driven abreast, and which remain to this day in spite of earthquakes, Turks, time and plunderers, perfect and complete in every respect, even to the drawbridges — which are so well balanced that I amused myself with opening and shutting the ponderous machines — and to the artistically decorated bronze Venetian guns, all in place and pointed at the imaginary invader, by sea and by land, ready to do their deadly work again if the universe could only go back two hundred short years. I have touched the iron spikes upon which the victorious Turkish Pasha caused the Venetian officers to be impaled. I have, without any difficulty, read the tablets of the many local heroes, and the marble slabs of rules and regulations to be observed by officers and men doing duty in the fortifications, and have drawn water from one of the four hundred and twenty wells with which the far-seeing Venetians had provided the place so that they could resist a prolonged siege without any fear of their water-supply being cut off.

Inside the town the only ancient buildings standing are three cathedrals and a few churches, all of which are now places of Mahometan worship. When I say all, I make a mistake, as one of the prettiest has long been used as a storehouse for the grain collected as Government tithes, and incredible as this sacrilege may appear, is so used at the present moment by the enlightened English nation. The only building that can be compared to the Famagusta cathedrals in richness and architectural beauty is St. Mark's, at Venice, and although the Turks have done all they possibly could to change their appearance from Christian churches to mosques, by pulling down the steeples, erecting minarets in their places, and filling in the bas-reliefs with mud, the buildings still have enough of the grand and magnificent left about them to delight and interest lovers of the beautiful. All the carved stone windows have been either demolished or roughly built up, while the hundreds of vaulted chambers which surround the sides looking upon the streets, and which were evidently used as business stores, are fast decaying, and the marble and granite grave-stones, every one of which covered the remains of a hero or a cardinal, are smashed to atoms. Upon entering these edifices one is shocked to find the whole of the interior — roof, walls, columns and all — one mass of whitewash, but when the experienced traveller makes a closer examination he feels thankful that such is the case, and for the following reason: It appears that when Famagusta fell into the hands of the Turks, their first step, after putting all the male inhabitants to death, was to turn the churches into mosques, and as it would have been too great a trouble to destroy all the paintings, mosaics and bas-reliefs, they were simply plastered over and then whitewashed. Coats upon coats of lime have been put on at various times until their original state has been forgotten, and now, under this ugly whitewashed column, with a little perseverance, I find a magnificent alabaster pillar, while the next one turns out to be real verde-antique marble, now worth more than its weight in silver, and every inch of the walls is covered with paintings, mosaics or chiselled works of great value. Whether the British Government will take steps to have these monuments preserved or not remains to be seen; all that the new rulers of the country appear to be doing just now being to squeeze taxes out of their lately acquired subjects.

Ever since I have been here I have been wondering if the terrible sand-cloud which has so often ruined Syrian, Arabian and Egyptian towns, even sinking ships at sea with its enormous weight, has had anything to do with the destruction of this place, and this idea is gaining ground with me since I found out that the natives, instead of calling it Famagusta, call it Ammochostos, which is the Greek for "buried in the sand."

Nobody ever sleeps in Famagusta, as, although the Government offices and all the business places of the district are within the fortifi-

cations, the people only go there in the daytime. Anybody sleeping there would be certain to be seized with fever of a dangerous character; whereas the little village, only half a mile distant, where the officials and others spend their evenings and nights, is one of the most healthful spots on the island, and is surrounded by trees and shrubs none of which can be made to grow in the town, as the climate, besides being injurious to man, is the same to beasts and even to plants. — *Correspondence of the New York World.*

THE CINCINNATI CHAPTER, A. I. A.

The Cincinnati Chapter held its regular monthly meeting on the 5th inst.

Mr. John Moser of Atlanta, Georgia, presented the chapter with "Grüner's work on the Dom of Orvieto," also with plates showing in color the decoration of her Majesty's Summer Pavilion at Buckingham Palace. This presentation was made in "Commemoration of the courtesies extended the 16th Annual Convention of the Institute by the Cincinnati Chapter." The books were accepted with thanks. Mr. L. F. Plimpton read an interesting and instructive paper on "Architecture in Monuments." The paper was generally and profitably discussed.

The paper for the January meeting will be by Mr. A. C. Nash; subject, Ventilation and Acoustics.

The movement lately inaugurated whereby the students in the several offices visit every Saturday afternoon some building in process of construction was reported as working satisfactorily, and that there was no doubt but that great good would result to the student as well as his principal.

WORMS IN HARD-WOODS.

Wheeling, W. Va., December 6, 1882.

To the Editors of the American Architect: —

Dear Sirs,—The worm-eaten timber of the Andover Church calls to mind a similar experience I had last year in a large warehouse I designed for Mr. Snyder of this city. In the third and fourth stories, the floors were supported by a number of young white-oak posts, twelve inches square. These posts were painted as soon as placed in position, with a thin coat of white-lead paint; shortly after this was done, it was noticed that some sort of a worm was working its way out of the post, from under the paint, and they increased in number to such an extent that it really seemed necessary to stop their further ravages, or the posts would be destroyed. One or two coats of carbon oil served to destroy the pests at the time and there is no indication that they will attack the posts again. I made inquiry at the time of several persons who dealt and worked in hard-woods for information, and I was told that it was not an uncommon thing to find small worms working in hard-wood, such as ash and oak used for pick and shovel handles, unless proper attention was given to the felling of the timber, and the handling and storage of the same, even after the timber had been worked into shape and placed on the market. In the case above cited, the worms had evidently attacked the timber before the priming coat of paint had been applied; but had escaped notice until they began boring out, and the wood-dust or flour exposed their operations. The worms were about one-fourth-inch long, and one-sixteenth-inch diameter, and had a cream-colored body and black head. They bored in a circuitous route under the surface, and not to any great depth. Hereafter, I shall advise timber of this kind to be treated with one or two coats of carbon oil before being placed in the building. Respectfully, S. M. Howard.

WAX FINISH.

Patchogue, L. I., December 7, 1882.

To the Editors of the American Architect: —

Gentlemen,—Will you kindly inform me through your columns, how to make the hard-wax finish for floors and wood-work, or if it is a manufactured article, where it can be obtained. I have tried wax in almost every way one can think of; but it invariably leaves something to be desired, and is too much work to use.

Very truly yours, J. Cox.

[The best hard-wax composition we have ever seen is manufactured by Chas. Butcher & Co., 171½ Tremont St., Boston.—Eds. American Architect.]

COMPETITION DRAWINGS.

Minneapolis, December 4, 1882.

To the Editors of the American Architect: —

Dear Sirs, — Will you kindly inform us if the plans and sketches for your competition will be returned, if return postage is sent you?

Architect.

[All drawings, whether competitive or otherwise, sent to us for publication, are carefully handled and returned uninjured to their authors. — [Eds. American Architect.]

NOTES AND CLIPPINGS.

Bronze Statue of Liberty for Waterbury, Conn. — A bronze statue of Liberty for a column 60 feet high has been modelled by the sculptor Bissell, of Poughkeepsie, and will be erected at Waterbury, Conn. She has a flag in her right hand and her face and movement are excited At the foot of the column a squad of soldiers, also in bronze, are falling into line. The base is square and will have on its four sides bronze statues representing Victory, a farmer, a mechanic, and a mother with children.

The Siphonage of Traps.—We are amused at finding a correspondent of the *Sanitary Engineer*, a San Francisco plumber of large experience, speak thus of Colonel Waring: "While we are willing to admit his ability as an engineer in large works, I think the matter in question was a subject with which he did not have any *previous experience*, and therefore in justice his deductions should only be entitled to the same consideration that would be shown to the amateur sanitary engineer who should, etc." We can imagine how Colonel Waring will relish being styled an inexperienced amateur, and in his absence, we can safely assure the writer that whatever may have led to the formulation of such unexpected recommendations want of experience with every least detail of plumbing certainly was not one of the causes. We do not propose to take one side or the other in the discussion and we hope that the disagreeing doctors may soon have an opportunity of making a set of experiments under their mutual planning and supervision; for we can hardly suppose that either Colonel Waring's or Mr. Philbrick's present belief is unaffected by the differing results obtained by the other. Meanwhile, we hope to be able to publish the results of a series of elaborate and accurate experiments extending over a period of several months, that have been made by two competent observers, who had begun their researches long before the publication of the National Board of Health's reports, which will throw new light on the vexed question of the ventilation of traps.

Seismology. — A utilitarian branch of seismology has been a study of the effects which have been produced upon buildings. Walls with openings in them, which run parallel to the direction in which there is the greatest motion, appear to be more cracked than those at right angles to such directions. At the time of an earthquake existing cracks in a building have been found to open and shut. Records of these motions have been obtained by means of specially contrived indicators placed across the cracks. Other cracks which had been marked and dated at their extremities appear to have extended. The effects of placing brick chimneys with wooden houses, giving too steep a pitch to a roof, causing arch-ways over doors and windows to meet their abutments at sharp angles, have been objects of observation. The difference in the effects produced upon buildings like those of the Japanese, which simply rest upon the surface of the ground, and those which by means of foundations are firmly attached to the soil, have yielded instructive lessons. In short, it would seem that for earthquake countries architecture requires considerable modification. In England the principal elements which enter into consideration are stresses and strains produced by gravity acting vertically. In an earthquake country we have in addition sudden stresses and strains arising from forces applied more or less horizontally.— *Nature.*

A Telegraph Pole Decision. — Justice J. O. Dykman, holding a special term of Supreme Court at White Plains, in Westchester County, N. Y., rendered his decision in the suit of C. Coles Dusenbury against the Mutual Union Telegraph Company recently. The suit brought by Mr. Dusenbury was a test suit, in which many other residents of White Plains were interested. It demanded the removal of the telegraph company's poles from Broadway and Spring Street, in that village, where they had been placed after the village Board of Trustees had refused the company permission to put them up. Justice Dykman decided that the plaintiff must have judgment on the ground that the telegraph company had no right to place its poles in front of Mr. Dusenbury's lands without making previous compensation.

A Faure Accumulator Company. — Articles of incorporation were recently filed in the New York County Clerk's Office of the Faure Electric Storage and Light Company, with a capital stock of $2,000,000, divided into 20,000 shares of $100 each. The object of the company is to manufacture, purchase and sell all kinds of electrical apparatus and machinery, to acquire patents relating in any way to electricity or to machines connected with electricity for lighting, storage and other purposes, and especially to acquire and work all patents and inventions of Camille A. Faure and Charles G. Perkins. Several months since Mr. William B. Whiting, of this city, and Mr. William Lachlan, an English engineer, arrived in this city from England, bringing with them a number of the Faure accumulators, with the view of making experiments and establishing branches throughout this country of "La Lumière et La Force," which company at that time had exclusive control of all the inventions of Mr. Faure. The purchase then of the exclusive right to use Faure's inventions in the United States led to the formation of the company here considered. It is understood that the storage batteries are to be used principally for lighting private houses, theatres or the streets. The company, however, feel fully competent to provide the power necessary to run street railroad cars and smaller appliances, and, considering the many advantages offered by the use of the accumulators, it is but reasonable to expect that the public will soon recognize their superiority over many other forms of applying electricity.—*Iron Age.*

The Submarine Use of Dynamite. — *La Nature* (Paris, November 11) gives an article by M. Maxime Hélène, on submarine explosions of dynamite, in which he describes and illustrates the blowing up of a rock at the mouth of the river Adour, conducted by himself. Four charges of 22 pounds each were placed on the rock (which was under water) at distances of about 6 feet on the same level. The charges were placed by a diver, the operator in a boat above retaining the wires connected with each charge. When the diver had reascended the wires were all connected to two conducting wires, and the boat rowed away, carrying the latter with it. At a distance of over 300 feet from the rock, these were put in connection with the battery, the circuit closed, and the charges exploded. Although the arrangements are simple, the operation is a very delicate one; and the difficulty of effecting a perfect connection of the various wires with other obstacles, will often make it a tedious one. If not very carefully conducted, it is also dangerous, as was proved by the fatal result of a similar operation carried out at Antwerp a few days after M. Hélène's successful one, in which four lives were lost.