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THE very delicate and difficult operation of straightening the walls of St. Alban's Abbey Church, in England, which was undertaken by Sir Gilbert Scott not long before his death, was begun a few days ago, says the *Builder*, with every promise of success. The walls of the nave — which is the longest nave in England, being not very far from three hundred feet — have so spread as to obviously endanger the building, and to make it imperative that in restoring it or even in preserving it, for the uses of a cathedral, to which, we believe, it is to be raised, they should be brought back to the vertical. This seemed a hazardous task, for the walls are some seventy feet high and seven thick, divided as usual into main arcade, triforium, and clerestory; and the south wall, which was most out, leaned twenty-seven inches outwards over the aisle. The masonry, moreover, was a good deal weakened by age, having crumbled more or less from long neglect and exposure, and the piers were thought to be none too heavy for the weight they had to carry. The roof, of course, is of timber, or it would have been impossible to bring the walls back to their places. The method used was this: the main effort being to straighten the south wall, a horizontal truss was set in the clerestory, running the length of the nave, or of that part of it known as Trumpington's work, which had deflected, to serve as a guide up against which the wall was to be forced into place. A sloping bed of concrete was laid against the inside footing of the south aisle wall, to serve as abutment for the shores or struts that were to bear against the nave wall, and on this concrete was bedded a continuous sill or "template." Upon this were set the feet of the shores, which were framed of struts radiating in a vertical plane, like flying buttresses spreading at the top, and bearing at the upper ends against upright wall-pieces, to distribute the pressure through the height of the wall. The shores were in two sets, one bearing against the upper part of the wall and the other against the lower part. The north wall of the nave was buttressed in like manner on the inside by shores resting on concrete footings at the base of the south piers, to sustain it against the tension of horizontal rods, which were carried through the south wall at the level of the clerestory, to be used in drawing the walls together, that is, in drawing the south wall up to the north. Small hydraulic presses were interposed between the feet of the shores of the south wall and the sill against which they bore. Since it had settled outward, to bring it back to its position would have involved lifting the whole mass bodily, more or less, as it turned about a horizontal axis or axes in its inner face. To avoid this difficulty the bold expedient was adopted of sawkerfing the piers nearly half through on the inner face below their base, and the walls below the triforium, so that the masonry should settle on the inside, as it came into position, instead of being lifted on the outside.

At the time of writing the article in the *Builder*, the process had begun, and the wall was moved safely ten inches toward the vertical, the hydraulic presses working and the rods in the clere-story being screwed up simultaneously. The operation required extreme caution, and the pressure was applied so as first to bring the main piers into position, after which the upper part of the wall was to be raised to the vertical by further effort. The masonry cracked somewhat and opened at the joints under the strain, chiefly on the outside, but there was every indication that it could be restored to its proper position without serious injury, and that this reparation, perhaps the most difficult that has been undertaken since the renewal of the piers of the Pantheon at Paris, by Rondelet, would be securely accomplished. It is said that only a few days before his death Sir Gilbert visited the church, and spent a whole day in examining the traces of the early English work, which had been displaced or covered up by the porch added to the west front at a late date, and declared that he had found all the details that were needed to restore the front completely, saying: "It is one of the finest things ever done, and we will do it again."

THE Chicago Academy of Design has been lately reorganized, after a season of rather unsuccessful struggle with losses and the difficulties of hard times, in a way which, it is hoped, will restore its former prosperity. Originally chartered in 1869, it was started with great spirit, and for a year or two had great pecuniary success. But like many other things in Chicago it has never fully recovered from the shock of the great fire of 1871. While modestly housed on Michigan Avenue after the fire, it still held its own fairly till, in 1876, it was moved to more expensive quarters in the building leased for it on the corner of Monroe and State streets. Here the pressure of hard times came upon it, and it had fallen into embarrassment, being preserved from disaster only by the guaranty of persons who have eked out its revenue from their private purses. Lately a vigorous effort has been made to put it on a sounder footing. Its constitution was revised last autumn, putting the whole control of it into the hands of a board of trustees appointed for a long term, of whom the president is Mr. James H. Dole, and the secretary Mr. W. M. R. French. The school of drawing and painting, which, in spite of discouragement, has been perseveringly kept up, is to be reorganized with the help of private subscription. It will begin the next year with a better arranged course, and with better appliances for instruction. Mr. Spread, who has latterly had charge of the school, will remain as professor of drawing and painting; Mr. L. C. Earle will have the care of the life classes; and lectures are promised from Mr. French and from Mr. W. L. B. Jenney. The instruction as at present arranged is confined to drawing from casts from the antique and from life, and painting in oil and water colors; but it is part of the plan to add a school of industrial art and design. There are now some forty pupils in the school, with a life class three evenings in the week.

At the same time the Illinois Industrial University is proposing to hold in Chicago a summer session for classes in iron-working and wood-working. A part of the Exposition Building has been allowed it for this purpose. There will be two classes in each kind of work, limited for the sake of supervision to twelve pupils each, in session three hours of every working-day, one in the morning and the other in the afternoon. This admits of forty-eight pupils, who will have one hundred and forty-four hours of instruction and practice during the term of eight weeks. The University has been doing this kind of work since its establishment in 1868; the main object of the course of this summer in Chicago is to show conspicuously the kind and the value of the system of instruction which it has developed. The pupils will be taught the handling of tools, by making simple things, such as are actually made in shops for working iron and wood. Each object will be drawn to scale, and the whole class, set to make it from the drawing, working simultaneously under instruction at the same object, with a definite allowance of time.

In the month of April, 1877, an act of incorporation was passed by the State Legislature in favor of the Rhode Island School of Design, which, up to the present time, has remained

but a name. The *causa causans* of its existence was certain surplus moneys presented by the Women's Centennial Commission for the establishment of such a school. As this sum was only sufficient to cover the expenses of a School of Art for one year at most, the incorporators have wisely not undertaken to open such a school. They have declined the overtures made to them by the Christian Association, which had raised a small sum for the purpose of supporting certain classes in art, and made approaches to the directors with the hope of consolidating both the embryonic schools, and so assuring their common growth. This proposition was not acceded to, because the directors felt that it would be for the best interests of their school that it should be absolutely free from the influence of any religious organization. It is now said that if five hundred persons will subscribe three dollars apiece, this sum, with the capital already in hand, will make it possible to open the school in October. It is said, too, that a gentleman has offered to be one of twenty-five to give ten thousand dollars apiece, to establish such a school as ought to be in a city where, engaged in the manufacture of jewelry alone, there are upwards of one hundred and forty establishments.

It is difficult to know whether London or New York is to be accounted the paradise of the speculative builder. First we hear of houses in London, built of ashy concrete or of brick-work laid in street mortar, crumbling down before the contractors can get them fairly off their hands; and then of warehouses in New York falling into ruin as soon as a heavy stock of goods is placed in them. One week we read of a brand-new building on a fine London thoroughfare tumbling in a heap into its own cellar as soon as its roof is on; the next we are told of the preparations of the New York Buddensicks to poison families at wholesale by turning the gas from the street sewers into their houses. The latest story comes from London. Under the present building acts the Metropolitan Board of Works, to which, as we understand it, their execution is intrusted, has power to compel builders to put in suitable foundations, but its authority in this is limited to the substructure of the walls and piers; it has no power to compel a suitable condition of the ground on which a building is to be put. Finding the need of wider authority to check the reckless habit of building in unwholesome situations, the board has appealed to Parliament for power to control the condition of building sites. The Parliamentary Committee, appointed to consider the application of the Board of Works and the objections of builders, has taken a large amount of testimony as to the practices which prevail. The testimony has been printed in a blue-book, and gives the impression of an unsavoriness which, we should say, it would try the mettle of the New York builders to surpass.

It is the common habit to consider a clay foundation much less wholesome than one of gravel; but it would appear that in London he was fortunate who found a new house built for him upon the clay, for he might assume that this at least was no worse than nature made it, while if the ground were gravel there was no knowing what dismal change it might have undergone. In London gravel is far too precious to be left to rest undisturbed in the bowels of the harmless earth. It is the habit, therefore, to dig it out to the depth of seven or eight feet, and the holes it leaves are convenient places into which to shoot the sweepings of the streets. It is said that the whole parish of Battersea has in this way been dug out and refilled within a few years; and other parts of London are as badly off. Some of the tracts are used as dust-shoots, where the dry rubbish and dirt which is taken up from the streets is thrown down. Others are slop-shoots, where liquid refuse and garbage are accumulated. The description of one of these, given by one of the health officers, is sufficient. It was a space about two hundred feet square, "was built up at the sides to a considerable height by means of paving-stones, so that the liquid matter thrown into it should not escape from it, and this was filled up to a height of some six feet with what is called slop from the streets. At that time vegetable refuse, decaying animal matter, dead cats and dogs, fish cuttings, entrails of fowls, and every available filth was thrown into this mass." This was done, of course, by the parish authorities. After due time allowed for fermentation and solidification the mass was carted off, "and I do know," says the health officer, "that it was used to form the foundation of houses in the neighboring parish."

We can easily believe what we are told of the result of this proceeding. In Hackney Wick, for instance, the annual death-rate of the whole suburb being seventeen or eighteen in a thousand, it was found that on one area of about ten acres the death-rate was thirty-four or thirty-five. It turned out that here the houses had been built on a dust-shoot. In one part of the parish of Marylebone there were continual outbreaks of epidemics, for which no reason could be assigned, until the health officer discovered that the houses had been built on a foundation of animal and vegetable refuse. In a neighboring parish the building of a group of houses over an old slop-shoot was followed, as soon as the houses were occupied, by a severe outbreak of scarlatina. In other cases houses were built over old cesspools, which, instead of being cleared out according to law and filled with clean material, were simply covered with a layer of brick and plaster permeable to gases. The effectiveness of reasonable precautions was singularly shown in the case of another block of houses in Hackney Wick. These, like those before mentioned, had been built on a dust-shoot, but the health officer, though without authority to require it, had prevailed on the builder to cover the whole area of them with a layer of cement concrete, and in these houses the death-rate was small for the neighborhood, with no zymotic diseases. It is not to be hastily inferred, nevertheless, that it is safe to build on foul land, and trust to concreting cellar floors; for an unwholesome soil will make an unhealthy neighborhood, and within the houses themselves the concrete is liable to crack from any settlement, — is sure to unless solidly laid, — and give an escape into the houses for the gases imprisoned in the soil.

The attitude of the cotton operatives in Lancashire is still threatening. The first disorders were repressed by military force after the burning of a few houses and mills, but while we write the discontent is represented as increasing. The masters steadily refuse to change their terms; the lock-out therefore continues, and as the work-people grow more excited an outbreak of great violence is feared. It has been said that the rioting at Blackburn was not done by the operatives, but by a mob of ruffians, who took advantage of the disturbances to break loose from control, and do violence in their name. This may be true; but it is none the more reassuring. The men who are ready at any time to stir up disorders which they cannot control are as dangerous to the public as the uncontrolled mob itself. We presume that a great part of the Socialists of this country are of this kind, as well as the workmen who lend their name to them. The fondness for drilling among the Communists and the itching of their fingers to get hold of the musket are not to be regarded as innocent. There are indications, fortunately, that in this country the eyes of people are being opened to this danger. The deposition of Kearney from the presidency of the workingmen's party in San Francisco is one of them. He has set up an organization of his own, it is said; and the associations outside the city are waiting to see which party it will prove more profitable to join. The movement in St. Louis has taken on the dignity of an organization of veterans. At the public meeting on Sunday a call was made for workingmen who had seen military service, either in Europe or in the United States, and some two hundred and fifty were enrolled as soldiers in "the army of workingmen."

THE GOLDSMITHS' WORK AT MYCENÆ. II.

The critical investigation of the art of Mycenæ will be a matter of long study; but one or two obvious facts and suggestions may be noted here. The buttons and flat disks of gold, of which enormous numbers were found, may almost be classed by themselves as ornamentation, being geometrical devices mostly of spirals or convoluted lines disposed on two or three axes, the hexagonal arrangement seeming to be the favorite. The designs are arranged with some skill, with due attention not only to the lines but to the flat surfaces and bands between them, yet are not always attractive. The most common effect is that of a group of angle-worms, or the convolutions of the human brain, symmetrically adjusted. Two patterns in the larger disks, one a cuttle-fish and another a butterfly, both very boldly conventionalized, are the only ones that are not entirely arbitrary. It is difficult to feel sure of the impressions one gets by seeing only the prints of these things, which, though they look faithful, yet fail, as indeed they must, to indicate everything which Dr. Schliemann and other examiners have detected in the originals, — since they are twice removed from

them, being made from photographs. As well as we can judge, there seems to be much inequality and uncertainty in the execution, which is natural enough if for instance, as Dr. Schliemann thinks, the buttons were made over the wooden forms which they enclose, and in which, as he says, the pressure of the tool has imprinted the exact pattern that the thin gold cover shows. The other kind of ornaments, which for convenience we may call swaged, assuming them to have been made in some such way as we have suggested, are quite different from these, being rudely naturalistic in form, and showing no such care or skill in design as the buttons and disks, but looking like a much commoner and cheaper kind of manufacture. The diadems and crowns, on the other hand, the sword belts, and a few of the minor ornaments, including the crosses and flowers found with the women's bodies, unless we are misled by the engravings, are of very much finer workmanship and design than those we have mentioned, the decoration being chiefly of rosettes of Assyrian character, with borders of fine beading and spiral or wave ornament. None of them are duplicated, and they seem to have been wrought by hand. It is difficult to believe that they have been made by the same people, and at the same epoch, as the coarser ornaments, although they are manifestly allied to them in style. None of the work, be it said, will bear comparison with the jewelry of the best periods of antiquity heretofore discovered, or with that which General Di Cesnola found at Curium. There are one or two ornaments so entirely unlike the rest as to reject all kinship with them, such as the bit of gold figured as No. 287, and the tube shown as No. 451. These are entirely composed of flowers with four pointed leaves, like early English dog-teeth flattened, attached to each other by the points of the leaves, the interstices being in the tube at least filled with an inlay of rock crystal. The only parallel to these in ancient work that we can recall is some of the painted ornament on Egyptian mummy-cases. The vessels of gold and silver show as great variety, and on the whole as little relationship to the ornaments of either kind as if they had been a hap-hazard collection from various sources, which perhaps it is not unlikely that they were.

It has been remarked that the representations of animals in the Mycenaean remains are much ruder than the purely conventional work. This is clearly true, as it usually is in primitive works. It is also noticeable that such representations are almost entirely lacking in the objects which show the most characteristic decoration,—the buttons and disks, the belts and diadems, sword-hilts and handles of sceptres,—while the rudely swaged ornaments, as we have called them, abound in them. Nevertheless, on some of the gems there are animals, and even human figures, engraved with a good deal of skill and spirit; others of them are rude enough. There is, however, one very surprising exception to the inferiority or mediocrity of this kind of work. That is the head which Dr. Schliemann, in pursuance of his Juno theory, calls a cow's head, but to which all other observers, learned or unlearned, agree in assigning the male sex. It is of silver, with horns of gold and an Assyrian-looking rosette, or as Dr. Schliemann says sum, of the same between them. If we may trust the engravings,—and fortunately this time there are two of them, by different hands,—it is clearly, in spite of the roughness of surface oxidation, a piece of masterly modelling that would be remarkable anywhere. It is impossible to believe that the people who could have produced it would have adorned their royal palaces and tombs with the glittering rubbish among which it was found.

That there are marked differences then in the artistic character of the various objects found by Dr. Schliemann at Mycenæ is obvious. That some of them may have been imitated from others in an inferior age or by inferior workmen is likely enough. The pottery is thought to be less advanced than the metal work. The execution of the carving on the tombstones found above the sepulchres is childish compared with the ornament on the objects found in the sepulchres. It is equally inferior to the sculptured ornament in the treasuries, and to some other fragments of carving both of wood and stone found by Dr. Schliemann. Archaeologists are probably right in thinking that the tombs are of a later date than the treasuries, and there is not much doubt that the tombstones are later than the tombs. There is reason to believe that the invasion of the Dorians, in whatever shape it came, crushed out the early arts of Greece, as the Teutonic invasions destroyed those of the Roman Empire. It is possible then that the rude tombstones of Mycenæ were the pious efforts of enfeebled descendants in this time of

decadence to renew the memorials, effaced but not forgotten, of their famous ancestors. But it is probable that the deposits in the tombs were of one epoch and their differences in character are to be ascribed to other causes than difference in date. As for the epoch, as we have said, tradition and historical evidence point to but one age of splendor at Mycenæ: that to which the legends of the Trojan war are ascribed. The cause of variation which most naturally suggests itself is the distinction between native and foreign workmanship. There is, we believe, no reason to suppose that gold was found in Greece, but every reason to think it was altogether imported. Unquestionably, the people who inhabited Greece in the heroic age were inferior in art to the peoples of Asia. Pretty much all the objects of luxury which Homer describes, when they were not of divine manufacture, were brought to Greece from foreign countries. The traders of earliest days,—up to the time when the Greeks themselves succeeded them as a maritime people,—who were, as traders commonly are, the leaders also in manufactures and industrial arts, were the Phœnicians, the remains of whose arts have lately been recognized, as their commerce has long been known to have been active, along all the coasts of the Mediterranean. Versatile and eclectic like their successors in influence, the later Greeks, they seem to have united in their art the characteristics of their neighbors on either hand, the Assyrians and the Egyptians, when they did not aim at actual counterfeiting, of which they were fond. Their traffic with the gold mines of Southern Arabia is a matter of tradition. The antiquities of Cyprus, Rhodes, Santorin, and other places on the Mediterranean, and even the discoveries at Nineveh, testify to their wide influence. Not only the arts but even the traders of Phœnicia figure in the verses of Homer.

There is a probability, then, that Mycenæ, like other states, derived the more valued, at least, of her ornaments directly from the Phœnicians, and doubtless the precious material for the rest must have come from the same source. The character of the work is such as to lend also a fair color to this supposition. It is evident that a certain part of it was home-made. The finding of the moulds is inexplicable on any other supposition. The inferiority of the duplicated ornaments in workmanship to the more important ones is in keeping with this. The masks for the faces of the dead, which would naturally have been made between death and burial, must necessarily have been made on the spot. The remarkable rudeness of their workmanship is obvious; it needs no greater contrast than is to be seen between them and the cow's head, or bull's head, which we have described, to mark the distinction between one class of work and another. We have said that the ornaments were invariably of thin gold plate. The masks could hardly have been fashioned in time for a burial unless the plates of which they were made had been kept on hand. Among the treasures of the tombs were pieces of gold plate and crumpled gold foil, some of it much alloyed with silver. From these facts, and from the natural convenience of handling, one might infer that gold was regularly imported into Mycenæ as an article of commerce in the form of plates and sheets rather than in ingots or in dust. It is not impossible that the stone moulds or forms found by Dr. Schliemann were imported also, especially since their materials are not found, we believe, in the region of Mycenæ. Possibly the work of the native goldsmiths was limited to producing, by these and other simple means, imitations more or less rough of the better wrought work which was brought them by the traders. That this use of gold in plates and thin sheets was not native to Mycenæ we know; that it was a Phœnician habit the Bible tells us. The sceptres, scale-beams, sword hilts, and buttons made of wood encased in gold of which we read in Dr. Schliemann's book remind one vividly of the Israelites' ark and its staves, made of shittim wood and overlaid with gold. Of the doors of olive wood which Solomon made for the temple we are told that "he carved upon them carvings of cherubims and palm-trees and open flowers, and overlaid them with gold, and spread gold upon the cherubims and upon the palm-trees." The finely wrought gold and silver cups which were buried with the Mycenaean kings are likely to have had the same parentage as that which Achilles gave as prize for the foot-race at the burial of Patroclus:—

A bowl beyond comparison,
Both for the size and workmanship, past all the bowls of earth.
It held six measures; silver all; but had his special worth
For workmanship, receiving form from those ingenious men
Of Sidon. The Phœnicians made choice, and brought it then
Along the green sea, giving it to Troas.

MODERN PLUMBING. IV.

FAUCETS.

BEFORE describing the different kinds of plumbing apparatus, it will be convenient to have a general conception of the structure of the supply cocks, which, although infinitely various in the forms they assume, depend essentially upon a few simple principles.

The commonest form is the ground-cock (Fig. 1), containing a plug, pierced with a hole which in one position of the handle coincides with the bore of the pipe and lets the water flow, and on turning one quarter round crosses the pipe and cuts off the water. The plug is ground in with emery, so as to fit water-tight, and is slightly tapered, so that the spring at the bottom, which can be tightened by turning the screw in the end of the plug, draws it down closely to its place. This works very well

unless the head of water is very great; in that case, the pressure of the water on the side of the plug, twenty or thirty pounds perhaps, together with the necessary friction of the plug in its seat, make it hard to turn.

The special defect of ground-cocks is that grains of sand or similar hard particles, getting in between the plug and its seat, cut the metal so as to allow the water to leak through, causing a constant dripping; and when this has occurred there is no remedy but to get a new faucet.

In the compression-cocks (Fig. 2) this defect is avoided. There are many varieties, but all consist, in substance, of a tube divided by a diaphragm, the middle of which is horizontal, and is pierced with a hole, which can be closed by screwing down upon it a metal stopper furnished with a leather or rubber washer to insure a tight fit. The screw is worked by a T handle or milled head, or in other ways. The great advantage of these faucets is the ease with which they are repaired. The washer is the only part exposed to wear, if carefully used, and when this gets so worn as to allow the water to leak through nothing is necessary but to unscrew the upper plate by means of a wrench, take out the plunger, and put on a new piece of leather, which is held in place by a small screw through the middle, and then replace the parts. This may be done by any one, even without shutting off the water, if necessary. The washers should be changed as soon as they show signs of wear, by slight leakage; otherwise careless persons, seeing the dripping, will try to check it by screwing the faucet down forcibly, and thus strip or injure the thread of the screw, rendering the faucet worthless.

Compression-cocks differ from ground-cocks in working best under heavy pressures, which tend to lift the valve from its seat, and prevent it from sticking when not frequently used.

Besides these two common forms, the Fuller patent cock (Fig. 3) is much used, the peculiarity of which is the manner in which the water is admitted or shut off by a plug with composition packing, moved to and from its seat in the bore of the tube by an eccentric, which is worked with a lever or T handle like those of other cocks. This is durable and effective; perhaps if it has a fault, it is that the plug, shutting with the action of the water and in the same direction, may, under heavy pressures, close so suddenly

as to jar the pipes, when an air chamber is not provided to diminish the shock.

Where it is desirable to prevent waste of water, self-closing cocks are used, which shut of themselves by the action of a spring when the handle is released.

A common and serviceable kind is formed by a compression-cock with a screw of so great pitch that it will screw down of itself under the action of a spiral spring coiled about the stem.

Under heavy pressures the shock or "hammering" caused by the sudden shutting off of the water may, with self-closing cocks, be so great as to strain the pipes severely, unless a pattern is chosen in which the spring closes against the action of the water instead of with it; and care is necessary with these to have a spring which shall be neither so weak as to be forced open by any unusual pressure in the pipes, nor so strong as to be unmanageable.

For various purposes special cocks are made, the forms being essentially the same, whether they act as ground-cocks, or by compression, or on the Fuller principle.

For filling tanks or cisterns the supply is generally made to pass through a ball-cock, which consists simply of a faucet with a lever handle twelve or fifteen inches in length, the end of the lever being furnished with a hollow ball of tinned copper, and so fixed on the spindle that when the rising water has floated the ball up to a level with the faucet the water is shut off, precisely as if the lever handle were closed by the hand. Ground ball-cocks are most used, but they are made on the compression and the Fuller principle also. If the ball is large enough, and the spindle oiled occasionally, a ball-

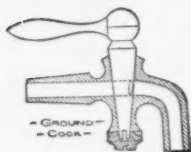


Fig. 1.

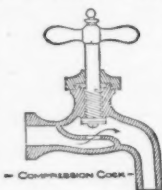


Fig. 2.

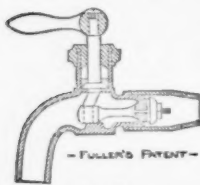


Fig. 3.

cock of any good pattern is little liable to get out of order; but plumbers sometimes carelessly leave them so placed on the spindle that when the lever is horizontal the water is only half or three quarters turned off. The remedy, which any one can apply, is to take the lever off the spindle, by removing the little pin which keeps it on, and replace it in a position a quarter turn below, and then put back the pin which holds it in place.

Next to the ball-cock, the most important cock on the supply pipe is the stop-and-waste, at the point where the pipe from the street enters the cellar wall. This, when turned so as to shut the water off from the house, opens a little orifice in the side, communicating with the house side of the pipe, so that if the pipes are laid as they should be, continually ascending from this point over the house, all the water in the house pipes will drain out through the opening. For this purpose, in the best work, a small sink with trapped outlet to the drain is placed beneath the cock. In common work, nothing more is done than to dig out a hole in the cellar floor beneath it, and trust to the water soaking away. The stop-and-waste cocks and all other stop-cocks on a line of pipe should always be of brass. They are sometimes put in of iron, on account of their being seldom used and generally placed in dark or unfrequented positions where a little economy will not be detected; but the iron, for that very reason, rusts into its place, so as to be immovable when its service is most needed.

Of the different forms of apparatus, nearly every one, wash-basin, pantry-sink, wash-tray, bath-tub, and kitchen-sink, has its special pattern of faucet, possessing some peculiar convenience.

For wash-basins the swing-cocks, which open as they are swung over the bowl, and close on being pushed back out of the way, are convenient, and very generally used. They are liable to the defects of other ground-cocks, so that compression basin-cocks are preferred by many plumbers. These are similar in shape, but the spout is fixed in its position over the bowl, and the water is turned on by a lever or T handle.

The Fuller cocks resemble the compression.

Self-closing basin-cocks are much used, and are made in all varieties. These are usually one half inch, while ordinary basin-cocks are almost always three eighths.

For pantry-sinks it is the rule to use a tall, upright faucet for filling pitchers and flushing dishes, turning over at the top, so as to be out of the way of the dishes; and it is generally specified that the cold-water pantry-cock shall have a screw for attaching a filter.

Wash trays and bath-tubs, besides kitchen-sinks, are supplied through bibb-cocks; that is, a short cock with the end turned down, so as to deliver the water nearly vertically, in distinction from cocks which check the flow of the water in a pipe without changing its direction.

Wash-tray bibbs are made to throw the water forward of the vertical, so as to reach the middle of the tray, and the handle is put at the side instead of on top.

Bath bibbs are arranged to project as little over the tub as possible, and deliver the water close to the edge of the tub. They are often arranged with two handles and one outlet, so that the hot and cold water will be mixed before they enter the tub.

For kitchen-sinks, the ordinary bibb-cock is used, either plain or with flange and thimble.

The plain bibbs end in a tapering portion, which may either have a screw thread to screw into an iron or brass pipe, or be tinned to facilitate soldering to a lead pipe; in either case the pipe, and the junction of the cock to it, being exposed to view.

With the flange-and-thimble variety, a board is set up over the sink or wash-tray, at a little distance in front of the pipes, and concealing them. The end of the faucet extends through a hole cut in this board and is joined to the pipe behind, and the flange covers the hole in the board neatly.

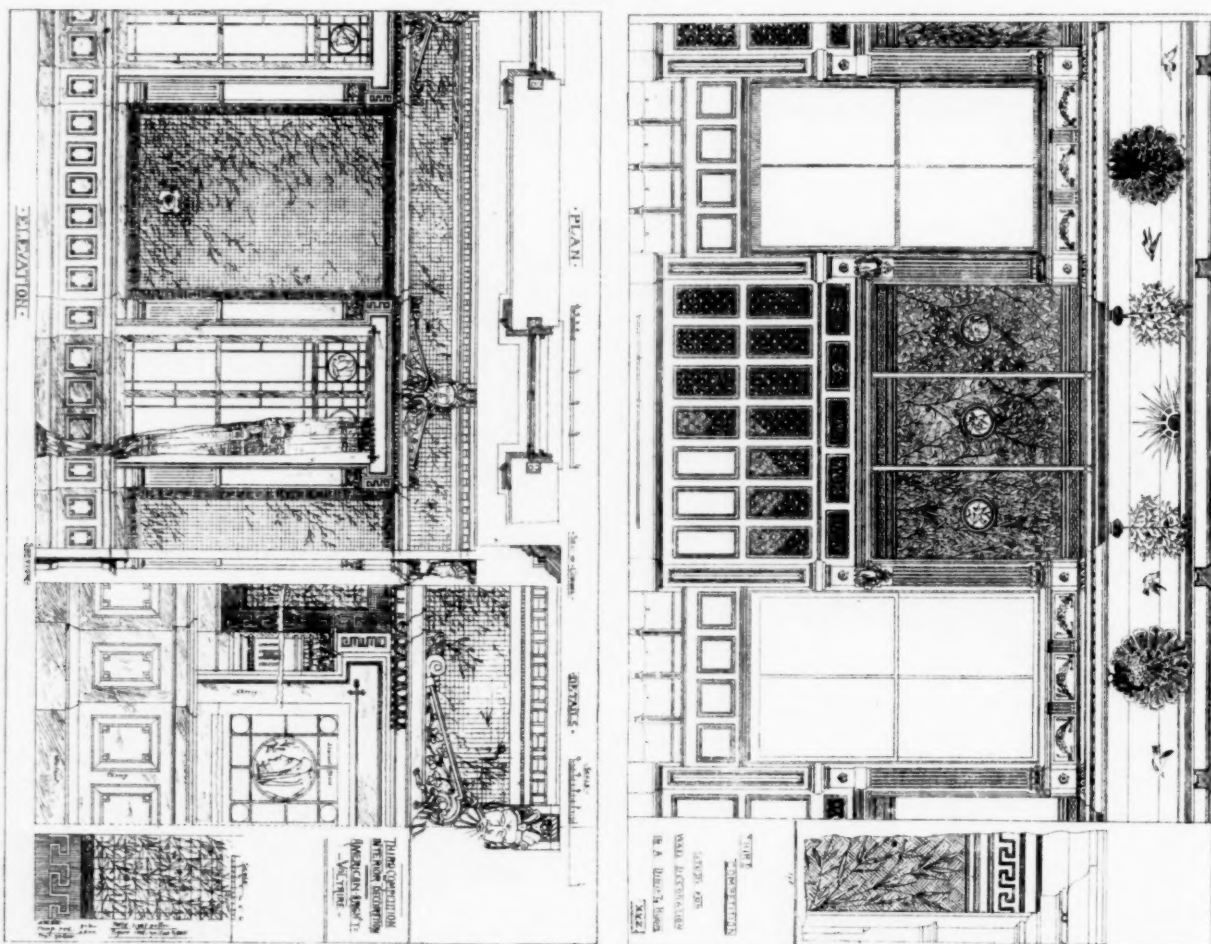
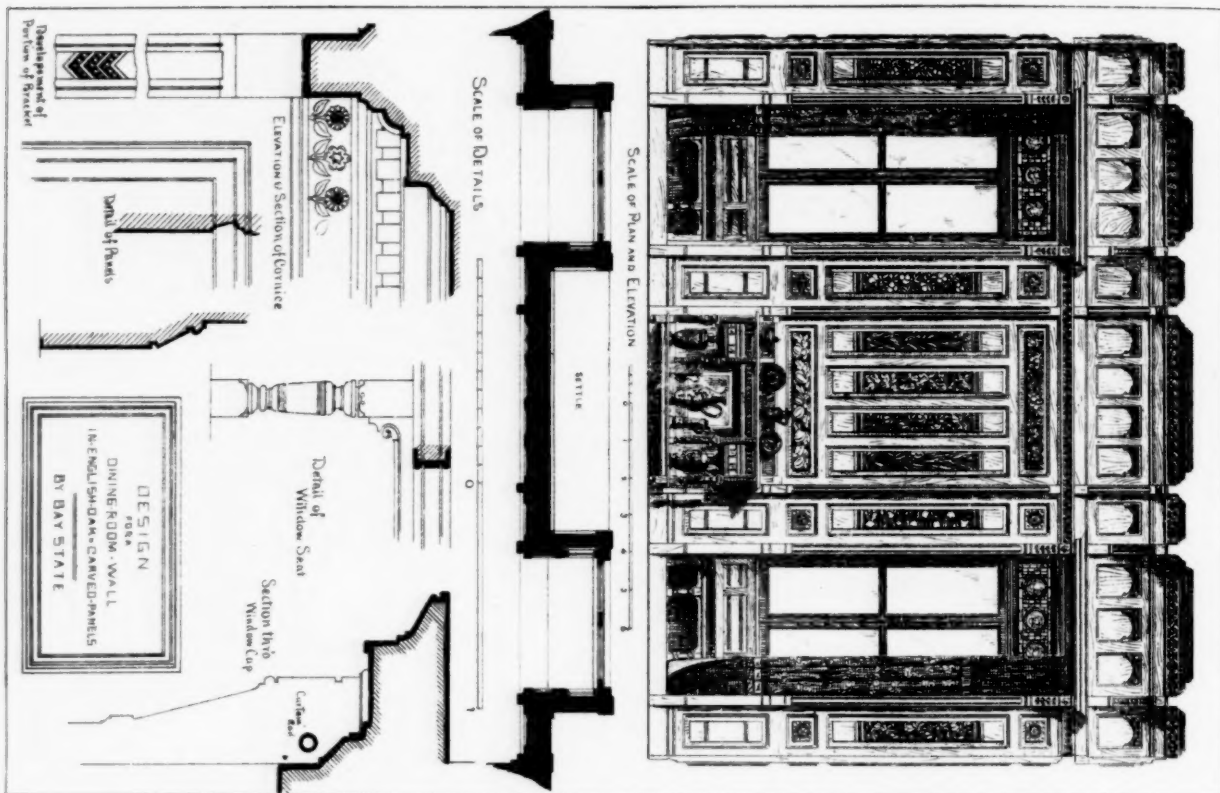
The proper joining of the flange-and-thimble cocks behind the upright board is more difficult, and the superior neatness of the work is not generally of much value.

Very elaborate combinations of faucets are often made, as, for instance, basin-cocks with four levers, two of which deliver hot and cold water into the bowl through a single outlet, and the other two supply a small hose or shampoo cock furnished with a plated rose. These are rather more suitable for barbers' shops, but are also arranged for private houses, and fitted with gold-lined soap cups, hooks for rings, racks for brushes, and so on.

There is a point to be observed in regard to all double cocks, whether for sinks, baths, or basins, which deliver both hot and cold water through the same outlet: if the pressure of the two supplies is very different, as for instance if the cold water is taken directly from the street supply under considerable head, while the hot water comes from a boiler supplied from a tank just above the faucet, the supply under the stronger pressure is apt to drive back the weaker, and force itself out alone, so that it is necessary to draw the hot and cold water alternately, instead of together.

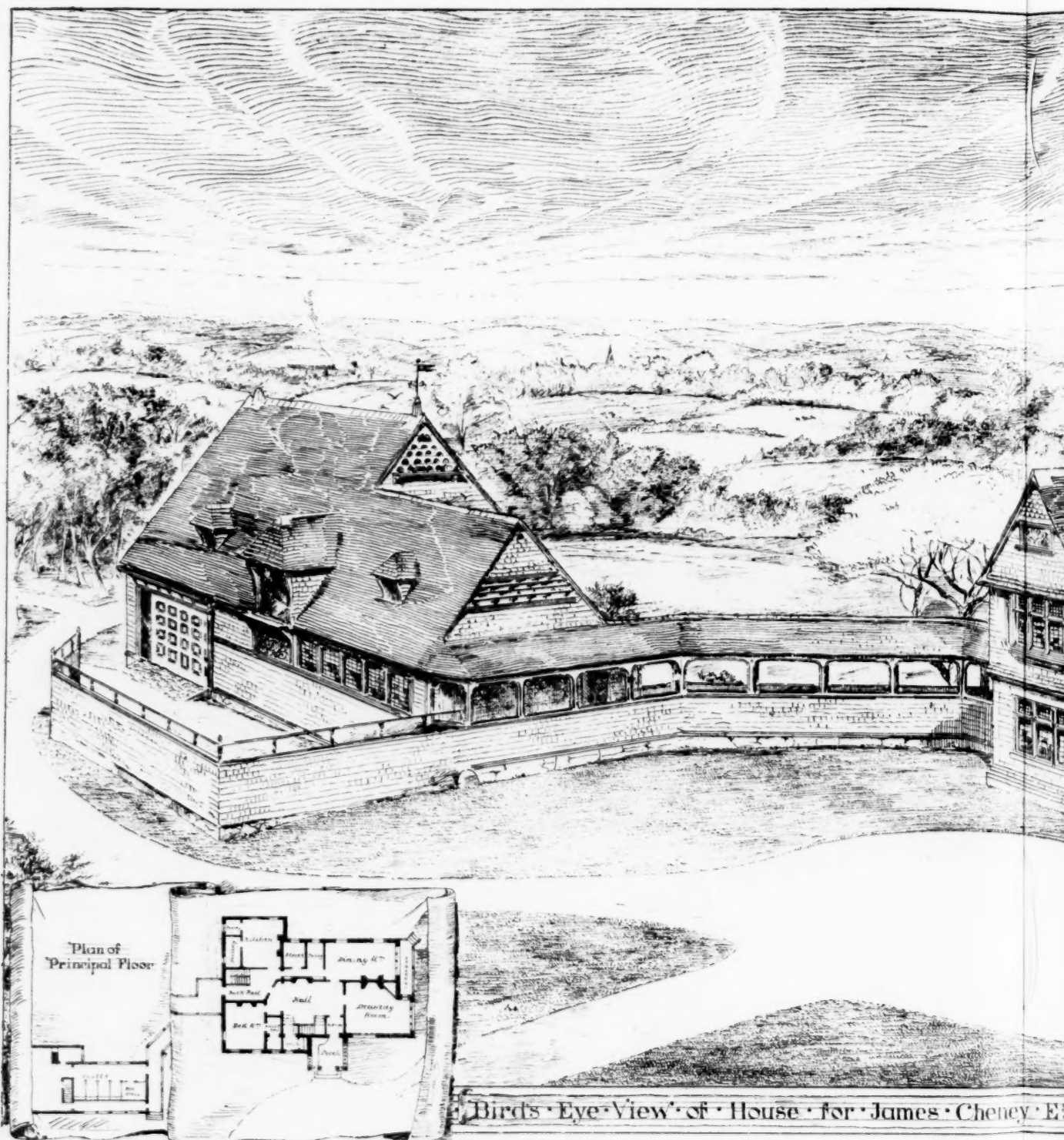
Baths are often fitted with separate hot and cold supply, entering side by side at the bottom of the tub, under a fan, or water spreader, and worked by cocks above the tub, with long spindles extending down to the pipes. This arrangement mixes the hot and cold water perfectly, and the quantity of each is regulated independently of the other.

Some other devices for supplying the water can best be described with the particular apparatus to which they are attached.



DESIGNS FOR A WALL DECORATION
COMPETITION No. 3. —

THE MANOTTE PAPER CO. 220 BROADWAY ST. NEW YORK





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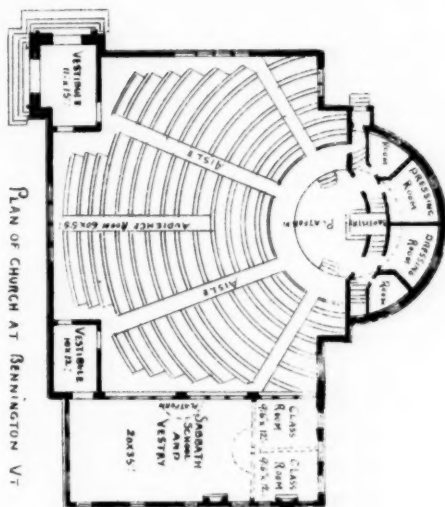
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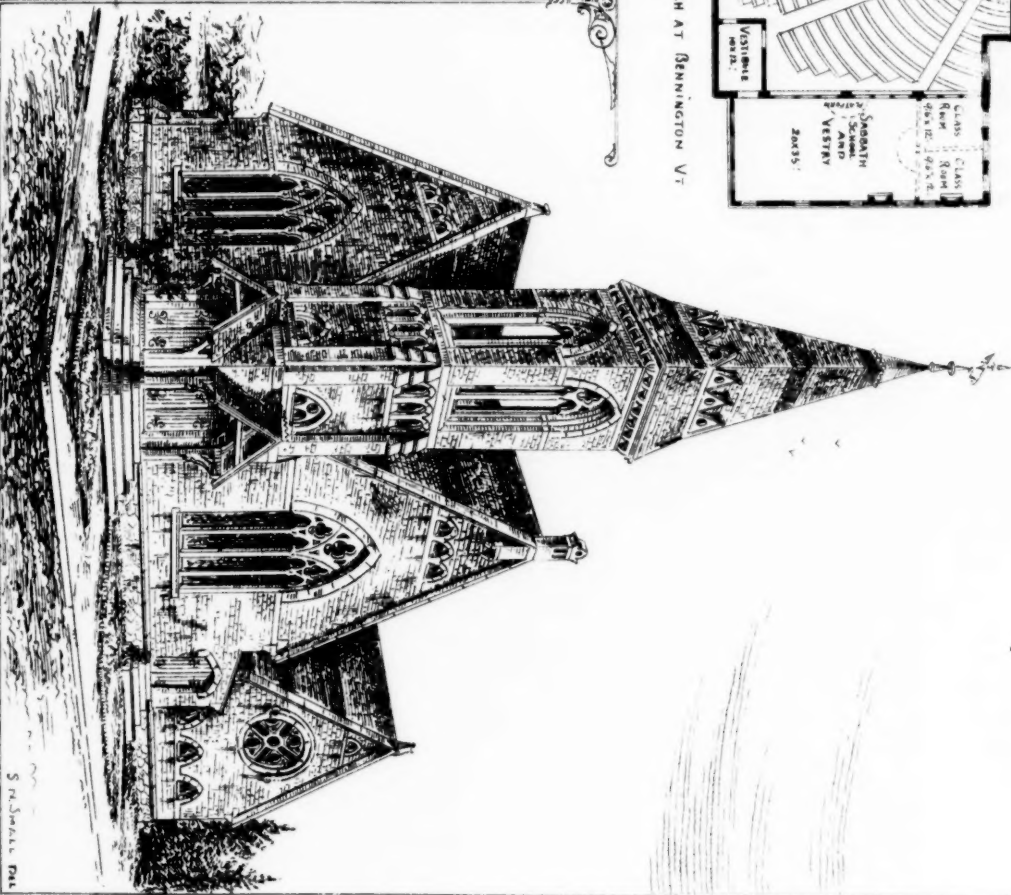


S. N. S. DEL.

PLAN OF CHURCH AT BENNINGTON VT



BAPTIST CHURCH BENNINGTON VERMONT L. B. VALK ARCHT. N.Y.



S. N. S. DEL.

EXPLORATIONS IN SAMOTHRACE.¹

LYING outside the usual course of travel, the island of Samothrace has been until very recently virgin soil for the explorer; and this in spite of its importance in the ancient world as the seat of a mystical worship only less in importance than the rites at Eleusis.

Among the Vatican MSS. is one still unpublished, detailing a visit paid by a celebrated traveller — Cyriacus Pizziccolli, of Ancona — to the island in 1444, when both the buildings described in the book we are about to examine were already ruinous. Since that time they have further suffered from Turkish occupation and from earthquake shocks, and their materials have been stolen, not only for building purposes, but to feed the local lime-kilns. One or two superficial examinations of the ruins were made by various travellers between the years 1822, and 1875, notably by some subsidized French explorers, the details of whose work have never been published. The book we note is the record of explorations made in the island at the expense of the Austrian government, by Herr Conze, an Austrian antiquary, assisted by Herr Hauser and Herr Niemann, both of them architects and professors in the imperial schools at Vienna. Their stay on the island was limited to six weeks, during part of which time as many as sixty diggers were employed. The result was the careful exploration and measurement of the remains of two small temples, and the discovery of many fragments of sculpture, which were conveyed to Vienna. Herr Conze furnishes an account of the progress of the work, and an inquiry into the age and original purpose of the buildings. Herr Hauser superintended the excavation of one temple, and Herr Niemann that of the other, — both works being simultaneously in progress, — and each reports in his own field fully and carefully.

Both buildings, together with a Cyclopean wall and other ruins as yet undisturbed, lie close together on the north shore of the island, not far from the modern village. No pottery was found except in one large mound of sherds, evidently a rubbish heap.

The Doric temple excavated by Herr Hauser faced a little east of north, and was partially encircled by a brook, which was restrained by a great wall from overflowing the level ground on which the buildings stood. In later times the stream burst its barriers, and toward the south, where the water first broke in, debris had accumulated to the depth of two to three metres. Only the north end of the substructure of the temple was visible, and no part of the superstructure was in place. The scattered remains found in digging prove that, after having been otherwise damaged, the temple was finally destroyed by an earthquake. The lower members of the structure, the drums of the columns, lay uppermost, and beneath them capitals, architrave, triglyphs, and — deepest of all — the cyma. All exposed parts of the building were of white marble, which was merely a facing for a structure of porous limestone. This latter has been so weather-beaten that it is almost impossible to measure the stones, or to trace their joints. This limestone is native to the island; the marble, of a bluish tinge, is not. It is coarse-grained and not compact, so that the precision of workmanship possible with Pentelic stone cannot here be looked for. As always, the material essentially influences both dimensions and construction.

The proportionate length of the temple is unusual. Measured on the stereobate its length over all is 39.61 metres (130'); the width at the north end 14.50 (47' 6"), at the south end 13.12 (43' 1/2"). The temple was prostyle; the pronaos unusually deep, with two rows of six columns each. In the axis of the building a door led to the cella. This last was divided lengthwise by two walls into three aisles. These inner walls were connected with the outer walls of the cella by transverse walls running across the side aisles, ten on either side. It seems to have been impossible to determine the former height of any of these interior divisions. The cella at its south end was closed on the exterior by a straight wall, but the interior finish was a curved wall of segmental form. This "apse," as Herr Hauser calls it, included the whole width of the cella. The two interior longitudinal walls, stopping abruptly at some distance from the apse, left an open space in front of it. It could not be ascertained how the ends of these were finished, nor in what manner the segmental end wall met the straight exterior walls of the cella. The corners formed between the straight exterior and the curved interior line of this south end were too small to be utilized, and were simply built up solid.

The difference noted in the width of the building at the north and south ends is caused by the steps which, rising from a limestone platform, give access to the pronaos, being continued around for a certain distance on either side. At 8.4 metres (27' 7") from the front they form a reëntering angle, and cease, the upper course of the foundation stones then becoming higher and running around the base of the cella without any steps. The steps were not found in place, but in good preservation amid the other ruins. In the pronaos the marble stylobate for the four centre columns of the inner row was found in place, so that their position could be accurately measured, the intercolumniations being 2.39 metres (7' 10 3/4"). The elevation of the stylobates made a raised field between the two rows of columns, equal in width to two intercolumniations. The slabs that floored this are of unequal size and thickness. No remains of stereobate are to be traced under the space that intervenes between

the columns and the cella. Thus it will be seen that the stereobate was not, as in Attic examples, a substructure for the whole building, but merely for the columns and the external walls. The marble floor reposed, not as in the Parthenon, on a foundation, but merely on a layer of limestone slabs, which rested on the ground or were filled under with rubbish.

The temple is so far ruined that Herr Hauser found it difficult to restore in imagination the space between the inner columns and the cella, which space was deeper than the pronaos proper. No points of support occupied it, for the long marble beams that ran from the cella to these inner columns, and many of their complementary panel pieces, have been found. The sill of the cella door was found in place. It is to be noted that between it and the beginning of the two inner longitudinal walls of the cella is an open space floored with marble and surrounded by a slightly raised band. This space was probably to allow the two leaves of the door to open inward and swing back against the inside of the front cella wall. There are indications that some mode existed of closing the centre aisle from view even when the door was opened, — probably by curtains. No remains of the door were to be found, nor is it possible to tell whether its jambs were perpendicular or slanting. The clear width of the door was about 2.5 metres (8' 2 1/2"). It may have been of wood overlaid with bronze, as pieces of a narrow bronze cyma came to light. The pronaos certainly was not closed in any way with iron gratings or gates. No marks, such as are visible, for example, in the Parthenon and Theseum and at Sunium, are here to be found on column or stylobate indicating the presence of such iron-work.

The cella is longer than is usual in Greek or Roman buildings, — over all from outside the door-sill 28.33 metres (93') in length, and 13.12 (43') in width, the inner measures being respectively 25.91 metres (85') and 10.6 (34' 9 1/2"). The longitudinal dividing walls, as has been said, do not run the full length of the apartment at either end. The foundations of these walls remain to a height of .37 metre (1' 2 3/4") above the flooring. There were ten of the strange cross-walls in either aisle, two of them being beyond the termination of the interior walls, between them and the apse.

When such a segmental or apse-like interior termination comes to light as we here find, it is usually ascribed without much discussion to Christian alterations. Here, according to the testimony of the explorers, this is not a possible explanation. No traces of Christian art are to be found, and the whole of the ruins are indisputably of one epoch. The radius of the curve, which, be it noted, is made with *coussoirs*, is 5.75 metres (18' 10 3/4"), and its flooring is two steps higher than that of the cella. In the middle of the first step is a slab 1.465 metres (4.9 1/4") wide, 1.205 (3' 11 1/4") long, and .36 (1' 2 1/4") thick. Penetrating it is a semi-circular hole, prepared on the edge to receive a cover. This slab is supported by blocks under either end, but beneath the hole is undisturbed soil. Between this stone and the wall is another opening in the floor, showing also the earth beneath, uncontaminated by rubbish. It is irregular in shape, the sides being formed by curved stones. It is as impossible to reconstruct, with any degree of plausibility, the rest of the sanctuary as to decide how the various walls were finished and joined, but no *voussoirs* were found to indicate an arched form.

Returning to the pronaos we find the columns were without bases, the shafts with twenty channels of elliptical profile, not very sharply or characteristically cut, owing to the coarseness of the marble. The channels of the different drums are not quite alike, showing the touch of various and sometimes of careless hands. Neither dimensions nor entasis (if it existed) can be exactly measured. It is probable the columns were five drums in height. The drums only touch at the outer edge, the centre being rough and a little sunken. The holes for the dowels are seen, and the incisions for lifting the blocks into place. The abacus is unusually deep and heavy. There is no decorative cutting beyond the strictly necessary. The outer columns seem to have been heavier than the inner ones. The architrave shows a pure Greek section, but is badly worked in parts. The triglyphs and metopes show only the thickness of facing stones, and one slab of marble formed one triglyph and one metope. The mutules are very short, only .01 cent. (1/32"). The cyma is rich in comparison with the rest of the structure, a honeysuckle over each metope alternating with a lion's head as water-spout over each triglyph. The tendril-like ornament between is sketchily worked and somewhat thin, and the honeysuckles are unusually stiff.

As has been said, stone beams belonging to the ceiling were found nearly entire. They stretched from the inner row of columns to the cella wall, a distance, including the points of support, of nearly 6 metres (19' 8 1/4"). To strengthen these stones they were made thicker than appeared to the eye. The visible part, in itself unusually deep, was .91 metre (3') deep, and concealed above by the ceiling was a further depth in the centre of the stone of .50 metre (1' 8"), tapering down toward either end. The under side of the beams shows a narrow, incised panelling. They rested, as in Attic *ionic* buildings, directly on the architrave. Fragments of the coffers, too small for any restoration of their design, were alone discovered.

Nothing was to be traced of the internal arrangement of the cella or of its roof. Its walls were marble-faced outside; inside the soft stone was plastered to a fine surface and painted red. This paint was put on *al fresco*, for in places where it had been renewed one or more times the fresh overlay of plaster was to be traced, unnecessary in any other method. In the apse was found paint of a black-

¹ Archæologische Untersuchungen auf Samothrake. Ausgeführt im Auftrage des K. K. Ministeriums für Kultus und Unterricht, mit Unterstützung Seiner Majestät Corvete "Zringle" Commandant Lang, von Alexander Conze, Alois Hauser, Georg Niemann. Mit 72 Tafeln und Holzschnitten. Wien, Druck und Verlag von Carl Gerold's Sohn. 1875.

ish-green color, which, on exposure to the air, turned to a greenish-gray. The red color, on analysis, proved to be from oxide of iron, the gray from powdered carbon. A most noteworthy fact is that, notwithstanding these well-preserved polychromatic decorations on the plaster, no sure traces of color were found on the marble in any part of the building. The whole structure was carefully, even anxiously, secured throughout by a profusion of dowels and clamps. Some of bronze were discovered, the bronze being of a fine quality.

The acroterium on the south gable was very elaborate and unusually large. Freely and cleverly modelled, its fragments help much to decide the probable date of the temple. In comparison with the Parthenon the entablature was low and the gable high, and the diminution of the columns insufficient. Judging by these and other details by the workmanship, and by the sculptures of the north pediment, the explorers pronounce the building to be late Greek, but ante-Roman, presumably dating from the time of the Diadochi. The sculptures are too free and clever for Roman work, too studied and elaborate to have belonged to the fifth century. The fact that they are not finished in the round, but merely blocked out at the back, proves them post-classical without a doubt. If the date of the temple is after all somewhat indeterminate, its purpose can be more easily discovered. It was undoubtedly connected with the mystical worship of the Cabeiri and Chthonian rites. The unusually large pronaos would by itself go far to prove mysterious rites, and the opening in the apse floor, like others in various temples, was, to put it curtly, the opening into the under world. Rites of purification are known to have borne a principal part in the *cultus* of Samothrace. The opening being in such a prominent place denotes its connection with the main purpose of the building. The sculptures, furthermore, show bacchanalian elements.

Passing to the second building, the one excavated by Herr Niemann, we find it to be an addition to the short list of ancient circular buildings we are able to cite. No stone of the superstructure was found in place, but about one tenth of its constituent blocks were discovered in the neighborhood. It was also Doric and of marble, and, according to the very confident restoration of Herr Niemann, consisted of a base surmounted by pilasters bearing an entablature and a domical roof. The interstices between the pilasters were filled with marble slabs, carefully wrought into the curved shape necessary. Half columns replaced in the interior the pilasters of the exterior, forty-four in number. The outer radius of the foundation wall was 10.15 metres (33' 3 $\frac{1}{2}$ "), the inner, 7.6 metres (23' 5 $\frac{1}{2}$ "), and the exterior circumference of the architrave 59.66 metres (194' 1 $\frac{1}{8}$ "). The height of the base remains uncertain, but it seems to have had two steps. The building was probably hypæthral. Unlike the other, its age is certain, its purpose problematic. An inscription on the architrave gives the third century B. C., and the workmanship bears out the date. Dedicated to the great gods, it may yet have been not a temple, but rather a memorial receptacle for a statue.

Other antiquities still remaining in the neighborhood of these two buildings are the great Cyclopean wall around the temple, the base of a building with an arched passage beneath it, and close to the Doric temple another in the Doric style, which is perhaps older, as it appears to be entirely of native stone. One large block of Egyptian granite was found in the temple, which, with the apse-like end, affords some indication of Egyptian influence; and the restorers point, by the way, to Arsinoë, whose death occurred in 247 B. C., as likely to have been the one commemorated by the circular building. Furthermore, there are both late Roman and mediæval buildings to be seen in various parts of the island.

In conclusion we may mark as most worthy of notice the facts that in this building, of indisputably Greek origin, vousoirs were used, at least in a horizontal arch, and that polychromatic decoration appears not to have been applied to the marble, though present on the plaster. A more important service, however, than the establishing of any such isolated facts is rendered by explorations of this kind, for they serve to demonstrate that classic architecture was not, any more than mediæval methods, a rigid following of absolute rules. Every such exploration renders more difficult the attempt mathematically to calculate the intentions of ancient builders. Furthermore, we see that the conscientious and perfect workmanship and the sure eye for beauty of proportion and form which we call "Greek" should more properly be held as classic Athenian. The further we stray, either in time or space, from the Attica of Pericles, the less we find of its absolute perfection.

M. G. VAN RENSSELAER.

AMERICAN VERNACULAR ARCHITECTURE.¹

II.

In Vol. II., page 280, of this journal, we noticed under the above heading the first five parts of Mr. Woodward's "National Architect," Vol. II. We have now received this volume complete with one hundred well executed plates.

The completion of this volume does not do more than fairly fulfil the promise of its earlier pages. It presents an accurate picture of the commonplace forms in American buildings, — forms such as

give to American towns their characteristic expression, and which have been in great part legitimately developed out of our conditions of living. As this book gives a deliberate record of these forms, as it

"nothing extenuates,
Nor sets down aught in malice,"

but ordains and gives a certain grammatical coherency to a style of building which every intelligent carpenter or builder has fairly in hand, and can set forth for you with a facility which, if fatal in respect to art, is at least significant of an established vocabulary of building-forms, — as this book doubtless performs this service for the public and for history better than any which has preceded it, and perhaps may be accepted as the American parallel of M. Daly's admirable "Architecture Privée" of the time of Napoleon III. in France, it should possess an especial attraction for all who are interested in the progress of art. Certainly to the foreigner, as the expression of a vernacular architecture, it will present elements of greater interest than would the published works of any accomplished American architect, which have derived their inspiration more directly from the study and adaptation of familiar and fashionable European forms, and which, although intrinsically of far greater value, are indicative rather of individual achievement, of personal culture, than of a national architecture.

Mr. Woodward has been prolific in his architectural publications: he has given us "Woodward's Country Homes," "Woodward's Cottages and Farm Houses," "Woodward's Suburban and Country Houses," and there is an ominous "etc." added to the list. We now have the second volume of Woodward's "National Architect," and so long as he remains truly national, so long as he continues to keep a vigorous curb upon his resources of imagination, there is no reason, from a mercantile and business point of view, why he should not go on indefinitely multiplying his designs for villas and town houses. But he must beware of inspiration or invention, of poetic sentiment or original thought; the moment he suffers these elements to enter into his compositions he will get beyond his public and they will have no more of Woodward. As it is, he has discovered a profitable field of enterprise in flattering and gently leading the tastes of the people. The solitude which genius makes for itself is imposing, but rarely remunerative.

This book contains eleven designs for city and country houses, types which have their principal seat in and about the city of New York, but which obtain more or less acceptance throughout the North and West. They are thoroughly illustrated by plans, elevations, and sections, and, in many cases, by details drawn to a larger scale and very accurately delineated. There are also designs for summer-houses, carriage gates, tool-houses, arbors, verandas, oriels, balustrades, finials, crestings, dormers, gablets, and porches, a revelry of jig-sawing, and a mine of wealth to the "practical architects" of our country towns. Architecture in boards has never received a more complete illustration. Not unfrequently, the drawings recall to mind the pages of Degen and the German "Skizzen Buch," which some fifteen or twenty years ago so pleasantly assisted the callow imaginations of young American designers; but most of these drawings are made indisputably our own by a certain infusion of what we are constrained to call vulgarity. The reserve and elegance of form which are the result of high training, the chastisement and self-denial which come from knowledge and discipline, the imagination which dares to venture upon new flights, the education which prevents these flights from repeating the disaster of Phaeton, — these qualities are not at present to be found in Woodward, nor in the national architecture. When, by secular processes of development they shall be found in the Woodward of the future, we shall have become an artistic people, and architecture proper will at last have a home and a recognition in the land. Until then the profession must needs go forth like missionaries among the heathen, starting with earnest convictions, and then learning the language; becoming familiar with the new conditions of life; encouraging each other; fighting against the Philistines; overcoming innumerable obstacles of ignorance and prejudice, not only among the unconverted, but within their own breasts; gradually winning their way to understand and to be understood. As a record of the condition of the heathen at the present stage of progress, Mr. Woodward's "National Architect" will be invaluable at all times.

Take, for example, plates 57 to 64 inclusive, representing a "design for a city house with a rear extension, to be erected on a lot twenty-five feet wide." Here we have the veritable "brown-stone front" of our literature, four stories of windows absolutely similar in architectural composition, a bracketed cornice returning upon itself, a high stoop with Doric columns and a composite entablature, round-headed windows in a rusticated basement; here are the familiar plans very correctly and carefully drawn, with no essential detail of information omitted. As a type, this design is in every way admirable; it is the exact expression of the manners and customs of domestic life in a great American city of the year 1878, for it contains no point of originality, no suspicion of exceptional treatment in any particular. It belongs to a class, and marks a point of progress far better than would any work of genius.

In like manner all the country houses in this book are planned remarkably well, but, in this respect and in respect to their elevations, they seem to be, so far as possible, within their sphere, the very symbol of the times. They represent safe points of departure

¹ Woodward's National Architect, Vol. II., containing original designs, plans, and details, to working scale, for city and country houses. By Geo. E. Woodward, Architect. Geo. E. Woodward, Publisher and Importer. Copyright, 1877. 136 Chambers St., New York.

for the architect. They are formulas of design for popular use, based upon experience, developed by necessity, and shaped by tradition. As such they have all the crudeness and vulgarity that belong to all popular manifestations of art in these days. Between this state of society and that of the Greeks of the time of Pericles, for instance, or that of the Royal Domain in the time of St. Louis, there is, in respect to art, a difference significant of the especial function of the profession of architecture in these days; for it has a function, notwithstanding that Woodward meets with a large sale, and that the commonplace is common.

WOODWARD'S ARTISTIC DRAWING STUDIES.¹

THIS is a book of a kind that has been very common, and from its imprint being without a date, we presume it is expected to be perennial. It consists of seventy or eighty plates, containing a variety of subjects—heads, figures, animals, foliage, and landscape—copied in lithograph from various originals. The lithographing is the usual conventional thing, apparently done by several different hands, at least in several different manners, and with fair mechanical skill, but without showing any special knowledge or intelligence. We cannot admire the selection of subjects. The heads and limbs are mostly like ordinary life-class drawing, from commonplace models; the animals, figure-sketches, and foliage are the conventional drawing-master's copies. One or two of the heads are from originals of greater pretension than the rest, and certain outlines of animals, purporting to be from sketches by Barye, are rendered with peculiar insipidity. Some of the heads and foliage drawings, we must confess, are atrocious. The drawing-master who uses these copies may find them convenient to save his labor or cover his ignorance. The pupil may learn mechanical neatness, as from a hundred other books that he can find, some better, some worse; but he will not be likely to advance either his taste or his knowledge.

THE ILLUSTRATIONS.

HOUSE FOR JAMES CHENEY, ESQ., SOUTH MANCHESTER, CONN.
MESSRS. GAMBRILL AND RICHARDSON, ARCHITECTS, NEW YORK.

DESIGNS FOR THE DECORATION OF A WALL.
COMPETITION NO. III.

IN this competition only fifteen designs were submitted. The jury has awarded the first prize to the design by "X. Y. Z.," and the second prize to the one by "Bay State," both of which we publish with this number. Honorable mentions have been awarded to the designs by "Inconnu" and the author of the token a palm branch crossed by an arrow, which, with one other design, will be published next week. As it is somewhat difficult to describe in words the graphic symbols which some competitors use as signatures to their work, we will ask them in future to bear this in mind.

FIRST PRESBYTERIAN CHURCH, PERRYSBURGH, O.—BAPTIST CHURCH, BENNINGTON, VT. MR. L. B. VALK, ARCHITECT, NEW YORK.

CORRESPONDENCE.

THE LATE SIR G. G. SCOTT.—THE WELLINGTON MONUMENT.—THE ROYAL ACADEMY.

LONDON, 30th April, 1878.

THE death of Sir G. G. Scott has been the greatest loss the profession has sustained in modern times. In the midst of his career, at the height of his fame, he has been suddenly called away from his work. It is not too much to say that the blank thus unexpectedly made in our ranks will be very difficult to fill up. A man of great experience and high culture, he took a deep interest in everything connected with architecture; he might be almost called the apostle of the Gothic Revival, so much was he identified with its rise and progress. Probably no one has had anything like the variety and quantity of church work pass through his hands that he had,—from the humble village church to the stately cathedral,—and whatever opinions there may be as to the quality of his work from a purely artistic point of view, there can be none as to the honesty of purpose, untiring energy, and burning zeal he at all times brought to bear on it. The architectural societies owe him a mighty debt of gratitude for the cordial and weighty support he was ever ready to give them; indeed, but for him the Architectural Museum would probably have ceased to exist. Many of the kindred arts connected with architecture were called into being and kept alive by the requirements of his practice, or through his influence; many of the workers in them owe their name and position to the like cause, as many a building scheme does its success to his name as its architect. Throughout the length and breadth of Great Britain and its dependencies, as well as on the continent of Europe, the impress of his genius has been left. No name has attained a more world-wide reputation than his, and no one in the world of art will be more universally regretted than he who now sleeps under the nave of Westminster, surrounded by the art he loved so well.

¹ Woodward's Artistic Drawing Studies, for Artists, Art Students, and Schools. New York: Geo. E. Woodward, 139 Chambers St.

Already there are several proposals for a memorial to his genius, though standing almost anywhere in England one might be inclined to quote what was said of another great church architect: "and for his monument look around you."

Strangely enough one of these proposals is a restoration scheme for the west front of St. Alban's Abbey. Now it is no secret this same subject of restoration caused Sir G. G. Scott no little trouble and personal annoyance in his later years,—or rather the Anti-restoration Society through some of its most prominent members did,—and notably during the recent discussions of the subject in the Institute, when several bitter attacks were made on his works in that department of his practice. It is not to be supposed that in his long career Sir G. G. Scott never erred; that he always did just what was right and no more, either in new buildings or old. As we have said, there are probably plenty of opinions about this,—it would be strange indeed if there were not,—but the wisdom and good taste of the attacks recently made on him are more than questionable, and knowing how keenly he felt on the matter, it was worse still when, after his death, one of the principal actors of the opposition, on being called on by the president at a meeting of the Institute, failed to do him the tardy justice of even disavowing all personalities on the vexed question. So the proposal to restore the west front of St. Alban's has been received with another howl from the now notorious society, who pursue the argument even over his grave. St. Alban's Abbey was under his care; in all probability the west front would have been restored by him; so if it is to be done at all—as done it will be—there is something as graceful as it is appropriate in dedicating it to his memory. It seems to us the anti-restorationists would best consult their own dignity, and the cause they profess to serve, if they used a little more discrimination and judgment in their dealings with those who may differ from them, and did not run their heads against everything and everybody as they do at present, often too on the most meagre information and faulty premises.

On Easter Monday the long waited for Wellington Monument was thrown open to public inspection in its place in St. Paul's Cathedral. It is much to be regretted that its gifted sculptor has not lived to see it finished; more so still that its crowning feature—the equestrian figure of the duke—is still wanting. The design is incomplete and ever will be, till the horse and his rider are in their place. The model for the group was partly finished by Mr. Stevens before his last illness, quite sufficiently so to know what his intentions were and to have them faithfully carried out; we trust therefore the day is not far distant when this noble work will be completed as its author intended. It is placed in a somewhat bad light in the chapel in which it stands,—against a large window looking south, through which the strong sunlight streams and throws the whole of one side into shadow. It is to be hoped this may be remedied to some extent by toning down the glaring light from the window, by stained glass or otherwise; at all events it is much needed.

As it stands the monument is the finest modern work of the kind we possess, with the genius of a true artist stamped on its every line. The recumbent figure of the duke, the groups of "Valor and Cowardice," and "Truth and Falsehood," might be from the studio of Michael Angelo himself, so vigorous are they in design and powerful in execution, while all the architectural work is carried out with a spirit worthy of the best days of the Renaissance, showing what an exceptional man its sculptor must have been to understand architecture so thoroughly. In his life he declared he knew of but "one art," and certainly painting, sculpture, or architecture, all seem to have come alike to him; he knew and did all well. His scheme for the decoration of St. Paul's, of which he left a model of the dome, is the finest that has yet been brought forward; and had he lived and been entrusted with the work, we doubt not we should have had as good reason to be proud of it as we have of his monument to Wellington. The great mosaic figures in the spandrels of the dome are all of his scheme which ever saw completion, but are enough with the rest of his works to tell us what a genius was lost in Alfred Stevens.

Next Monday—the 6th of May—the Royal Academy opens its doors again; this week a series of private views has been given, to the artists, the press, and the favored friends of the Academy. The architectural collection is not above the average, and is stronger in civil than in ecclesiastical work. The place of honor is given to the late Sir G. G. Scott's designs for the Hamburg Exchange. In two magnificent pen-and-ink perspective drawings, his Gothic and classic design for the same building hang side by side,—the former in that phase of secular Gothic long afterwards identified with his name, and the latter founded on the type of the work at Heidelberg; and though neither of them was ever carried out, they still remain amongst the most successful of his efforts, better in many respects than either his subsequent designs for the Foreign Office, or the Berlin Houses of Parliament. Of the members of the Academy Mr. Norman Shaw has sent a couple of designs of houses,—one a very beautiful drawing,—which we shall notice again; Mr. Street, some school or college building; Mr. Pearson (who is mentioned as likely to be the new R. A. in Sir G. G. Scott's place), a fine drawing of his noble church in Red Lion Square, and a somewhat unsatisfactory Elizabethan country house; Mr. Waterhouse, the new A. R. A., a country house in his peculiar phase of Gothic, and an interior of the hall of the Natural History Museum, for which artistically, perhaps, one cannot say very very much.

The principal competitions of the year are represented by the successful and some of the unsuccessful designs, such as the Wakefield Town Hall, the Barrow-in-Furness Municipal Buildings, the Leeds and Nottingham Public Buildings, and the Kensington Vestry Hall. Several churches of the recognized Gothic type and several interiors in the present fashionable mode are also there, all of which we hope to notice more in detail; but we cannot pass over a design for a college tower by Mr. Bodley, a noble piece of work in late Gothic and of striking character, a great square stone tower, crowned by a wooden lantern, thoroughly English in design and splendidly detailed, at once original and artistic throughout.

A quaint design for Tipperary Town Hall, by Mr. Jackson, also claims notice; it is in that peculiar phase of late domestic work which he has employed in his Military College at Oxford, in which plaster walls and red brick finish play a prominent part. How it will all look in execution remains to be seen. Two richly colored drawings show Mr. J. P. Seddon's design for the decoration and furnishing of Queen's College, Oxford, almost too highly colored to give a good idea thereof; it is so gorgeous one loses the detail of the design.

ST. LOUIS.—ITS GROWTH AND ADVANTAGES.—ITS BUILDING MATERIALS.—THE COST OF LABOR.—REAL ESTATE.

ST. LOUIS.

THE census of 1870 surprised and gratified the people of St. Louis, by showing that their city, with 310,869 inhabitants, was the fourth in size in the United States, following in order New York, Philadelphia, and Brooklyn. The city directory recently issued estimates the population of St. Louis, at the close of 1877, at 502,685. Another decade of growth in the same ratio would make St. Louis about as large as New York is to-day.

St. Louis is believed to be the healthiest city on the globe. The registration of deaths is careful and systematic, yet in 1877 the total mortality was but 5,660, or at the rate of 11.1 in 1,000. The mortality of London and Paris, two of the healthiest cities in the world, is about 20 in 1,000; that of Washington and Philadelphia is about the same; while in Baltimore the rate is about 25 in 1,000, in Boston 26 in 1,000, in Chicago and New York each 27 in 1,000, and in New Orleans 33 in 1,000, according to the latest information at hand.¹ This remarkable salubrity may be ascribed chiefly to the excellence and abundance of the water supply, to the extensive and well-arranged system of sewerage, to the almost entire absence of overcrowding in tenement houses or otherwise (there are but two known tenements in St. Louis, holding together not much more than one hundred families), to the ample width of the streets and alleys in every part of the city, to the vigilance of an efficient board of health and police department, and largely also to the healthy site of the city, which is a broad plateau rising rapidly from the bank of the Mississippi to a level far above high-water mark, thence extending westward in a series of gentle undulations whose ridges are more than a hundred feet above the highest stage of the river floods.

The city is somewhat lozenge-shaped in plan, with a convex river front of about sixteen miles, and a maximum width of seven miles. In the older parts the Philadelphia system of numbering the streets parallel to the river has been followed, but in the newer portions this plan has unfortunately been abandoned.

The amount of building during last year was moderate. The number of permits issued was 2,115; the valuation² of the buildings was \$3,229,726. These buildings are almost exclusively of brick, though sometimes with fronts of sandstone ashlar on the more expensive houses. The frame buildings are rarely of any consequence, being chiefly sheds, stables, and small additions to brick houses.

St. Louis dwellings are almost invariably arranged on the L plan, the dining-room and kitchen being in a rear building on the same level with the parlors. Basement houses are not popular, and are rarely seen. Wide alleys bisect every block and give convenient access to each house at the rear.

Building materials of all kinds are abundant, cheap, and of good quality. The city rests upon a stratum of excellent brick-clay, often many feet in depth, from which are made the best of ordinary and face brick, perfect in color, shape, and surface. A favorite method of grading down a lot that is too high is to establish a brick-yard on it and convert the surplus material into a marketable commodity before removal. Beneath the clay are inexhaustible beds of white limestone, hard and strong, yet easily worked, and furnishing the best of material for rubble walls and for cut-stone steps, sills, and other details. This stone crops out along the river front and in numerous "sink holes" and other depressions within the city limits. Thus quarries as well as brick-yards are everywhere to be found within convenient reach. The limestone also furnishes the best of lime for mortar, while the Mississippi River benevolently deposits an excellent supply of clean building sand on the bars above and below the city and on the opposite shore. Fire-clay and coal are found beneath the limestone, and both deposits are largely worked. Cement is obtainable from Alton, twenty miles up the river. The Iron Mountain, eighty miles south by rail, supplies iron in quality and

quantity to suit any demand; also an excellent red granite closely resembling the well-known Scotch granite, and used in the same way for polished shafts on the exterior of buildings. From the same place come considerable quantities of yellow pine lumber, while white pine is brought down the river on rafts. It has thus the benefit of a thorough water-soaking in transit as an aid to seasoning, with, however, the disadvantage of a consequent loss of brightness and uniformity of color, and a more or less serious discoloration. For this, among other reasons, it has been found difficult to introduce here the custom of finishing interior wood-work in shellac, as is so often done in Eastern cities. Painting and graining are still the universal fashion in St. Louis interiors.

During the past winter rubble masonry foundations have been laid for the extremely low price of \$1.75 per perch of twenty-two cubic feet, mortar, labor, and everything else included. Some weeks ago, however, the quarrymen and the leading stone masons formed a combination and advanced the price to \$2.50 per perch, which is the nominal rate at present. Bricks are furnished and laid in the wall for \$8 per thousand. Plastering is done for about eighteen cents a yard. Floor joists of ordinary sizes are held at \$14 per thousand feet; "Star" lumber at about \$35 per thousand.

The real estate market is dull, and has been so for the past ten years or more. Good lots within half an hour's ride of the centre of business, in an unexceptionable neighborhood, fronting on good streets well paved and sewered, with water and gas, and paved alleys, may be purchased at \$25 and upward per front foot. These lots have a depth of 100 to 150 feet or more. A fair six-room brick house can be built for \$2,000, and \$500 more will suffice to add almost every desirable convenience. Such a house, if well planned and in a good neighborhood, will rent, when new, for \$25 to \$35 a month, according to locality. Older buildings of the same size can be rented as low as \$20 a month in some parts of the city.

In St. Louis, as in nearly all the other cities of this country, except New York and Boston, there is an almost entire absence of houses planned for occupancy by two or more families. The German population have, indeed, for years been in the habit of building what are popularly known as "Dutch houses," two stories high, intended for one family to a floor, the upper floor being reached by outside stairs at the rear; but these houses are quite destitute of the conveniences demanded by American tenants, and are occupied almost exclusively by foreigners. Within a little more than a year, two small but genuine apartment houses have been built. One of them was eagerly taken at remunerative figures as soon as it was done, and the owner of the other is understood to be about to build again, on a much larger scale. It may therefore be assumed that the era of flats has begun in this city, greatly, no doubt, to the increase of the comfort of its citizens. Whether or not it will equally promote the healthfulness of the city will remain to be seen.

C. E. ILLSLEY.

TRINITY CHURCH, ROCKAWAY, L. I.

NEW YORK.

MR. J. CLEVELAND CADY has been doing a piece of clever work in the new Trinity Church at Rockaway, L. I., in the village of Woodburgh, which was dedicated a short time ago. The church has a beautiful site, with a large churchyard, rectory grounds, trees, shrubs, vines, and flowers around it, and a view of the ocean in the distance. The ideal building in the minds of a considerable portion of the farmers around there was an imitation of a city church, even though it should be a very poor imitation, and of course had nothing in harmony with its surroundings. There were, however, a sufficient number to sustain the architect in carrying out a thoroughly rural building, which combines with the landscape and seems almost a natural feature of it. It is a rambling building, whose low walls and porches group with the beautiful flowering shrubs, whose loftier gables peer through the openings in the trees, and whose spire and belfry rise quite above them. The interior shows the construction, which is simple, very fully; the colors are rich but quiet. The body of the glass is of a silvery tone, with a border of soft green. The apsidal chancel, however, has been made the focal point of the building, and its nine memorial windows are a mosaic of the choicest antique glass, in the richest colors, the whole glowing like a mass of jewels. While the windows in the church seem to reflect the sentiment of nature, the trees and the sky, those of the chancel suggest a glory beyond that of nature.

The church is fitted in butternut, has a fine organ, and the seating capacity is for about four hundred persons. As was well said of it by a competent critic, "the building has been designed to harmonize with its surroundings, and in the interior to reflect something of the freshness and sweetness of nature combined with a dignity suitable to the temple of the Most High." In cost, too, it is remarkable, the entire expenditure falling short of \$12,000; and yet in an artistic sense the congregation possess a treasure which many a purse-proud body, spending thrice the sum, has failed to secure.

W.

THE TOWER OF ASPERMONT.—The ancient tower of Aspermont in Switzerland, which crowned a mass of high rocks, and which had withstood the tempests of ages, fell lately with a tremendous crash, and crushed a number of goats which were browsing in its shadow. The castle, with which it was connected, was built by the Roman Emperor Valentinian in the year 368. It had long since crumbled away.

¹ Report of Elisha Harris, M. D., of New York city, to the National Health Association in 1874.

² The expenditures by the government on the new custom-house and post-office are, of course, not included in the valuation above given.

THE QUALIFYING OF ARCHITECTS.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir,—I have read with interest your papers on "The Qualifying of Architects," and I now hasten to respond briefly to your kind invitation to "any one" who will offer his suggestions on the subject.

That an architect should know something, that he should have an education which will enable him to do his work well, is admitted by all. As you say, the President of the American Institute of Architects has made that education the subject of an address at the last convention, the chapters (especially the Boston Chapter) have taken it up in good earnest, committees have been appointed, the public press is interested in it, all the world, excepting ourselves, has long ago made provisions for it, but we are still in doubt as to what an architect should really know? how he is to acquire knowledge? what is to induce him to acquire it and what is to become of those who either will not or cannot acquire it and who insist upon being architects without it?

It is seriously questioned whether the public will look with favor upon the educated architect, or reject him as a member of a privileged class. There is but one thing not subject to doubt, namely, that a number of architects will give the cold shoulder to any scheme of superior education, and that the general coöperation of the profession is not to be relied upon, even though the public and the law should unite in its favor, unless the *de facto* architect of the day is permitted the undisturbed pursuit of his work whether he knows it or not.

That great ignorance on the part of the public and (to be candid) also on the part of many architects, gives rise to endless errors and prejudices, which must more or less embarrass this subject, cannot be denied. The question in my mind is, whether it is better to submit to these errors and adapt ourselves to these prejudices, or to remove ignorance by a clear statement of the case and overcome prejudice by prompt explanation. Is it not wiser to trust to the good sense of the public (which includes the profession), and remove an existing evil, as it were, by common consent rather than endeavor to mitigate it by half measures?

To this end let us proceed to determine what an architect should know and why he should know it.

It is the function of the architect to construct buildings and give to them an artistic expression of the ideas and purposes for which they are erected. Artistic expression in architecture is to be attained only by the modelling of inert matter in its relation to other matter. This relation is construction, and construction therefore forms the groundwork and keynote of all architectural art effort. It is not possible to arrange, model, decorate, or color masses of matter with a view to express vigor, elegance, strength, repose, or any of the statical attributes of architectural art, without a clear conception of the mechanical conditions of matter under the influence of gravitation.

To avoid all controversy or cavil in this direction I do not mean to say that mouldings or leaf decoration are to be projected by lines, the geometrical result of the relation of forces, but that the knowledge of the laws governing those relations must be ever present in the mind of the architect, to secure rational and expressive forms, which will fairly represent the ideas which are the basis of his building. It is not true, as asserted by Fergusson and others, that the work of construction can or may be separated from that of the art work of the architect and performed by another person. This can be done only in that exceptional condition of architecture (which is not architectural art) where forms are borrowed from the past and externally applied to a building without organic relation to it. This is not living art. It is not the production of original poetry. It is the performance of a funeral dirge of the past at a modern wedding. It is not doubted or disputed by any one that a knowledge of mechanics is necessary to the architect to enable him to build well.

To express tersely what will comprise such a knowledge of mechanical principles as should be possessed by every practising architect, I will state that "Weissbach's Mechanics" is the textbook generally used at the present time in good polytechnic schools and universities both here and abroad. To read Weissbach, the student must be familiar with mathematics (I mean by this the whole of mathematics which begins with algebra and ends with the calculus, comprising geometry, descriptive and analytical geometry, trigonometry, plain and spherical conic-sections, etc.)

Vast sums of money are continually wasted upon spurious scientific improvements in artificial building materials and in the matter of heating, ventilation, acoustics, etc., invented by ignorant persons and adopted by reason of the utter lack of scientific knowledge on the part of the architect. It is not asking too much to require that every practising architect shall be familiar with the progress made in the knowledge of light, heat, electricity, magnetism, and sound, as laid down say, in "Deschanel," another well-known textbook in our own universities and polytechnic schools, or some other equivalent authorities. Architectural monuments mainly relate to ideas connected with religion, society, and the state, which have their foundations in the past. The treatment of these ideas is in all cases a poetical one. This indicates, that to the architect at least a general knowledge of history and a certain acquaintance with literature are indispensable. General æsthetics, architectural æsthetics,

history of architecture, and drawing, as branches of education of the student of architecture, are a self-evident necessity and need no further comment.

How is the architect to acquire the knowledge of all this? As it is the special province of polytechnic schools to teach it, and as it is not taught in architects' offices, the many excellent polytechnic schools here and abroad may be safely recommended to the student of architecture as the best place wherein to acquire his education, with the special understanding that he should not enter an architect's office until he has completed his theoretical studies. Then and then only can he derive benefit from the practical work going on in an office which may answer the purpose of an academic course with young men of exceptional ability and industry.

But if a man has not the advantages of a polytechnic education, is he to be excluded from the practice of our profession on that account? No! certainly not, if he has acquired the necessary information elsewhere. But this must be made patent to the profession and the community in some way;—and how? Any university or polytechnic school may, upon the request of the profession, be induced to examine candidates at stated times and certify to their proficiency. The *modus operandi* would be this: The faculty through the proper professors would prepare, say 200 questions covering the range of mathematics, 150 questions from Weissbach, 100 from Deschanel, 100 each from some recognized history and æsthetical work on architecture (say Kugler, Lübke, or Semer).

These questions would be printed upon separate cards and placed in piles upon a table, where the candidate could draw six cards from each pile. If he answers four of every six questions respectively let him pass; he knows enough to be able to learn more. But let there be no architects' commission, it is not needed and may do harm. The faculty of a university is quite sufficient. It is the most competent and the most impartial tribunal to be found for this purpose. The universities and polytechnic schools perform this duty abroad, not only to determine graduates for the various professions, but also for the public service, and their certificates are accepted as final by the various departments of the government.

It is not necessary that the profession should ask the State to prescribe these qualifications of architects by law and enforce such a law by penalties. This may be and probably will be done in the far future without professional interference. All we need to do to answer our present purpose, namely, to induce architects to acquire a proper education, is to state to the public our convictions as to what this education should be, how it is to be obtained, and how it is to be made patent that it has been obtained; and then support these our convictions by setting an honorable example by passing such an examination ourselves. Some of us have already done so, and it will not be onerous to do it again for the good of the cause. Others have never had a regular training, but yet are able to join in this enterprise; nor is it necessary that there should be many. If the Atlantic seaport towns will furnish twenty names who will respond to this call, it would be quite satisfactory; if not, ten would answer very well.

You will ask perhaps, "What is to become of the many hundreds of practising architects who are not prepared to pass such an examination?" I have no anxiety on their account. As there is no compulsion in the matter, they can continue to practice without an examination.

Some of the young men, who will realize that to become, and really to be an architect, leads through harder work than they are willing to perform, will at once abandon the profession and become useful members of society in some other walk of life. Others again, earnest, vigorous, and not without education, will set a time for themselves when they will walk up to the rostrum and ask for a regular admission. Two or three years of earnest work will answer this purpose very well. Here it is, where the chapter organizations will serve an excellent purpose; they will be so many classes, able to pay competent tutors to prepare members for an early examination. Some of the older practitioners who feel that they cannot master the subject, nor change their profession at this late hour, will continue to practice architecture as they have done heretofore, by guess. Yet if an important work involving serious questions in construction should fall into their hands, to avoid undue responsibility they will request some regular architect to correct their plans, at least as far as safe construction is concerned. I am sure, that all of us will be glad to lend them a helping hand.

There will be a few irreconcilables who will talk nonsense about natural abilities and hereditary genius, who will rail against a privileged aristocracy of learning; will pronounce science, mathematics, and æsthetics a humbug, and will prove to their own satisfaction that the man who knows nothing is practically best prepared to do everything.

We can bear this patiently. It will neither convince nor impress any sound mind nor any appreciable number of even the less instructed part of the public.

Perhaps you will explain to them that it is no special privilege to practice what you know, that a profession cannot be considered a privileged class, no matter how well prepared its members may be to perform their work, as long as no one is excluded from it for any other reason than insufficient ability. Perhaps some day you will get out of patience and tell them that it is *they* who form a privileged class, permitted by the leniency of their fellow citizens to practice a profes-

sion which they do not understand, and that their clamor should be stopped by a wholesome legislative enactment against architectural quacks.

Most respectfully,

LEOPOLD EIDLITZ.

AUTHORITIES ON THE STRENGTH OF MATERIALS.

LONDON, ONTARIO, May, 1878.

TO THE EDITOR OF THE AMERICAN ARCHITECT :

Dear Sir,—After reading several articles in the *American Architect*, in regard to accidents, and particularly one of May 11th, being an accident at St. Johns, wherein it says the third floor fell, being overloaded by the goods of the tenant, etc., the question occurred to my mind, Whom are we to take as reliable authority as to the weight a given amount of flooring will carry, or roof trusses, iron pillars, wooden pillars, beams, etc., etc.; in fact, for the strength of materials, as we have not the opportunity, in most cases, I presume, of testing these matters for ourselves?

I, the writer of these lines, am using Trautwine's "Engineers' Pocket-Book." I have other works, but I seem to prefer the one mentioned. Your opinion of the same would be gladly accepted by your correspondent.

I have put up some pretty weighty buildings when a builder, but have never had an accident, and generally am told that I build very strong. But I have proved it the safe side. And, having considerations on hand just at present, as to strength of materials, your answer in regard to the best authority would oblige,

Yours truly,

W. J.

[TRAUTWINE'S book, which our correspondent uses, is a well-tried and trustworthy hand-book, though very condensed and elementary. The authority most commonly consulted, perhaps, is Professor Rankine, who treats the subject at length, and with mathematical analysis, both in his "Applied Mechanics" and in his "Civil Engineering." But decidedly the most helpful book of the kind that we know, from the architect's point of view, is Mr. Hatfield's "Transverse Strains," published last year by John Wiley & Sons, which is worked out with great clearness and completeness, and carefully adapted to the details of construction actually in use among architects and builders. It is confined to cross-strains, as in floors, girders, roofs, trusses, and the like, and does not include the discussion of piers and columns. In the study of framings the methods of graphical statics have been found to be extremely convenient, and are much in use of late, avoiding as they do the troubles of algebraic computation. Treatises on them have been published in the United States by Professor Greene and Professor Dubois. They are also introduced in Mr. Hatfield's work. —EDS. AMERICAN ARCHITECT.]

YELLOW MORTAR.

BOSTON, May 17, 1878.

TO THE EDITOR OF THE AMERICAN ARCHITECT :

Dear Sir,—About two and one-half years ago I experimented with making yellow mortar, and had some brick laid with it. I used yellow ochre for coloring, but found it took a great quantity in proportion to the mortar. Will you please inform me, or inquire through the columns of your paper, what is generally used for coloring?

O. F. SMITH.

WOOD ENGRAVING.

We take from the *Architect* the following extracts, which we find in it. They come from Mr. John Newton's essay, prefixed to the catalogue of a recent exhibition of wood-cuts by the Liverpool Art Union.

Upon the origin of this art a great deal has been written, which may be found in the works of Papillon, Heineken, Jackson and Chatto, Weigel and Zestermann, and A. F. Didot, but all that is certainly known may be told in very few words. Carving in wood, and, consequently, the use of wooden stamps, must have been practised and used before the dawn of history. We know that the ancient Egyptians and Assyrians employed such stamps to impress their primitive characters upon soft clay, and specimens of them actually exist in our museums. The Romans also used them; though, to brand their slaves, they were obliged to employ brass ones. No further advance was made until the twelfth and thirteenth centuries, when engraved blocks began to be used for giving off impressions in color on to the smooth surfaces of silk and other fabrics. Weigel gives no less than ten illustrations of printing from wooden blocks on coverlets and garment fabrics before and during the fifteenth century. Such imprints increased considerably during the thirteenth and fourteenth centuries, when liturgical vestments and choice draperies were often thus elaborately adorned. Linen, silk, satin, and even leather received such impressions in various colors, sometimes in gold. Here was the germ, certainly, yet it grew not into the art. Down to the end of the fourteenth century, no mention has been found of wood engravings. Boccaccio and Petrarch, and our own Chaucer, are silent about them. Even Richard de Bury, Bishop of Durham, in the reign of Edward III., in his curious "Essay on the Love of Books," says not a syllable about any other illustrations but those painted by hand. There is not a single wood engraving existing which there is any good reason to attribute to an earlier date than the beginning of the fifteenth century.¹

At length we tread on firm ground. Some eighty years ago Heineken, a most indefatigable hunter after book rarities, discovered in an ancient convent at Buxheim, near Augsburg, a large colored wood engraving of St. Christopher, with the date, 1423, distinctly cut underneath. It was

pasted inside the right-hand cover of a manuscript book finished in 1417. Another large engraving (*The Annunciation*) was pasted inside the left-hand cover, and both were colored by stencilling. This volume is now in the magnificent collection of Earl Spencer. Many other single wood-cuts have been discovered which may be somewhat earlier than these, but the St. Christopher still remains the earliest wood-cut about the date of which there is no dispute.

The next step in the progress of wood engraving was to print a connected series of large wood-cuts, having at the top or bottom of each an explanation of the subject of the picture, and to bind them together as a book. Several of these block books still exist, of which the best known are—1. *Apocalypse*; or, *Scenes from the Life of St. John* and from the *Revelations*; 2. *A History of the Virgin Mary*, as it is supposed to be typified in the *Song of Solomon*; 3. The so-called *Biblia Pauperum*, which consists of *Typical Figures of the Old Testament*, followed by their *Antitypes in the New*; or, *The History of Jesus Christ* pictorially represented.

The cuts in all these early works are executed in the simplest outline manner; there is not the least attempt at shading, by means of inner lines—cross or parallel—to be perceived in any of them, and the most difficult part of the engraver's task must have been the cutting of the letters. All the earliest wood-cuts, probably until the invention of printing, were taken off by laying the paper on the inked wood block, and rubbing the back of it gently, as wood engravers do to this day in taking off their trial proofs. Each leaf was printed on one side only, and, to make a number of them into a block book, the backs of the leaves were often pasted together.

But all these advances were soon to be cast in the shade by the discovery of the art of printing. The illustrious Gutenberg, one of the greatest benefactors of the human race, was engaged for many years in laboring to perfect the divine art of printing. He commenced by taking a hint from the wood engravings which so suddenly sprung into demand, and had letters cut in wood, with holes through them, by which they could be strung on wires. These were, no doubt, soon thrown aside for types made of some lead alloy, cast in brass matrices, as appears from the records of a trial he had in 1439, from which we learn that he had invented a press, and that this was one of the secrets of the "wonderful art" to which Gutenberg already laid claim. By the invention of printing a wonderful stimulus was given to wood engraving, and the two inventions progressed, hand in hand together, in a union that bids fair never to be dissipated. Thenceforth the block books were usually multiplied at the printing-press, and, in the last of the series, the "*Speculum Humanae Salvationis*," which first appeared about 1460, the wood-cuts are taken off by friction, as before, the back of the leaf being left blank, but there is an accompanying text printed at a press, from movable type. And now, by the rapid diffusion of printing, the two arts spread over Europe. In 1461 appeared the first printed book of fables, illustrated with rude wood-cuts, and within twenty years from that time quite a series of illustrated Bibles had been produced.

In spite of the vast stimulus given to wood engraving by the invention of printing, there was no improvement, to the close of the fifteenth century, in the technique of the art or in the designs engraved, and the best of the cuts during that period are decidedly inferior to the best of those in the early block books, or even the still earlier ones, such as Earl Spencer's. One only exception can be made, viz., the beautiful title-page to the Latin edition of "*Breydenbach's Travels*," printed at Mentz in 1486, which, both in design and execution, is the finest wood-cut produced to that date.

But now appeared the greatest artist who ever drew on a wood block, the all-accomplished Albert Dürer. He was born in 1471, in the glorious old city of Nuremberg, then the greatest manufacturing town in Europe, the Birmingham of the Middle Ages, but, unlike our Birmingham, the highest qualities of art were displayed in its metal work.

His father was an able goldsmith, and Albert was his favorite child. "My father," he says, "took special delight in me. Seeing that I was industrious in working and learning, he put me to school, and, when I had learned to read and write, he took me home from school, and taught me the goldsmith's trade." But Albert longed to be a painter, and at length he was apprenticed to Michael Wohlgemuth, the principal painter of Nuremberg. Wohlgemuth's establishment was probably the largest picture manufactory of the time. He also executed a vast number of designs for the wood engravers, especially for the numerous volumes continually issuing from the presses of Antony Koberger, the most enterprising printer, not only of Nuremberg, but of Europe, and Dürer's godfather. In Wohlgemuth's workshops, therefore, Dürer had plenty of practice in drawing for wood engraving, and thus obtained that inclination for the work which has been as fortunate for the world as for his own fame. His paintings, which might have given him a name equal to the greatest of the Italian school, have nearly all perished; the numerous drawings which he executed are shut up in Imperial museums, or in the cabinets of a few wealthy collectors; but his engravings and wood-cuts exist yet by thousands, and have carried his fame to all the world.

After the usual travels (*wanderjahre*) of a German youth, he returned to Nuremberg at his father's bidding, in 1494, to be married, and settled down at once to hard work. In 1498 appeared his earliest woodcuts, the sixteen great designs for the *Apocalypse*. The northern mind had long dwelt with eagerness on these mysteries of things to come, and among the earliest block books produced in Germany is an edition of the *Apocalypse*, with rude figures. But Dürer not only transcends all efforts made before him in the representation of these strange promises, terrors, and transformations, these thaumaturgic visions of doom and redemption; the passionate energy and undimmed simplicity of his imagination enable him, in this order of creations, to touch the highest point of human achievement. The four angels keeping back the winds that they blow not; the four riders; the loosing of the angels of the Euphrates to slay the third part of men; these and others are conceptions of such force, such grave or tempestuous grandeur in the midst of grotesqueness, as the art of no other age or hand has produced. From this time until his death, in 1528, he continued to pour forth, with a creative energy that never seemed to flag or to repeat itself, an incredible series of designs, of which nearly two hundred have been fortunately preserved to the world in the

¹ Playing cards are said to have been introduced into Europe by the Saracens, towards the close of the fourteenth century, and some have endeavored to trace to them the first impressions from a wood block on paper or vellum. But it is now known that the earliest cards existing are all hand-painted or stencilled.

popular form of wood engravings. These include, besides the Apocalypse series, the *Life of the Virgin*, in twenty large wood-cuts, the most generally pleasing and popular of all his productions; the twelve folio cuts known as the *Great Passion*; the series of thirty-seven smaller ones distinguished by some writers as *The Fall of Man and his Redemption through Christ*, but which Dürer himself always called the *Little Passion*; also many single subjects, amongst which are some of his finest designs; and, lastly, the gigantic works which he executed for the Emperor Maximilian. This great monarch, fired with a hundred ambitions at once, was anxious that the best artists of his time should be employed to represent him as a hero of romance, successful alike in the chase, in love, and in war, as a wise king, a patron of all the arts, and a successful general. For this purpose he employed, during several years, Hans Burgkmair, Hans Schaufelein, and especially Albert Dürer, in executing vast designs for wood engraving of triumphal arches, cars, and processions, which, doubtless, he expected would transmit his glory and his fame to future generations. We may form some idea of the labor involved in these designs from the *Triumphal Arch*, which consists of ninety-two separate wood engravings, each more than a foot square, all drawn by Dürer, and which form one large composition about 10½ feet high by 9½ feet wide. The whole subject is a kind of pictorial epitome of the history of the German Empire, representing the succession of the German Emperors, and the more remarkable events of Maximilian's reign, with illustrations of his descent, possessions, and alliances. On this task, so unworthy of his genius, Dürer was engaged, more or less, from 1513 until 1520.

It is difficult to avoid lingering over the life and works of one so personally attractive and so marvellously endowed, but for the present we must refrain, and consider him only as connected with wood-engraving. Until his time wood-cuts were little more than mere outlines. With Dürer they at once became finished drawings in which the light and shade and color were fully expressed. The numerous engravings and etchings on copper, which he executed with his own hand, are unrivalled for marvellous delicacy and minuteness of detail, but he adopted an entirely different style in his drawings for the wood-engraver. The material then used was pear-tree wood, cut, like planks, in the direction of the grain. Large pieces could thus be obtained, but delicate wood-cutting on such a substance was quite out of the question. This necessitated a large and bold style of drawing, coarse indeed to our eyes, yet very effective. Dürer's works, both on copper and wood, were greatly popular from the first over all Germany and Italy. Raphael introduced some of Dürer's figures into his finest paintings, and a famous Italian engraver, Marc Antonio, copied his wood-engravings by wholesale on copper. It was partly to check these piracies of M. Antonio that Dürer made a journey into Italy in 1505.

Hans Burgkmair, of Augsburg (1473-1531), deserves the next place to his greater rival of Nuremberg. That superb procession, the "Triumph of Maximilian," consisting of 135 large wood-cuts, the greater part, if not all, of which were designed by Burgkmair, would, of itself, stamp him as an artist of uncommon richness and fertility of invention. He was engaged on this great undertaking from 1513 to 1519, when the emperor died. The work was at once suspended. The wood blocks were cast aside and forgotten, until they were accidentally discovered, worm eaten and injured, and some impressions taken from them in 1796. Such is the vanity of human hopes and aspirations! Burgkmair is a very unequal artist; he often displays great power and originality, but he has not the careful handling and refined touch of Dürer. If, however, some of his pieces are bad, others are superlatively fine, especially "Death and the Lovers," which combines his usual picturesqueness and energy with an Italian feeling for beauty and grace, most rare in early German wood-cuts. This is also one of the earliest specimens known of the chiaroscuro, or tinted wood-cut; an attempt to increase the capabilities of wood-engraving, and to imitate more nearly an artist's drawing, by printing in colors, or tints, from several wood blocks. In this one of Burgkmair's three have been employed. Another fine chiaroscuro by him, the "Emperor Maximilian on Horseback," is printed from two blocks. Burgkmair was also the chief designer employed in the production of "Der Weiss König," the Wise King, another work intended to hand down to future generations the learning, wisdom, and adventures of the Emperor Maximilian, but which remained unpublished until nearly three hundred years after his death.

Hans Schaufelein, another great artist, who was apprenticed to Dürer, was the designer of the large wood-cuts in the "Romance of Sir Theur-danck," the only one of Maximilian's artistic publications that he lived to see completed. It was first published in 1517. Schaufelein's powers, however, are better seen in his "Great Passion," a series of wood-cuts published at Nuremberg in 1507, in a book entitled "Speculum Passionis," etc. Many of the designs have a striking resemblance to those of Albert Dürer. The work, however, which best sustains his reputation is "Les Danseurs des Noces," the figures in which are drawn with great spirit and vigor.

We now come to Hans Holbein (born at Augsburg, 1494, died in London, 1543), the last of this great school of artists, who was not only an admirable painter, but also one of the best designers that ever drew on a wood block. This great master ranks next to Dürer in artistic ability, natural genius, and fertility of invention. Nay, in some respects, he surpassed Dürer, as he had a much higher feeling for beauty of form. It has been most truly said of him that none has equalled Holbein in composing an action with the smallest number of figures, and in the smallest possible space. This is well seen in the "Bible Pictures," but especially in the "Dance of Death." These tiny pictures deserve a careful study. They are wonderful for their infinite variety, the dramatic energy of the figures, and the sharpness of the satire. It is a pity that the smallness of the scale on which they are drawn detracts somewhat from their effect. Most fortunately these little gems of design have been cut in the wood with a perfection that has never been surpassed. Of the many able copies made by modern engravers, none approach the originals. They have all the spirit of the master; the drawing is very simple, but every line tells.

The art of wood-engraving was early introduced by the Germans into Italy with that of printing, but no native works of any ability are known to have been executed before 1490. From that date until about 1560 the Italian presses produced many beautifully illustrated works, with designs

full of grace and elegance. The second place after Germany must, however, be awarded to France for the number and excellence of its early wood-cuts. Throughout the fifteenth century Paris was the chief centre for the trade in manuscript books. There dwelt those numerous artists and scribes who wrote and decorated the vast numbers of beautiful Books of Hours, Psalters, and other devotional works, which made the French school of illuminators so famous, and of which many copies still exist. The Paris publishers early applied the new arts to furnish cheaper substitutes for these expensive volumes. They had the most exquisite models to imitate, and abundance of artists to furnish the requisite designs; and so well did they employ the advantages they possessed, that in a very few years Paris was the great centre whence Europe was supplied with prayer-books, which have never been surpassed for the beauty of the printing and the decorations. They were usually printed on vellum, in imitation of the manuscripts which they supplanted; and, to increase the resemblance still further, it is not uncommon to find copies in which all the pictures have been painted over in colors and gold, so as to look like miniatures.

When Caxton introduced printing into England, and set up the first press at Westminster, about 1476, he brought with him, also, the new method of multiplying pictures for book illustration. But, though he employed it largely, the best cuts in his books are foreign productions, and the rest such rude things as any clever lad might draw and then cut with a penknife. Such, also, are the embellishments to the works of Wynkyn de Worde and the other early printers. The same may be said of nearly all English books down to the time of Bewick, 1753-1828, before whom no school of designers or wood-cutters existed in England. Thomas Bewick was, indeed, the father of wood-engraving in this country. Nothing could be lower than the state of the art when he appeared. Himself no mean artist, possessed of extraordinary mechanical dexterity, he devoted all his energies throughout a long life to improve his art. He thoroughly understood all its capabilities, and knew how to produce the greatest possible effects with the smallest amount of labor. Some of the birds, as the partridge, the woodcock, and the common duck, in his "Land Birds," are wonderful things in their way, for the perfect fidelity with which he has expressed the plumage and general texture of the bird. Yet his pupil Jackson tells us that he would execute such a cut in less time than a modern French engraver would take to execute the delicate cross-hatchings necessary, according to French taste, to denote the grey color of a soldier's coat. Much might be written, also, on the humor and spirit of the numerous head and tail-pieces which he designed, but they are better seen than described. He also trained quite a school of eminent wood-engravers to whom we owe the present advanced state of the art in England.

JAPANESE DRAWING.

FOREIGNERS are better acquainted with the bronze, porcelain, and lacquer work of Japan than with the simpler drawings on silk and paper; yet in no other matter do the artists show more skill, or attain more pleasing effects. When a fine picture of this sort is desired, the silk is stretched on a frame, and glazed with a preparation of alum, glue, and water. The artist then traces a faint outline sketch with a charcoal pencil, whose lines may be brushed away with ease. If satisfied with this trial composition he proceeds to lay on the colors, or if it is to be an India-ink drawing to cover the silk with hasty blots, which, in good time, assume a surprising coherence and sense. This rapid work is considered the true Japanese style, and is very fashionable just at present. But to enjoy it a certain education of taste is requisite, and as this has to be cultivated at the expense of nature — who does not work hurriedly or in black and white — I prefer to preserve the foreign liking for the better finished and brighter color pieces. These relate mostly to bits of ideal landscape bathed in that "light that never was on sea or land," courtiers in the gorgeous robes of the past, and especially flowers and blossoms visited by insects and birds.

Of course, we expect to find the processes of drawing the reverse of our own. In painting landscapes, for instance, the artist begins with the foreground and retreats until he reaches the mountains and the moon in the background. In India ink the artist generally makes the middle distance first, afterward diluting his preparation so as to leave a fainter mark for further distance, and finally bringing out the full design by a few spots of intense black. In one charming sketch in black and white, which a leading artist drew for me, of a bird resting on a broken stem of lotos in a pond of pads, he first made a few faint trial lines, then completed the figure of the bird; went on to draw the broken stem and the leaf drooping in the water, and then the more general view of the pond. A grotesque grub, toiling up the leaf, supplied the element of whimsical humor so common in every species of artistic composition in this country.

These paintings may be either large, and in that case they are mounted on strong paper or cloth and hung upon the wall, or if smaller, are pasted into albums, whose leaves open on the principle of screens. It is also the fashion to send a blank album to a painter, with the request that he fill one or more sheets with a characteristic sketch, and thus in time an interesting collection can be gathered of representative work by the best of one's favorite artists. Or a person desiring such a gallery may send sheets of silk to those artists whose skill he wishes to enjoy, and thus obtain an album. And very often beautiful sketches may be found for sale in screen shops or on the streets.

Many of the conventionalities that surround Japanese art are odd and interesting. Certain rules of perspective are followed, though no correct system is known. The representation of scenery is gov-

erned by a code of lines and dots, which are fancifully designated, and are minutely described in native art treatises. The use of these approved means of delineation distinguishes between the artistic schools or "sects."

Not only do the manuals prescribe rules for the representation of objects, but they set before the artist a schedule of themes sanctioned by classic use, in both Japan and China, which are to direct his own invention. Some of these subjects are quaint and suggestive, such as peach-trees in blossom, with here and there a cottage and willows; a company listening to the distant music of a fisherman singing in his boat among the willows; rustics carousing, with landscape background; a flight of wild geese at twilight; a mountain forest ruined by a winter's gale, and mountaineers returning home down a defile at sunset. These are but specimens of a long list; and beside the catalogue of themes there are others which apply a similar method to the treatment of single details in a composition. Thus one author gives a list of the hundred phases of the plum blossom. There is, moreover, a class of pictures which may be styled pictorial compliments, as they express or suggest congratulation or flattery. Thus a stork flying and screaming in the sky symbolizes fame. The peculiar constitution of the national language, or rather languages, which gives such a scope and perfection to the pun, results in a mass of these curious double-enders. But I pause, lest by thus glibly discussing this topic, I fall under the scorn of the native author whom I have so freely used, who says, "It is very easy to talk art, and some there be who are learned critics without being able to draw a line, or may be they can make leaves of grass and the chrysanthemum." — *Letter to the N. Y. Evening Post.*

COMPETITIONS IN INTERIOR DECORATION.

NO. IV. A CHIMNEY BREAST AND STONE FIREPLACE.

THE subject for the fourth competition is a chimney breast and stone fireplace situated at the end of a dining-room in a city house. The room is thirteen feet in the clear, and is sixteen feet wide; the chimney breast is five feet wide; the fireplace may be used for wood or coal fires. Required half plans, taken through the fireplace and above the fireplace, an elevation and section, with details to a larger scale. The making of a perspective of the end of the room is left optional with the competitor. The drawings should be received at the office of the *American Architect* on or before June 27.

NOTES AND CLIPPINGS.

THE WAGES MARKET.—With this week's issue we present to our readers as a new and permanent feature of our journal a tabulated statement of the day-wages paid in the various building trades in the chief cities of the country. This table will be found on page iii of the advertising pages.

MACHINERY HALL, PHILADELPHIA.—A very amusing illustration of the saying that what is everybody's business is nobody's business has come to light in Philadelphia within a few weeks. At the close of the Centennial Exhibition, Machinery Hall was not taken down, because, amongst other reasons, the Philadelphians were confident that the Permanent Exhibition would be a great success, and that it would ultimately expand into Machinery Hall. As there was no likelihood that it would be needed immediately, a body of watchmen was put in charge of the buildings, and wages aggregating about two thousand dollars were paid them. As might be perhaps inferred from their actions, these watchmen were ward-politicians, who were appointed to the places in payment for services at election times. At first they were very zealous and made many arrests, and having thus lulled any suspicion of their honesty that might be entertained, they began and have continued up to this time a systematic course of depredation upon the property left in their care. The park guards and people in general who saw cart-loads of iron rails, wooden counters, tables, machinery, boards, etc., leaving the building, supposed that it was all done under warrant from those in authority, and never interfered nor reported the fact to the city officials. The result is that the great building has been pretty thoroughly stripped of all that was portable and salable, and all that is left is the mere shell of the building.

IN DANGER OF A FLOOD.—The *Boston Advertiser* says that the inhabitants of Mill River Valley, particularly of Williamsburg, have been much alarmed by the suspected unsafety of Goshen reservoir, the summer supply of the mills on that fatal river. In response to a petition, the county commissioners examined the reservoir Saturday, May 11, together with many citizens. They will order the flash-boards to be removed, and other precautionary measures. Many families have long kept watch all night for an expected flood.

THE OLD SOUTH CHURCH.—It is said that of the \$400,000 required to save the Old South Church, Boston, the sum of \$158,000 is still to be raised.

STRANGE SINKING OF LAND.—A little village in the neighborhood of Draguignan, France, has lately been the scene of a remarkable subsidence, which has attracted the curious from all directions. An elliptical tract of ground, containing over ten thousand square feet, sank gradually one day, accompanied by loud noises, until it left an orifice of over one hundred feet in depth, with water at the bottom. Numerous trees and vines disappeared completely in the new lake. A similar depression on a smaller scale occurred in the same vicinity a century ago, and both the phenomena are attributed to the action of subterranean streams. — *Nature.*

THE STRENGTH OF WROUGHT IRON.—The *New York Tribune* says that a series of experiments has been carried on at the Washington Navy Yard, by Commander L. A. Beardslee, of the United States Test Board, to ascertain the strength of iron used in chain cables. It had been suspected, with just reason, that the British admiralty tables for the strength of wrought iron needed revision. Not less than two thousand tests of the tensile strength of iron have been made at the Navy Yard, to determine the elastic limit, elongation, and reduction of area of the various specimens; and forty-two complete chemical analyses have also been performed. Some of the conclusions which have been reached are remarkable. The admiralty tables are declared unsafe, and new ones have been prepared. The board finds that the tenacity of two-inch bar for chain cables should be between 48,000 and 52,000 pounds per square inch; one-inch bar, between 53,000 and 57,000; and that stronger irons than these make inferior cables, because they have less ductility and capacity for welding. The strength of wrought iron and its welding power are influenced quite as much by the reduction it has undergone in rolling as by ordinary differences in its chemical composition. In general, the processes for making wrought iron give an uncertain quality to the product, while the methods of making cheap steel confer certainty and uniformity. The ordinary practice of welding is capable of great improvement, by being performed in an atmosphere freed from oxygen. The importance of the subject will be conceded, since the safety of human lives must often depend upon the strength of a ship's cable, or of the links in a bridge chain.

HISTORICAL BUILDINGS IN HOLLAND.—We learn from *La Semaine des Constructeurs* that a commission has existed for some time which is charged with the preservation of the buildings of the kingdom which are valuable from historical, archaeological, or artistic points of view. It has proved its value by saving from destruction such works of art as the Gate of the Captives at The Hague, the fine feudal castle at Muiden, and the superb bronze grille at Haarlem. Its powers seem to be quite absolute, for when the state has appropriated money for the restoration of any building it can apparently make what changes or additions it please to the plans presented for approval by the local authorities. Moreover, the right of absolute veto resides in it. This body has latterly thought it advisable to print, for the instruction of the public, reports of its proceedings under the title of *Communications de la Commission pour la Conservation des Monuments historiques et artistiques du Royaume*. The first issue contains the royal warrants under which it was formed; the instructions addressed by the commissioners to provincial authorities, whether lay or ecclesiastical; and the reports of the members themselves, illustrated by plates, which show the buildings reported on.

FRENCH STRIKES.—The history of strikes shows that soldiers may be useful in putting an end to strikes by other means than by force of arms, although in the more peaceable way they are as likely to incur the ill-will of the people quite as much as if there had actually been a trial of strength between them. When in 1865 the journeymen hatters of Paris struck, an order of the day was read in all the barracks to the effect that all soldiers who were hatters by trade should have leave of absence provided they would fill the places of the strikers for the wages offered by the masters. A strike of the hackmen that took place in Paris that same year was brought to an end in a very few weeks by detaching soldiers to fill their places.

A NOVEL BRICK KILN.—Stories are common enough of machines which receive a live pig at one end and deliver him in the shape of sausages and salt pork at the other in incredibly short time, but to believe that a car of moist bricks can be pushed into a kiln, and in four or five hours be drawn out at the other end perfectly baked and cool enough to handle, requires an effort. Yet it is said that at Normanton, England, Mr. Foster has such a kiln, and that it works perfectly. The kiln is a little more than one hundred feet long and is only eight feet broad. Through this kiln is laid a track, on which travel iron cars, whose iron-work is protected from the fire by burned clay, by the current of fresh air which is drawn under them by the draught, and by not being fully exposed to its fury, in that the cars are on a lower level than it. This fire is in the middle of the kiln, on either side of the track, and as the chimney-flue is at the entrance end, the fire is drawn to meet the entering car, with its load of five thousand raw bricks, and thus gives them a preliminary drying and baking before they are exposed to the full heat of the fire, and also allows them to begin to cool off as soon as they have passed the middle. The kiln will contain nine cars, — or, in other words, 45,000 bricks, — and as the bricks are unloaded from the cars directly into wagons, the progress of the line of cars is slow enough to allow the bricks to cool thoroughly after passing the fire. There seems to be very little heat wasted, for the cars are just the width of the opening of the kiln, and their load of bricks reaches quite to the top of the arched passage. At any rate, as the cost of burning one thousand brick is said to be less than six cents, the process cannot be called an expensive one.

PAPER SHUTTERS.—The latest application of paper to building purposes is the manufacture of window-shutters, for use in places where the dilatation and contraction of the metal would make the use of iron shutters undesirable.

A QUESTION OF DOMICILE.—A Douai tribunal has decided a case where a house was built across the border-line of two communes, half in one, half in the other. Its residents were declared inhabitants of the commune on which the front door opened.

THE MANUFACTURE OF PORTLAND CEMENT.—Portland cement is made near Rochester, England, in this way: Gray chalk is intimately mixed with one fourth of its weight of clay in a pug mill supplied with warm water, and is then run off into a settling-pond, where the superfluous water is removed. The sediment is dried on a floor specially constructed and provided with flues, then burned in a kiln, and lastly, ground between millstones.