PRICE 15 CENTS.

MARCH 12, 1892.

THE AMERICAN ARCHITECT AND BUILDING NEWS

VOL. XXXV. * REGULAR EDITION * NO. 846.

ARCHITECTVRE

ENGINEERING

DECORATION

CONSTRVCTION

TICKNOR & COMPANY

BOSTON MASS.

CONTENTS.

ILLUSTRATIONS.

Additional Illustrations in the International Edition.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XXXV. Copyright, 1892, by TICKNOR & COMPANY, Boston, Mass. No. 846.

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

MARCH 12, 1892.

CONTENTS

A NEW decision in regard to the rights of the lowest bidder is reported from New York State. The Water Commissioners of Buffalo advertised for bids for a pumping-engine. The law requires contracts for public work of this sort to be awarded to the lowest bidder, but the Commissioners ordered the highest-priced pump offered. Certain citizens sued to have the award set aside, on the ground that it was made contrary to the statute; but the Supreme Court of the State, speaking through Judge Childs, has come to the rather startling conclusion that "the parties offering to furnish the material or do the work advertised for at the lowest money consideration are not necessarily to be considered the lowest bidders." As usual in such cases, the Court ruled that it was the province of the Commissioners to decide which was the lowest bid, and their decision could not be set aside by the Court unless it was arbitrarily or improperly made; but the judge added that "The single fact that the contract was awarded to the party requiring the most money for the work is not at all decisive of this question. If the successful bidder offered a machine more valuable than its competitor, he may have been the lowest bidder, although requiring more money." This, it will be observed, makes the question of who is the lowest bidder dependent upon the opinion of the Commissioners as to who will furnish the best work, or the best machine, for the money, thus substituting the judgment or fancy of the Commissioners in place of actual facts. It is obvious that the law never contemplated anything of the kind, and that it was intended to exclude all private judgment or choice on the part of such officers; and the fact that it is found necessary for the Supreme Court to hold that the proper carrying out of the law consi ts in an evident violation of it, only shows how inconvenient and irrational the law is, and how much better it would be, after officers have been appointed in whom the public has confidence, to let them use their discretion, instead of hampering them with laws which, in the public interest, they must break, and for their violation of which the Courts have to invent such ingenious excuses. Not long ago, in Pennsylvania, where the law required a certain contract to be awarded to "the lowest responsible bidder," the officials in charge passed over a bidder of ample financial resources because they thought that he drank, and gave the contract to another man, at a higher price. It was proved that there was no foundation for the notion that the first man drank, but the award of the officials was sustained by the highest court, on the ground that, having acted in good faith, although hastily, and without sufficient evidence, their award was not subject to judicial revision. Practically, therefore, the lowest bidder has no rights. Undoubtedly, he never ought to have any which would set him above the judgment of honest and intelligent officials, and it is curious to see how attempts to give them to him by statute come to grief.

A RATHER novel point in regard to employers' liability has been decided in New York. A plumber, named Stuber, was sent by his employer, one McEntee, to solder a pipe in a sewer excavation. While he was at work, the sides of the excavation fell in, and killed him. His heirs sued McEntee to recover the statutory damages, of five thousand dollars, for his death, but the claim has been denied, on the ground that as Stuber was sent by his employer to perform the work at which he was killed, at a distance from the shop, and in a place, and under circumstances, about which the employer knew nothing, Stuber was put upon his own responsibility, and acted on his own discretion in going into the excavation; and, under the circumstances, the employer was not an insurer of the safety of the undertaking.

THE colony of Queensland, in Australia, has undertaken an experiment, the results of which will be watched with interest. It is well known that many, if not nearly all, of the Australian colonies have for some time been given over, body and soul, so to speak, to the trades-unions. The unions have elected the colonial governments, and have made laws to suit themselves. The effect of this legislation has not been altogether happy. Almost the first proceeding of the labor leaders, after they had secured undisputed power, was to enact stringent eight-hour laws, by which not only was eight hours made a legal day's work, but people who wanted to work longer were made rather uncomfortable. We all know that the socialists and anarchists, and other people who manufacture scientific information for what they are pleased to term the "laboring classes" inform us that, beyond a universal eight-hour day, little is needed to produce a millennium on earth; and that the prevalence of a system under which every one shall work eight hours out of the twenty-four, sleep eight hours, and amuse himself eight hours, assures a comfortable living to every man, besides intellectual culture, health and divers other good things; while the people who endeavor to base their assertions on observed facts, instead of their inward intuitions, say that, however desirable it may be to rest sixteen hours out of twenty-four, the consequence of doing so, in the present condition of the world, is to raise the prices of manufactured articles, without increasing the incomes of those who make them, and thereby to diminish the purchasing power of the community, with the result that production has to be curtailed, and the number of persons employed is lessened, instead of being increased. We will not discuss here the comparative merits of the two views. It is sufficient to say that, whether as the inevitable consequence of the application of the trades-union theories, or, as we suppose our socialist friends will maintain, through the demoniac machinations of the "capitalists," business in Australia has been for some years going from bad to worse. The members of the strongly organized building trades, having the Government authority in their hands, have looked out for their own interests by procuring the expenditure of immense sums on public buildings and similar works. The money for this purpose has been obtained by reckless borrowing. We have seen it stated that the public debt of the Australian towns and colonies amounts now to a thousand million dollars. As the whole population of Australia is not more than four millions, this gives a debt *per capita* of two hundred and fifty dollars, and it is rendered less difficult to believe by the circumstance that four years ago, before the era of the greatest extravagance began, the public debt of the colony of Queensland, exclusive of any municipal debts, was about four hundred dollars per head.

IT may be imagined that the circulation of this deluge of other people's money made building business, at least, brisk for a time, but the golden flood has begun to fail, and business is resuming the stagnation which threatened it before this remedy was applied. Naturally, the load of interest which has been assumed does not brighten matters much, and the eight-hour law is so far from providing employment for all those for whose benefit it was intended, that, even in the rapidly-growing colony of Queensland, there is not nearly enough work for all those who want employment. To remedy this state of things, the Government of the Colony has adopted a measure so characteristic of trades-union folly that it would be amusing, if it were not sad to see the suicide of an

intelligent community. As there is not work enough for the members of the trade organizations already settled in the colony, the Colonial Government has decided that it will not do to run the risk of having any outsiders come in and get part of it, and has formally announced that no more immigration into the country will be allowed. How the principal portion of the population, which does not enjoy the privilege of trades-union membership, will like the operation of the new law remains to be seen. We need hardly say that no people, least of all the energetic and intelligent Australians, will be contented long to sit down inside a fence and look at each other. If the merchants cannot have new customers, the farmers new consumers, the teachers new scholars, the lawyers new clients and the contractors new houses to build for the families from outside, and if the people already there cannot have their friends from home come and live near them, if they wish, they will assuredly soon find their way out of Queensland to a more accommodating country; and, as the population diminishes, the demand for labor will decrease still more rapidly, until, to satisfy the hungry workmen, some new move is taken, on the nature of which we will not speculate.

THE Boston Museum of Fine Arts has purchased the collection of Japanese pottery belonging to Prof. E. S. Morse, of Salem, which has for some time been exhibited in the Museum. The price agreed upon is seventy-six thousand dollars. A larger sum is said to have been offered for it by friends of art in Chicago, but Professor Morse was willing to make a sacrifice to keep it near home. One of the conditions of the sale is that Professor Morse shall have the privilege of selling duplicates, and he is to be retained as curator of the collection for three years at a salary.

IT is reported that a large new railway station is to be built in Boston for the Boston & Albany Railroad Company. Messrs. Shepley, Rutan & Coolidge are said to have the plans nearly completed, but they naturally say very little to newspaper reporters on the subject. The railroad company has long owned an extensive tract of land bounded by Exeter and Boylston Streets on the east and north, and extending to Huntington Avenue on the south, and nearly to Chester Park on the west. In this area it is said that a station is to be erected, containing thirteen tracks. If this is true, the building will be by far the most spacious one of the kind in Boston, and the architects who have it in charge will have an opportunity not only for a design on a grand scale, but for making their building conspicuous, such as seldom occurs in our crowded cities.

AN exhibition of architectural drawings, designs for furniture, models, cartoons and photographs of executed work will be held at the Art Association, 174 Montague Street, Brooklyn, N. Y., from April 25 to May 7 next, under the auspices of the Department of Architecture of the Brooklyn Institute of Arts and Sciences. In connection with this, there will be a loan collection of decorative work and bric-à-brac. Works never before publicly exhibited in Brooklyn are admissible, and must be sent to the Art Association Building April 19 and 20; and a blank form must be filled out and sent before April 16 to the Secretary, Mr. Charles T. Mott, 169 Broadway, New York.

PROFESSOR HERKOMER, whose active mind enjoys attacking artistic problems of various kinds, has some new ideas about theatres, which he described in an address given a few weeks ago at one of the London theatres. As he has a private theatre connected with his house at Bushy Park, he has been able to carry some of his ideas into practice, and is thus in a position to speak confidently of their value. One of the most startling innovations which he proposes is the abolition of the footlights. These, as he says, are a survival of the time when only feeble candles were available to illuminate the stage, and it was necessary to put them close to the actors; but, as now employed, they are unnecessary, and do more than anything else to give a false and unnatural look to the stage and the actors, which interferes greatly with the illusion, and, consequently, the sentiment of the play. At his own theatre he has no foot-lights, but illuminates the stage by means of a group of lights on each side of the proscenium, about ten feet from the front of the stage, and on a level with the actors' faces. These lights, shining from the front on the actors, but screened from the audience, give all the front illumination necessary, and prevent any trouble from the heavy shadows which would be cast upon the faces of the actors by a light proceeding wholly from the stage, and have a much more natural and agreeable effect than foot-lights. By other devices in the way of lighting, Professor Herkomer thinks that a whole range of scenic effects can be produced which have never yet been attempted. By passing light through colored glass on surfaces of gauze, various atmospheric phenomena of great beauty may be imitated. Something of the sort has been done already in New York, where we have seen the clearing away of a mist beautifully represented by drawing up successively a number of gauze curtains; but the addition of colored light would certainly be a novelty. Professor Herkomer, however, suggests another novelty, still more startling. After the gauze mists and clouds had been properly arranged, he would cast upon them the images of living persons, reflected in a concave mirror, and thrown on the gauze by means of a lantern. There would be no difficulty in posing a group for such a purpose behind a gallery, and throwing the image on the stage, until, as he says, "the heavens would live with spiritual figures," and the effect would certainly be more poetical than that of the present method of bringing supernatural beings on the stage by hanging them from above with wires. A stout party with pasteboard wings, suspended in this manner from the ceiling, generally suggests a spider a good deal more than he does an angel, and, if spiritual beings are to be hereafter frequently seen on the stage, which we are not sure is very desirable, it would certainly be advantageous to the illusion to have them projected as disembodied forms.

A GOOD deal has been said lately about the new explosive, Fortis, which is fired, like ordinary gunpowder, without a primer, or detonator, and explodes with a force equal to that of dynamite. As described in the *Revue Industrielle*, its manufacture is very simple. It is practically gunpowder, mixed with picric acid, binitro-benzine, or some other nitrated hydrocarbon; and, curiously enough, the last ingredient, which gives it most of its terrific force, acts, so to speak, as a restraining agent, and the mixture is much less liable to spontaneous or accidental explosion after it is added than before. The usual way of making it is to grind separately to an impalpable powder sixty-five parts of nitrate of potash or of soda, thirteen parts of sulphur, twelve of charcoal, and ten of binitro-benzine or picric acid. The last three ingredients are then ground together, as in the ordinary process of making gunpowder, and the saltpetre or nitrate of soda gradually added. When the mixture is complete, instead of making it into a paste with water, as is done with gunpowder, for the purpose of graining it, the Fortis is simply heated. It is sometimes warmed in a steam-bath to something over the boiling point of water, and at this temperature the picric acid, or binitro-benzine, melts and, soaking down through the mass, gives it a pasty consistency, so that it can be moulded into cartridges, or formed into cakes, which, when cold, are broken up into grains, like gunpowder. In this process, it is important to avoid too high a temperature, which would cause the sulphur to melt and separate; but a better method, where cartridges are to be made, is to compress the powder directly into the mould, and then heat the whole in an oil-bath to about 300 degrees Fahrenheit. At this temperature both the picric acid and the sulphur melt, but, under compression, neither will separate from the other ingredients, and the result of the process is to produce cartridges of perfectly agglutinated material, as hard and impermeable as if they were crystallized. Gunpowder, in such a solid form, would probably be nearly useless, but the explosive force of Fortis is increased, and the impermeability of the solid cartridges gives them great power of resistance to the deteriorating action of air or dampness, which may be further increased by dipping them in collodion. Another practical advantage of the process of compression is that for such cartridges nitrate of soda may be used in place of nitrate of potash. It is well known that nitrate of soda, which is a natural product, is much cheaper than saltpetre, and makes a stronger gunpowder, but its deliquescent properties make it unfit to use in ordinary gunpowder. The compressed Fortis cartridges, however, are so dense and hard, being really castings of a mixture of picric acid and sulphur, holding the charcoal and nitrate of soda in suspension, that they will not absorb any moisture, and nitrate of soda answers every purpose.

CAPITALS.[1] — III.

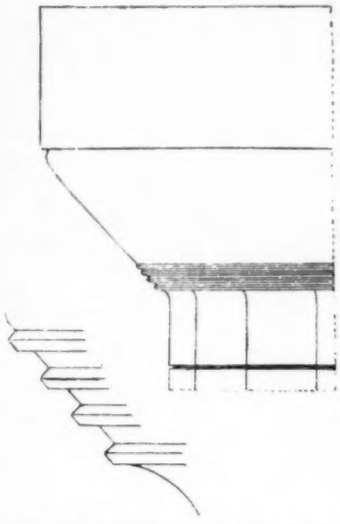


Fig. 33. Capital from the Propylæa of the Acropolis of Athens.

OF the three principal orders spoken of at the beginning of this article, two must be considered as characteristic in Greek art: the first, or Doric, in the art of Continental Greece; the second, or Ionic, in that of Asiatic Greece, or of the peoples of Ionian stock. It is in Athens that the most perfect specimens of the latter have been preserved. Our study must necessarily be confined almost wholly to the capital, but a few words should be said concerning the shaft of the column viewed as a support of the capital.

The Doric shaft is the more simple of the two; it is supposedly monolithic, and in the shape of a slender frustum of a cone, a form which assures its equilibrium. The gorge or neck of the capital is merely a continuation of the shaft, with no moulding to separate distinctly the two divisions of the column. The Ionic shaft, on the contrary, is a monolith sharply defined at top and bottom by an astragal; the astragal at the top bears the capital, while that at the bottom, through the rounded profile of its torus, rests on a circular base. The shaft is cylindrical, except for the slight slope dictated by æsthetical requirements.

The one absolutely distinctive feature of the Doric capital is the echinus or ovolo. Imagine a shallow, flaring vase quirked in at the top, as though to prevent the contents from spilling over; above this is a robust quadrangular plinth, and the flattish bottom of the vase resting on the shaft. This gives us the original and main characteristics of the Doric capital. There are strigæ, varying in number, running around the upper part of the shaft, which would apparently indicate the dividing line between it and the capital, but the flutings are carried above these without a break, and have the appearance of penetrating the echinus, curving outward slightly at the point of entrance. The beginning of the echinus is best indicated to the eye by the cluster of delicate listels, three to five in number, known as annulets. It would seem as though the echinus had been put on a lathe, and that the strigæ naturally resulting from the turning had been purposely allowed to remain as in certain mouldings of the Ionic base (Fig. 33). All this, taken in connection with the robust and simple aspect of the capital, contributed to the creation of one of the noblest forms of Greek art. But this deduction from our comparison between the forms of the Doric echinus and a vase holds, however, for the most ancient times.

It soon appeared to Greek artists that this form was heavy, and that, in lacking grace, it also lacked force and sinew, and they set to work to modify it; but the modification was accomplished by successive attempts, and in accordance with the natural laws of evolution observable in all art. From the original capital it was possible, it would seem, to derive two different types, one having the profile of the moulding which we call ogee or cyma, and which would have joined the shaft and capital more closely by leaving the echinus its full development; the other, by interrupting this development and breaking the curve, so as to give the echinus the appearance of a straight line with only a slight swell, that merely served to counteract its stiffness, would make it seem more powerful, as it would not have the air of bending under the weight supported by the abacus. It was toward the latter that Greek artists turned; it was this form which the architecture of the fifth century developed to its highest degree of grace. We present an illustration of the capitals of the Propylæa of the Acropolis of Athens and of the edifice known as the Temple of Theseus, also at Athens (Fig. 34).

Magna Græcia persevered longer in the use of the distinctly rounded and weighed-down echinus, as the ancient examples of the Temples of Ortygia and Selinus show (Fig. 35). It was by a singular reversion to purely archaic forms that the so-called Portico of the Agora at Athens was adorned in the time of the Emperor Hadrian with a capital whose strongly rounded echinus and annulets, bound into a thick ring, reproduce the primitive forms in an exaggerated fashion (Fig. 36).

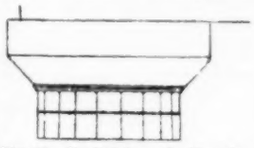


Fig. 34. Capital from the Temple of Theseus.

Unfortunately, artists did not succeed in keeping within the limits prescribed by the great architectural creators of the fifth century; the echinus was gradually reduced, and at length became nothing more than a reversed frustum of a cone. Such is the capital of Pæstum, that of the Doric-Tuscan temple of Cori and others (Fig. 37).

A peculiarity will be remarked in the capitals of the basilica of Pæstum, where a row of leaves decorates the hollow moulding, which, contrary to all other examples, makes the capital narrower at the throat than the shaft of the column (Fig. 37, *a*). The same thing also occurs, it is true, in the capital of Selinus, but the peculiarity in question has, nevertheless, raised a doubt as to the genuinely Greek origin of the capital of Pæstum: suggestions have also been made of a restoration by a Roman hand. We shall not, however, attempt to solve the difficulty.

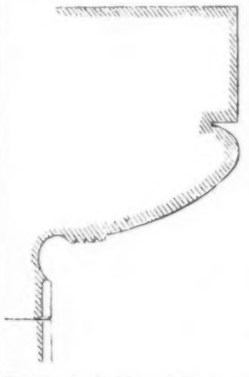


Fig. 35. Capital from Selinus.

Fig. 36. Capital from the Agora, Athens.

Fig. 37. Capital from the Temple of Hercules, Cori.

The annulets, decorating with delicacy the lower part of the echinus, were always maintained during the golden period of architecture. The profile, even, varied but little. When they disappeared, they were replaced by a fine moulding composed of a cavetto with a listel completing it, and, when the flutings ceased to be carried up to the echinus, the gorge of the capital extending down to the striga, which apparently indicates the separation between the shaft and capital, was left plain, and had the form of a flat band projecting over the arrises of the channellings. We find this transformation already curiously indicated in a capital common to the columns and antæ of the Temple of Zeus at Olympia (Fig. 38). We shall return to the subject presently in the discussion of capitals and antæ.

We come now to the Ionic capital, the noblest examples of which may still be seen on the Acropolis of Athens. It is a well-known fact that Athens was an Ionian city, and that the Ionian capital, whose especial field of development was Asiatic Greece, adorned the Temple of Athena Polias. If the Ionic column be considered as a whole, it will be found to be less simple than the Doric, but at the same time it has more variety, and the constitutent elements are more clearly distinguished from one another.

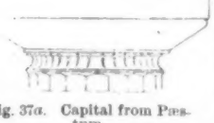


Fig. 37*a*. Capital from Pæstum.

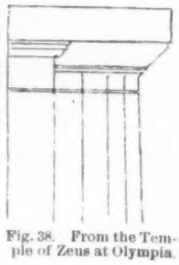


Fig. 38. From the Temple of Zeus at Olympia.

Usually the more delicate the structure the greater the number of organs, and beauty is always more real and more apparent in the simpler creation; delicacy and grace often

[1] From the French of Adrien Joigny, in Planat's *Encyclopédie de l'Architecture et de la Construction*. Continued from No. 845, page 149.

demand more finish (Fig. 39). The first thing which impresses one in the Ionic column is the fact that so many elements as are exhibited there at the same time can, by the fashion in which they are arranged, produce such a complete unity.

We must note at the start the entire independence of the shaft with relation to the rest of the column. While combining

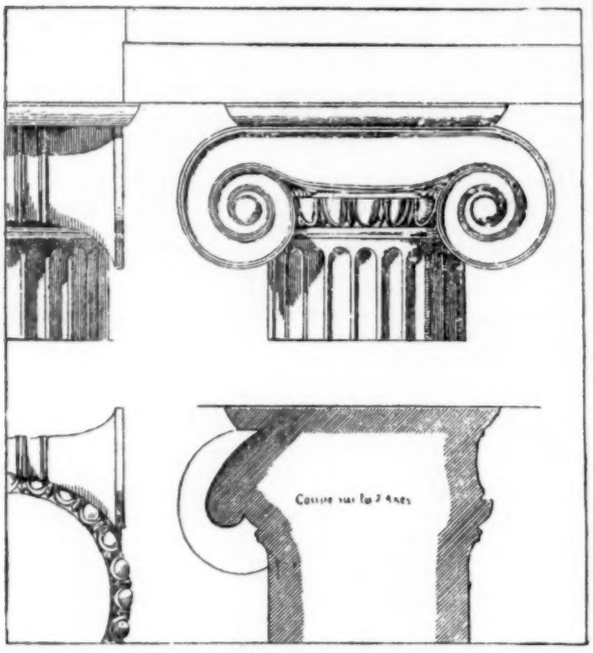


Fig. 39. Ionic Capital from the Propylæa.

without any difficulty with the other essential elements, the shaft has its independent structure. It is a monolith, or carefully retains the appearance of being such; instead of resting crudely on the floor, and instead of blending with the capital, it is furnished, top and bottom, with an astragal, the profile of which does away with all sharp edges for the planes of contact. On the upper astragal rests a genuine echinus, not like that of the Doric order, but proportionately lower, and with the profile of a quarter of a circle; up to this point, therefore, the Ionic column has the appearance of a special kind of Doric column. Certain Ionic columns, moreover, have come down to us, denuded of their volutes. A drawing made by Tournefort of the capital of an old temple of Samos, exhibits the echinus carved in an egg pattern; the upper horizonal face seems perfectly formed and has a rectangular notch as though for the securing of some part which has disappeared.

This likeness between the Ionic and the Doric columns tends to the conclusion that all that is found in the first above the echinus — which is of rounded profile and terminates the circular portions of the capital — was placed there just as the Doric abacus was placed on the flaring echinus of that order. It is difficult to consider the very thin plinth which receives the weight of the architrave, as of itself equal, either in appearance or reality, to its part in the *ensemble*, except on the ground that a close and indissoluble connection between it and the volutes existed in the mind of the creator of the capital.

Fig. 40. Capital from the Erechtheum.

The volutes develop in the longest direction of the architrave, so that the two vertical planes of their faces are just about the thickness of the architrave apart. The echinus, therefore, projects over these faces so that the seat which it forms is partially unoccupied. The echinus is sculptured with egg patterns and the torus of the astragal with pearls and beads. Sometimes, as in the Erechtheum, the top of the shaft is enriched with a band carved with marine flowers, below which the channellings stop (Fig. 40).

The volutes constitute the most interesting and most original part of the Ionic capital. They represent a sort of cushion made of a supple, flexible material, on which the thin abacus rests; beyond the abacus, at the right and left, the cloth-like material appears on the face as rolled about a point which constitutes the eye, and the sides are raised and fastened. To make the disposition clear, let us imagine the column completed to the echinus; on the echinus, let us suppose a plinth as long, following the direction of the architrave, as the diameter of the echinus, but not as deep in the other direction; this plinth bears two flanges after the fashion of the ancient altars of which we give a few examples (Fig. 41). The cushion made of layers of cloth is placed on this altar-table, the middle part sinking down between the two flanges and the ends hanging over at the right and left, furnished with metallic rods at the extremities which serve to stretch them by their weight. The head of the rod will make the eye of the volute if we roll it over so as to give the edge of the cloth a spiral shape. The side of the cushion thus formed will be held up by the projection of the echinus beyond the plinth, and a band like a strap will serve to retain the whole in place. The abacus above is of slight thickness. This wholly hypothetical explanation of the evolution of the Ionic capital seems to us to account with sufficient clearness for all its forms.

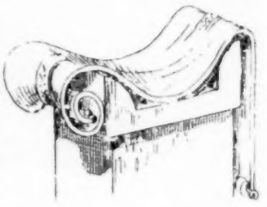


Fig. 41.

According to this they were derived from the altar, but, and we must insist on this point, it was not by direct imitation of it that the Ionic capital was created. To introduce as the characteristic ornament of a support an element made of a flexible material would have been an absurdity (Figs. 42, 43); before the enlarged altar became a column it must itself have transferred this disposition to stone, and the latter must have assumed, as support of some sacred object, a henceforth consecrated form whose decorative features alone were borrowed from the original (Fig. 44). This aspect of an altar extends to the very foot of the column, and farther investigations of the subject, therefore, come properly under the study of the column as a whole. Thus much, however, has been necessary to a clear understanding of the volutes. In accordance with the theory outlined above, the column is no longer merely a transformed post: in its complete form and in its beauty it is something quite different from an industrial production; it was, as has already been said, a monument by itself before it was made to do duty as a support in temples.

Fig. 42.

We shall have something to say presently about the probable development of the Doric capital; it must have been analogous to that of the Ionic, for all these noble works must have been wrought out of the fancy of different individuals, if their genesis depended upon dissimilar laws; it would be impossible on that supposition to explain satisfactorily the universality of their employment — a point that ought not to be overlooked.

To return to the Ionic capital. According to our theory of its formation, the volutes and the echinus must have been independent of each other, and yet the egg decorations of the latter are usually not visible under the coussinets. Among the reasons which may be adduced to account for the bringing of the volutes so near the rest of the capital, we must certainly include, in addition to the desire to restrict the size, the desire also to avoid the difficult operation of carving the egg pattern under the coussinets. The eggs of the echinus are all visible in the capitals of Erechtheum and are all sculptured in their minutest details; they are twenty-eight in number. In

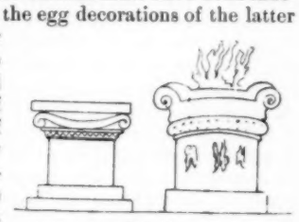


Fig. 43.

the Ionic capitals supporting the ceiling of the Propylæa of the Acropolis of Athens this ornamentation is carved only where the echinus is not covered by the volutes; in the other parts the eggs are merely chamfered off, as it were; a few strokes of the chisel outline them and apparently limit the

Fig. 44.

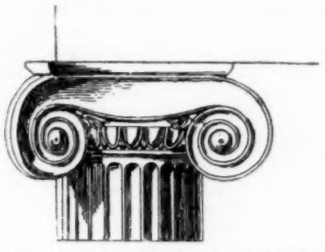


Fig. 45. Capital from the Temple of Nikè Apteros.

paintings which covered them and gave them, under the shelter of the volutes, an aspect differing but little from that of the fully sculptured eggs, which were evidently painted in the same colors. However this may be, the labor of finishing the details of such portions of the echinus as could less easily be reached was avoided.

The capitals of the Propylæa are more ancient than those of the Erechtheum, and it is clear that if the sculptor of the latter was able to carry his work farther than had hitherto been done it is not probable that one coming later would have presumed to carve the echinus after the fashion of that of the Propylæa. This observation may aid us in fixing approximately the date of the construction of the temple of Nikè Apteros (Fig. 45).

The great deviation toward the south of the axis of the temple, the obstacles which, owing to its situation, the architect of the Propylæa encountered when he came to build the right wing, the legend which attached to its foundation, everything goes to prove its high antiquity; but, on the other hand, there is no conclusive evidence that it was not reconstructed in the fifth century. We add that it may have been restored at about the period of the construction of the Propylæa, and perhaps by the same architect; in any case, we must conclude, if observation amounts to anything, that it antedated the execution of the columns of the Erechtheum. In fact, in the capital of the Nikè Apteros, and notwithstanding the fineness of the work, the egg pattern of the echinus is sculptured, as in the Propylæa, only in such parts as are not covered by the volutes; the rest is merely painted; a slight stroke of the chisel served to outline the eggs and darts, and limit the colored decoration. Now, we repeat, with the example of the capitals of the Erechtheum before him, is it all probable that the architect of an edifice as precious as this temple of the Wingless Victory, could have had recourse to a comparatively primitive process? It seems to us hardly possible.

Here now is an Ionic capital, which belonged to some one of the edifices of the Acropolis of Athens, doubtless a circular structure. The composition of its volutes is original, and we call attention especially to the way in which the artist *juggled*, if we may so speak, with the eggs under the coussinets; three, at the very most, are visible on the principal faces, and even the bead below the eggs is sculptured only from one volute to the other (Fig. 46). We cite this capital to show what the disposition of the volutes became in time, for it belongs to a period far later than the best examples given above. It may even have formed part of a Roman building.

But in the temples of Asia Minor, that is, in genuinely Ionic sanctuaries, these reductions of the Ionic capital already occur from the fourth century. Neither in the temple of Apollo at Didyma, nor in the temple of Athena Polias at Priene, is the entire row of eggs on the echinus visible. There is also another simplification; there ceases to be any imitation of the supposed fold of cloth falling over above the echinus, and nothing but the moulding bordering the spiral and passing under the abacus remains. These two modifications seem even to move parallelly; thus at Priene where the curved falling fold is still maintained, the eggs of the echinus are only two-thirds hidden, whilst at Didyma where the former is suppressed the eggs have wholly disappeared under the coussinets of the volutes. It is examples analogous to this last which the Roman Ionic capitals furnish.

We must refer the reader to a detailed study of Ionic architecture for a more complete development of the very interesting history of the Ionic capital. As to the peculiar trace of the volutes it has been stated that the spiral makes three turns in reaching the eye. But we might point out at once one of the characteristic peculiarities of this trace. If, through the centre of the eye of the volute two perpendicular lines be passed, one vertical the other horizontal, it will be remarked that the spiral never meets one of these in its movement toward the eye, without having already acquired the curvature that it will maintain in the following quadrant; in a word the tangent to the spiral at the point where it crosses one of the rectangular axes is always inclined toward that axis. It is this that gives the spiral its accent and vigor; it has the appearance of hastening toward the centre. Therefore in the geometric methods deduced by modern writers for the trace of the volutes from the quite obscure directions which the text of Vitruvius affords, the centres of the various arcs composing the spiral are always taken outside of the eye. Is this really the method followed by the ancients? Its execution presupposes intelligence and skill on the part of the workman. It seems to us that some simpler way must have been adopted, one that could be understood by every one. It is noticeable that the eye of the Ionic capital is often disposed as if its presence must necessarily have interfered with the operation of the trace of the volutes (Fig. 47); perhaps in the circular hole in which the eye was to be placed, a wooden peg was inserted held perpendicularly to the plane of the volute and slightly conical in form, with a thread wound around it like a child's top; when completely wound up with a stylus fastened at the free extremity, it could unwind from the eye until it coincided with the horizontal lines continuing the spiral on the face of the capital. This would account for the variation of the centres of the curves and also for the continuity of the latter.

Something must now be said of Ionic capitals with eight volutes, a deviation from the primitive principle that dictated the rational disposition of the capital. In the Ionic capital the face must be parallel to that of the architrave. The volutes develop in the direction of the length of the architrave, thus giving it the appearance of being more firmly supported in this direction. It is only an appearance, however, for the thin plinth separating the capital from the architrave is always and without exception square. The little that has been said of the probable origin of the Ionic capital shows sufficiently the reason for this. It suffices also to add that this capital is not derived from those found on the island of Cyprus where the attempt to prolong the support is patent. But these last, if they were known to the Greeks — and that of the museum of Constantinople seems to give proof of it — would have justified the inventor of the Ionic capital in adopting unhesitatingly the development of its volutes, since ancient examples had already furnished a type which, though of different origin, nevertheless offered an evident analogy in the forms.

The face of the Ionic capital being parallel to that of the architrave, it followed almost necessarily that in the angle

Fig. 46. Capital on the Acropolis of Athens.

returns, the capital must have its two adjacent faces toward the interior angle as well as its two cushions or bolsters toward the interior angle. The Greek architects did not hesitate to adopt this disposition notwithstanding its difficulty. And as the volutes of the different faces could not have

developed freely, since, owing to their strong projection, they would have penetrated each other, the faces were so inflected as to permit of backing the volutes against each other in accordance with a plan the horizontal trace of which would be the diagonal of the angle of the architraves.

Fig. 47.

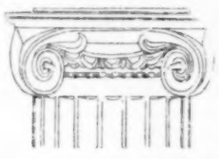


Fig. 48. Pompeian Capital.

Æsthetic reasons have been adduced for this disposition which it seems useless for us to call up, since it has evidently imposed itself upon architects. But they maintained this modification of the volutes only for the external angle, and on the interior, where two other volutes necessarily meet and slant toward each other, they accepted the disposition as it presented itself.

As in the case of the Hathor capital, a day was to come at last when the architect would yield to the temptation of making the four faces of his capital alike, as in the Doric capital and in the Corinthian which was already perhaps in formation (Fig. 48). All that was needed was to repeat at the four angles what had to be done once at the angle capitals. Thus the coussinets disappeared and there were eight volutes backed against each other two by two following the rectangular diagonals of the capital. Whence came this new disposition which was destined to receive so many interesting applications, in spite of that absence of logic which would have made a singular impression on the ancient architects, no one can say. Examples of it may already be seen in the temple of Bassæ, which many believe to be the old Temple of Phigalia built by Ictinus; others hesitate to accept this identification, others still believe it to be an ancient edifice reconstructed at a much later period, and the singular alteration of the old Ionic capital which we have just shown would perhaps justify these last. We shall deduce from it another argument in favor of our theory of the origin of the Ionic capital. The coussinets which are so characteristic, and seemingly so difficult to maintain could not be done away with until the time came when fancy could be substituted for ancient traditions. However, these traditions were never wholly abandoned and there resulted from all this labor only a new creation, a new capital.

(To be continued.)

SEWAGE DISPOSAL AT ISOLATED HOUSES.[1]

From the *British Architect.*

THE safe and inoffensive disposal of the sewage of buildings not within reach of a public sewer has always presented difficulties. Until twenty years ago, the "out-of-sight-out-of-mind" system, in other words the use of cesspools, was nearly universal. The radical objections to the cesspool had already begun to be recognized, and they are now known to be absolutely condemnatory. Cesspools are always objectionable, and there are not many cases where they are at all admissible.

Soon after the introtroduction of the earth-closet, its inventor, Mr. Moule, devised the method of discharging sewage into shallow, underground drains, and this was soon improved and brought to something like a system by Mr. Rogers Field, who collected into a flush-tank the dribbling stream of sewage from the house and caused an intermittent discharge of considerable volume, and at considerable intervals, into the tiles. This system was somewhat improved in this country, and was brought to such a state of efficiency as to come into quite general use. Among other large works of this kind may be mentioned those planned by the writer for the disposal of the sewage of the Woman's Prison at Sherborn, Mass., and of the village of Lenox, Mass. Somewhat later Mr. Croes used the same system, discharging his tank by intermittent pumping, instead of the intermittent action of an automatic siphon, at the Lawrenceville School in New Jersey. For domestic use in connection with suburban houses, the system has been very widely adopted. In 1884, the writer used a flush-tank for the accumulation of the sewage from a large country house near Baltimore, delivering its discharge with satisfactory results directly onto the surface of the ground, instead of into sub-surface absorption-tiles.

Up to about 1890, the theory of sewage disposal was a matter of development and interest rather than of positive knowledge.

The experiments carried on under the auspices of the Massachusetts Board of Health at its experimental-station at Lawrence, Mass., under the immediate and admirable direction of Mr. Hiram F. Mills, an engineer of great capacity and a member of the Board, have given us much more exact knowledge on the subject than we had before. It is not too much to say that these experiments and Mr. Mills's deductions from them constitute the most important advance yet made within so short a time in the world's sanitary knowledge. The voluminous publication of the details of these experiments, and the conclusive reasoning based upon them, will well repay the careful study of all who are interested in the subject. For our immediate purpose, it is sufficient to say that these experiments demonstrate beyond question the fact that, and almost the precise manner in which, organic matter contained in sewage is reduced to its elements; that is, is absolutely destroyed as organic matter. The experiments were conducted in tanks filled with various filtering materials. The simplest and most striking illustration of the process was obtained in the case of a tank "filled with gravel-stones, none of which would go through a screen having a mesh one-eighth of an inch square, but all of which would go through one having a mesh three-eighths of an inch square"; and another "filled with gravel, none of the stones of which were less than three-fourths of an inch in diameter, nor more than 1¼ inches." In both cases the gravel was carefully washed, so that no sand or soil would remain attached to the stones. The material was put into the tanks damp from washing. In his "General View of Results", Mr. Mills says:

"The experiments with gravel-stones gives us the best illustration of the essential character of intermittent filtration of sewage. In these, without straining the sewage sufficiently to remove even the coarser suspended particles, the slow movement of the liquid in thin films over the surface of the stones, with air in contact, caused to be removed for some months 97 per cent of the organic nitrogenous matter, a large part of which was in solution, as well as 99 per cent of the bacteria, which were, of course, in suspension, and enabled these organic matters to be oxidized or burned, so that there remained in the effluent but three per cent of the decomposable organic matter of the sewage, the remainder being converted into harmless mineral matter.

"The mechanical separation of any part of the sewage by straining through sand is but an incident, which, under some conditions, favorably modifies the result; but the essential conditions are very slow motion of very thin films of liquid over the surface of particles having spaces between them sufficient to allow air to be continually in contact with the films of liquid.

"With these conditions, it is essential that certain bacteria should be present to aid in the process of nitrification. These, we have found, come in the sewage at all times of the year, and the conditions just mentioned appear to be most favorable for their efficient action, and at the same time most destructive to them and to all kinds of bacteria that are in the sewage."

We see, therefore, that the process that is called "filtration" is not filtration, but a mere exposure of the sewage to the air under conditions favorable to the development of the destructive bacteria, which, so far as we now know, are the sole agents for the purification of sewage by the complete oxidation of its organic impurities. The value of these experiments is not confined to their relation to the process known as intermittent downward filtration. They seem to point out the method of destruction by all natural processes of oxidation, whether in filtration through aerated material, by exposure on and in the immediate surface soil, and mixture with oxygenated waters, as in flowing streams. Indeed, it is questionable whether intermittent downward filtration will be much used in its integrity, save under exceptional conditions. This is a system which precludes the possibility of agricultural returns, and it requires for its perfect action soils of such a highly porous character as are by no means generally found where sewage is to be disposed of. These experiments, however, mark out clearly the character of the processes of destruction and the conditions required for efficient oxidation.

When sewage is delivered into porous absorption-drains laid in the surface soils, it soaks away into ground which is sufficiently penetrated by air to facilitate bacterial growth. When sewage is delivered over the surface of the ground the process is substantially the same, but exposure to the air is more complete, and oxidation is, within suitable ranges of temperature, proportionately active. In all work of sewage-disposal, the conditions essential to bacterial oxidation must be kept constantly in mind, and as much as possible

[1] By Geo. E. Waring, Jr., M. Inst. C. E., Newport, R. I.

favored. The process being in all cases the same, the skill and judgment of the engineer will be applied to regulating the work in such a manner as to secure their best development and most favorable action.

Aside from the efficiency of the ultimate disposal, it is of the greatest importance when the works are established in the immediate vicinity of the buildings in which the sewage is produced, that all parts of the process should be free from offence to the eye and to the nostril. The system of sub-surface irrigation, with the use of a double-chambered flush-tank, the first chamber holding back solid matters and scum, and the second chamber accumulating and intermittently discharging the liquid portions, has always had the drawback, perhaps more theoretical than practical, that the first chamber had, necessarily, some of the worst characteristics of a cesspool, for, while the free movement of liquid through it prevents a high degree of foul putrefaction of any of its liquid portions, and indeed carries off the gases of the putrefying sediment, the scum with which the contents of the tank are always covered is in a constant state of decomposition, and is constantly producing foul and objectionable vapors. No way has yet been discovered in which this foul deposit-chamber can be dispensed with in the case of subsurface disposal with the small-sized absorption-drains generally used. As this is the system now usually adopted, and as it is still the best one available under certain conditions, its details are shown in the accompanying diagrams (see Illustrations). Figure 1 shows the construction of the double-chamber tank. The settling-chamber, *A*, is a small round cistern with a wide throat — not less than eighteen inches diameter — to facilitate the removal of its scum and deposit. It receives sewage from a pipe turned down through the dome and barely trapped against the return of air — if deeply trapped, grease accumulates and obstructs the drain; with this slight trap, the flow from an ordinary house suffices to keep it free. It overflows through a deeply-trapped pipe into the discharging-chamber, *D*. It is divided by a wall into two chambers; the top of the wall being just at the overflow line. The compartment, *B*, on the inlet side, has its water considerably agitated by the inflow. Before the dividing-wall was adopted, this agitation was communicated to the contents of the whole chamber, and flocculent matters, which would settle to the bottom or float to the top in still water, were carried over by the current into the discharging-chamber. This agitation is now confined to the compartment *B*, from which the liquid portion flows to the compartment *C* in a thin sheet over the top of the wall, in such a manner as not to disturb the contents of this second compartment, allowing flocculent solids to settle quietly to its bottom. Under some circumstances, perhaps due to a higher temperature in the sewage, and this to its larger amount, the decomposition of the sediment and of the scum is sufficiently active to prevent accumulation to an injurious amount. In such cases, the settling-chamber need never be cleaned. This is not to be depended upon without occasional inspection. In the majority of cases it is necessary every few months to bail out the chamber and get rid of its accumulations, which should be buried or dug into the ground at once.

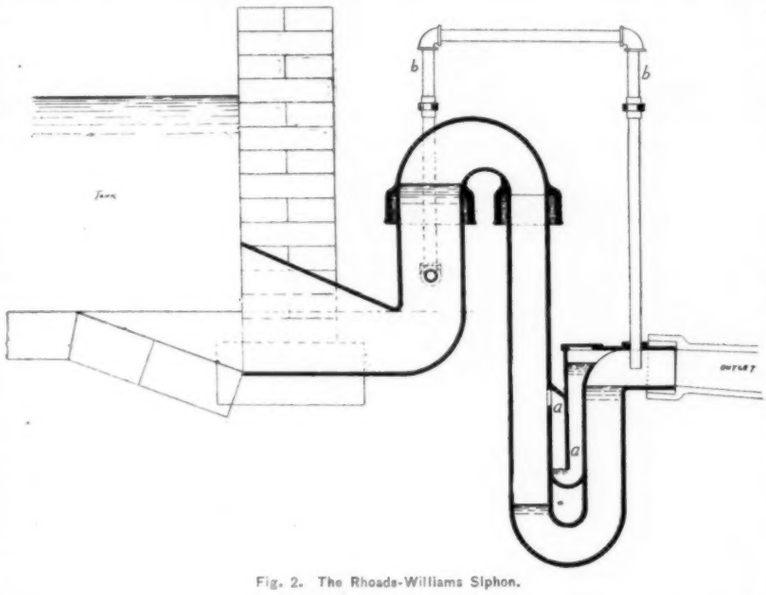


Fig. 2. The Rhoads-Williams Siphon.

The liquid overflow from the settling-chamber *A* to the discharging-chamber *D* represents practically the full amount of sewage brought down by the drain. The discharging-chamber should be made large enough to hold the product of at least twelve hours; there is no objection to its retaining twenty-four-hours' supply — a longer retention would lead to too much putrefaction. This chamber is furnished with an automatic siphon. The one shown being what is known as the Rhoads-Williams siphon. Its details are shown in Figure 2.

It depends for its action on the sudden releasing of compressed air contained between the inflow from the tank and the deep trap near the outlet. When the pressure is sufficient to force the water in the blow-off trap, *a*, *a*, to the bottom of this trap, the air-pressure is released, and the head of water, which it had held in the tank, forces a full flow into the siphon and brings it rapidly into action. Air is introduced for the breaking of the siphon after the main flow has ceased by the admission of air from the drain through the pipe, *b b*. These siphons are sold by flush-tank dealers.

The siphon is located entirely outside of the tank in the ground. This obviates the serious fouling of the siphon itself, which has always been a source of difficulty when it was placed inside the tank. Its opening into the tank is funnel-shaped so as to take the flow rapidly and to make sure that there will be no obstruction from such minor solid matters as the sewage may contain. It is not ordinarily found necessary to clean out the discharging-chamber, matters which would otherwise accumulate within it being held back in the settling-chamber.

Its outflow is a slightly putrid sewage containing more or less fine flocculent matter, not enough to interfere with the proper action of two-inch absorption-drains. These absorption-drains may be placed at a greater or less distance from the tank as the tank may be at a greater or less distance from the house. They are made of ordinary round two-inch tile in one-foot lengths, laid in earthenware gutters, their joints being open about one-fourth inch and being protected against the entrance of earth by the loose-fitting cap laid on the top. The gutters and caps are of larger radius than the outside of the tile, so that practically the whole joint is available for the escape of sewage into the ground. The surface of the gutter on which the tile is laid should be ten inches below the finished surface of the ground. In a reasonably porous surface loam, it will suffice to have one foot of tile for each gallon of the contents of the discharging-chamber. The tile, caps and gutters are shown in Figure 17.

If the soil is heavier, the length must be increased. An impervious clay is not well suited, under any circumstances, for this use, but where nothing else is available there should be at least three feet of tile per gallon. The tile may be one continuous line, or a number of shorter lines, connected with the four-inch main leading from the flush-tank. The tiles need not be more than three feet apart, though twice this distance is not unusual. In fact, the system is in this respect a very flexible one and can be adapted to land of any shape or inclination. The fall of the main line from the tank to the absorption-drains should not, especially after coming within twenty feet of the first line of tiles, have a fall of more than four inches to one hundred feet. Its joints should be cemented and the branches for connection with the tile lines should come out from the bottom of the tile, not from the middle as is usual with its vitrified branches. Special pieces for this purpose are to be obtained from the dealers. The absorption-lines themselves should have a fall of not more than two inches per one hundred feet: more than this gives a tendency to an accumulation of sewage at the far end of the line, and, if the line is long, to a breaking out of the sewage at the surface.

Figures 3, 4 and 5 show three different methods of applying this system according to variations of the ground. In each case the dotted lines are contour-lines showing differences of elevation of one foot.

In Figure 3, the flush-tank *A* receives its sewage from the sink-drain leading from a corner of the house. Its discharge is through a direct line to the point *c*, starting at the tank at a depth of three or four feet below the surface and coming to within a foot of the surface at the point *c*. At the point *c* the main drain is turned at an angle and has three different outlets to be used, one at a time, in alternation. The first one communicates with two parallel drains at the bottom of the field these having a sufficient combined length to receive the whole discharge of the tank. The second one runs parallel to the first, to two absorption-drains corresponding with the first two. The third communicates with the other system of three parallel lines which are shorter, having about the same aggregate length as the two of the other systems. They are carried around nearly parallel to the contours to secure the requisite slight fall.

In Figure 4 the flush-tank is fed by two drains from the house and connects, as shown, with three series of three drains each. The land is much more nearly level and the nine absorption-drains are in ground having a total fall of only one foot.

In Figure 5 the flush-tank is fed by a single drain, not straight, and connects with its alternating chambers. There are two series

of drains, four on one side of the field and four on another, while a third line connects with the series of three shorter drains on each side of the medial line.

The flush-tank may be placed in any position and at any distance from the house and the field may be at any distance from the flush-tank to which a proper fall can be obtained.

One modification of this system which will obviate much of the difficulty by requiring a greatly reduced retention of solid matters, where indeed a coarse screen may be made to hold back all that it is necessary to retain, consists in the use of larger absorption-tiles, say four inch or six inch, with open joints, laid just under the surface of the ground and laid in two, or better, three series, each of which has sufficient capacity in its pipes to receive the entire contents of the tank at each discharge. The discharge being at intervals of from twelve to twenty-four hours, the liquid sewage with its soluble and its finer suspended impurities will have ample time to leak out into the soil; and during the period of intermission. While the other two series of drains are being used, worms, beetles and other insects will consume, or decomposition will destroy, the relatively small amount of deposited matter, which, however, might be sufficient to obstruct two-inch tiles.

A still further modification consists in making the drains of similar large tiles of "horseshoe" shape, laid in a trench filled with coarse gravel or broken stones. The capacity of the tiles and of the voids among the stones in each series should be sufficient to receive the full contents of the tank. Where the ground is reasonably absorptive, and is sufficient in quantity, the large tiles alone may be used. Where the ground is less absorptive and is restricted in area the coarse matters surrounding the tiles will be a decided advantage.

Cross-sections of four-inch horseshoe-tiles laid in trenches filled with stone or gravel are shown in Figures 11 and 12 and 13.

In Figure 11, the ground is supposed to be reasonably absorptive, like garden mould. In Figure 12, the natural soil is very heavy and non-absorptive, and is level or nearly so. It is thoroughly underdrained and is covered with sand or gravel in low ridges, being deeper at the absorption-drains than midway between them. The purification takes place entirely in this porous and well-aerated surface, the clarified water sinking into the drained ground below. In Figure 13, the land is non-absorptive and has a decided slope. It should be well underdrained with tiles running up and down the slope. The surface is covered with sand or gravel and is divided into sections by banks of clay (under the sand) at the foot of each section. The sewage is delivered into a horseshoe-tile, with broken stone, at the upper side of each section and is purified (and its water is absorbed) before it reaches the clay bank below, or is held by this bank until it is disposed of.

This question is often raised with reference to the sub-surface system: "If the dire results of the use of the ordinary leaching cesspool are so serious, why is it not just as bad to discharge the same materials into the ground by leaching drains?" The difference is radical. In the case of the cesspool, the leaching takes place almost entirely at such a considerable distance from the surface that the exclusion of air makes bacterial action impossible, while the delivery through drains laid immediately under the sod is into aerated ground which is teeming with bacteria.

In the system described above, a certain amount of putrefaction is inevitable and putrefaction is always objectionable. When once its fæcal matter is submerged, so as to prevent the exhalation of its odors into the atmosphere, *fresh* sewage is entirely inoffensive to the smell. It is simply so much dirty water. It might be thrown in considerable quantities onto a grass plat without other objection than that which would attach to the sight of its solid portions. Unless thrown so frequently and in such quantities on the same spot as to saturate the ground, exclude the air, and so prevent bacterial action, it would produce no odor whatever, barring the slight odor of exposed fæces. The same sewage retained for two or three days in a barrel, vault, or pool, would enter into a state of offensive decomposition and would constitute a nuisance of a serious character.

The real problem in the disposal of household sewage, and indeed of the sewage of large institutions, and even of small towns, is to bring it into contact with a suitable oxidizing medium, while in so fresh a condition as not to be offensive and to make sure that the drains and other appliances through which it passes shall at no time become offensive. Offensive odor is, of course, chiefly to be guarded against, but offence to the sight would also constitute an important objection. No method has as yet been devised by which the whole process could be appropriately carried on on the front lawn of a dwelling-house. We have, however, arrived at a point where even in a reasonably secluded back-yard, all of the conditions may be satisfied. Setting aside exceptional cases, where only the sub-surface system with a double chambered flush-tank would be acceptable, the work may be done in a great majority of cases by a system of surface disposal or of sub-surface disposal with large pipes with an automatic flush-tank from which the deposit-chamber is absent, which may at all times be thoroughly aerated and which may be cleansed with sufficient frequency to prevent odor from its sliming. Especially in connection with such a flush-tank can the ventilation of the main drain and soil-pipes be maintained with such completeness as to prevent the accumulation of odors in them. The objection to placing a flush-tank of this character quite near to a house is rather fancied than real.

The nearer it is and the more constantly subjected to inspection, the greater will be the certainty of keeping it always in good condition. On the other hand, the farther from the house, the more will the solid parts of the sewage be broken up in transit, the less imperative the need for scrupulous cleanliness, and the less the care required. However, civilized living requires great care in all such matters. Civilization is only lately beginning to take cognizance of this requirement, and the public at large is still disposed to like best a system which calls no attention to itself and of which the objectionable features are so hidden as to be easily forgotten. Even under their best development, such systems belong to the "out-of-sight-out-of-mind" class.

Until 1879, when the writer constructed for the late E. F. Bowditch, of Framingham, Mass., a water-closet consisting of a white earthenware hopper set in white tiles with nothing in front of it, and with only a seat without a cover over it, this seat being hinged to turn back and expose the hopper, it was the universal rule, in housework, to convert the water-closet into an unobtrusive piece of furniture by enclosing it tightly in wood-work — often handsome cabinet-work — with a lid attempting to conceal its character. Now, a dozen years later, all "first-class" plumbing supplies only such fully exposed closets, frankly showing what they are and demanding, and receiving, the constant care which removes the least suggestion of offensiveness or indecency. The modern closet so constructed, is in every respect unobjectionable; the old closet depending on concealment for its decency, was almost universally indecent. It manifests itself, not to the sight, which soon becomes accustomed to whatever is needful and appropriate, but to the smell which never becomes accustomed to the fetid odor of a highly ornamental pan-closet, even though built around with polished rose-wood.

Unquestionably, the same principle will apply in the case of apparatus for the disposal of sewage outside of the house. The cesspool, the vault and the double chambered flush-tank will soon have become a thing of the past, among those who care for good sanitary conditions. Their places will be taken by some device having the essential features of the system described below, combining efficiency with the possibility of, and the demand for, perfect cleanliness. This being accomplished, the "horrid drains" will soon cease to exist, or to be thought about.

It is not to be supposed that this precise manner of applying the system will long remain the accepted one. But the principle of the arrangement seems to embody all the elements of permanence. This principle may be thus stated:

Deliver the sewage as soon as produced, through thoroughly ventilated pipes and drains, to a point outside of the house; hold back its coarser substances by some form of screen which will allow everything to pass that can, in an unobjectionable way, be disposed of with the sewage; accumulate the regular flow through the drain in a receptacle large enough to hold the supply of a few hours, or of a day, as the case may be; the receptacle becoming full, discharge its contents automatically, rapidly and completely onto the surface of the ground, or into drains immediately below the surface, for its final, complete and inoffensive disposal; arrange the screen and tank in such a way that they may be kept in a cleanly condition with little labor and without requiring the constant supervision and nagging of the master of the house. The appliances shown in the Figures 6 to 16 and the method of working described in connection therewith, seem to constitute a satisfactory application of this principle.

Figure 6 shows a vertical, longitudinal section, Figure 7 a plan, and Figure 8 a vertical cross-section of a new form of flush-tank of which the inside measurements are, a width of one foot eight inches, a length of six feet and a height of two feet. At a distance of four inches below the top on the long sides, a ledge two inches wide is formed by setting the brickwork of the walls that far back.

This ledge is intended to receive wire-cloth screens twenty-four inches square, shown in Figure 10. The length of the tank may be increased to any number of multiples of two feet in order to obtain the desired capacity. A tank eight feet long would take four screens, a tank ten feet long, five screens, etc. The uniform width is maintained as the screens are made only in the one size and as they would be liable to sag if much wider between their supports. The bottom of the tank is so graded as to deliver its contents entirely at the centre of the discharging end where there is a depression equal to the receiving height of the throat of the siphon at its narrowest part. At the upper or inflow end of the tank there is built a recess fifteen inches square to receive the screening cage shown in Figure 9. This cage is made of galvanized-iron-wire cloth with one-inch mesh. It is entirely closed at the top and bottom and on three of its sides. One of its sides, that which is to be placed next to the inflowing drain, has an opening at its top ten inches square. This cage constitutes a complete screen to withhold whatever will not pass a one-inch mesh — paper and all solids of considerable size. The agitation of its contents by the inflow will break up much of the softer solid contents of the sewage and carry them through the meshes; what will not so pass must be retained because it would tend to obstruct pipes in the case of sub-surface delivery and would make objectionable deposits on the ground in the case of surface delivery. These cages are furnished in duplicate, so that whenever one is removed for cleaning, another can be substituted for it immediately. The one removed, after standing a few minutes,

will have parted with all of its liquids and its solid contents can be shaken out through the ten-inch opening and removed, or dug into the ground. When the cage and the covers, Figures 9 and 10, are all in place, the whole tank is sufficiently screened from observation and is protected against leaves and rubbish which might otherwise get access to its contents. As often as experience shows it to be necessary, perhaps daily, the covering screens, Figure 10, should be removed, after discharging the tank, and its walls and bottom should be thoroughly swept down, the sewage accumulated in its outlet being sufficient for such washing. As above indicated, the frequency with which this cleansing should be performed will depend on nearness to, or remoteness from, the house, walks, etc.

Figure 18 shows the masonry construction of this tank, the material being brick glazed on the inner face and marble or other slabs at the top.

The tank is discharged after its contents reach a certain height by the action of a Rhoads-Williams automatic siphon placed entirely outside of the tank, having a funnel-shaped inlet for the entrance of the sewage. This siphon will require no attention. Whenever the tank fills to the discharging line, the whole accumulation will flow out rapidly and when the flow ceases, the siphon will "break," allowing no further discharge until the tank has filled again.

The tanks may be built of ordinary brickwork laid and coated inside and out with Portland cement or with stone or concrete similarly coated. They may be cheaply but simply made or they may even be lined and capped with white marble. Another excellent material would be white or straw-colored glazed bricks laid with close joints. Elegance of finish will not be altogether useless, for the finer they are the more easily and the more certainly will these tanks be kept in good condition.

Figure 14 shows the flush-tank illustrated in Figures 6 to 10, placed at some distance from the house, receiving sewage from three house-drains, and delivering its contents for surface disposal by the use of three alternating systems of surface gutters or barriers to equalize the flow. These sections are marked *A*, *B* and *C*, the gate-chambers *a*, *b* and *c* regulating the distribution. In *A* and *B* the sewage is delivered along the upper edge of gently sloping land. If the land is steeper, the gutters or barriers must be nearer together to equalize the flow. Water escaping from the upper gutter or barrier 1 is collected again at barrier 2, and again at barrier 3. Disposal for section *B* operates in the same manner. On section *C*, the gutters or barriers being much longer, only two are needed. These illustrations are not drawn to scale, and are only intended to illustrate the general features of the process. The gutters or barriers must be absolutely horizontal, and so arranged that the sewage escaping from them will flow evenly over the land below. The distribution may require the cutting of a leader-furrow here and there in the grass with a spade.

This method of surface irrigation removes absolutely all impurity from the sewage; what becomes of it after it has passed over a sufficient area of ground is immaterial. If it escapes into the brook or other water-course, it will by that time have become purer than the water of the brook itself.

Figure 15 shows a system in which the same tank is used, receiving the flow from four house-drains, and delivering its sewage into absolutely level, wide trenches of sufficient length. In the case shown, there are two of these trenches returned on themselves to give sufficient length. They are marked *a*, *a*, *a* and *b*, *b*, *b*. In connection with the same system, there is shown a system of surface irrigation on sloping land. The satisfactory use of the trenches *a*, *a*, *a*, and *b*, *b*, *b*, requires land of very absorptive character, the more porous the better. The best of all is a fine gravel. As the trenches become filled on the discharge of the flush-tank, the liquid soaking away into the ground, there is left a felt-like coating on the surface, which requires either a sufficient intermission of use to be destroyed by exposure to the air, or which accomplishes the same purpose, a thorough raking into the surface from time to time of the material in which the trenches are cut.

Figure 16 shows the same flush-tank surrounded by a screen of evergreens, *s*, *s*; two systems of sub-surface absorption-drains similar to those shown in Figures 3, 4 and 5; and one system of surface disposal, similar to those shown in Figure 14.

The variation of details, such as the size and location of the flush-tank, the arrangement, location and extent of the surface gutters or barriers, the horizontal trenches, the sub-surface absorption-drains, etc., may be almost infinite, so that the character of the soil, the formation of the surface, the use to which the land is to be put, the necessity for concealment, etc., may be accommodated in all cases.

It may with advantage be repeated here that while this system of disposal seems to be as nearly perfect as is possible in the present state of the art, no such system will withstand neglect. It affords a perfect solution of one of the most difficult and dangerous problems connected with life in districts where sewers are not available, and the completeness of the result to be secured amply compensates for the slight amount of regular attention required.

FOSSIL CORAL. — A new building material, of uncertain origin, but called "fossil coral," is being worked on a small island of the Bay of Suva, Fiji. It is so soft that it can be easily cut into any desired form, but soon hardens when exposed to the air, and acquires the characteristics of fire-brick. — *Invention.*

ENGLISH BYE-WAYS.

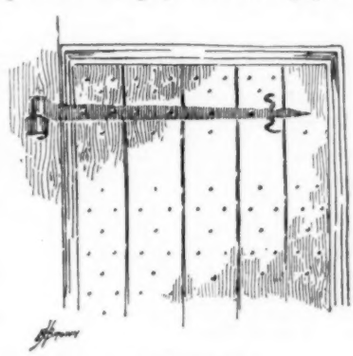
SHREWSBURY.

Shrewsbury Castle.

THE American architect abroad on a holiday trip usually takes a peep at Chester. Who would dare to go home again and say that he had not been to that town, which seems to call aloud to the tourist, "This place is quaint and picturesque, come and look at me?" Then he hurries off to London, stopping perhaps for a day in Shakespeare's country, and after spending a few days in the modern Babylon, hastens away to the Continent as if there were nothing worth seeing in the bye-ways of "Merry England." Sometimes he does not even pay this scant courtesy to the mother country, but passes her by as if she were not worthy of a visit, so much in a hurry he is to hunt the picturesque in Brittany or Flanders. But if he would devote a week to exploring some of the out-of-the-way corners of England, and would stop to visit even one or two of her quaint old cathedral cities, he might find so much to interest him that he would, perhaps, forego somewhat of his Continental trip.

One great charm I have always found in travelling in the English country is that the people one meets are friendly and that I can chat with them and talk to them about their own affairs. There's a homely simplicity about the middle and lower class English people, as you find them in their own country, an easy, good-natured way of living that is peculiarly pleasant and refreshing to one that has been used to the trouble and turmoil of an American city. I mean the English villagers, or the dwellers in the rural towns, not the Cockney, for the man born within the sound of Bow Bells differs but little in character from the man whose haunts are in the Bowery or lower Broadway. Then, too, if one visits England in the early summer, the beautiful bright green of the foliage, the bright colors of the wild flowers and the soft haze in the atmosphere form a picture that cannot readily be forgotten, and that is a perfect delight to the tired city man seeking rest and recreation. But all this is not architecture. Let us hasten off to see what can be found to make it worth our while to delay the journey to the Continent for a few brief days. We'll see Chester, of course, but there's no need for me to describe that, it is almost too hackneyed already.

So this bright morning — for bright days are neither uncommon nor rare in the English springtime — let us take the train on the Great Western Railway for Shrewsbury, forty-two miles away by rail, and almost due south from Chester. I won't describe the journey through the beautiful eastern border of Wales, where we get glimpses of deep ravines, now shooting over a viaduct across the river Dee, and again winding around the wooded hills. Finally, after an interesting ride of an hour and a half the train draws up into the handsome station at Shrewsbury. As we are not going to stop here over night, we leave our grips in the "left-luggage" room and drop into the station restaurant, where we get a fine luncheon of salmon, fresh from the Severn, and then start for a stroll about the town, with our sketch-books in hand, ready to note down any bits that may be of interest and our Kodaks all loaded and eager for prey. This is the town of which Hawthorne wrote: "The streets ascend, and curve about, and intersect each other with the customary irregularity of these old English towns, so that it is quite impossible to go directly to any given point, or for a stranger to find his way to a place which he wishes to reach, though by what seems a

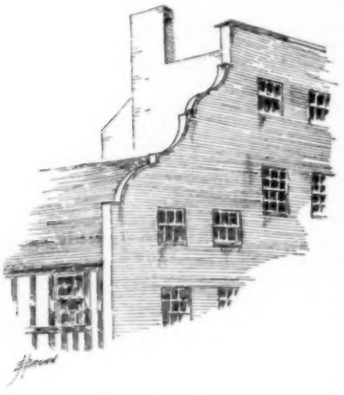


Door, Shrewsbury.

singular good fortune, the sought-for place is always offering itself when least expected."

We scarcely leave the station when Shrewsbury Castle, a grim and gloomy-looking old building, founded by a vassal of William the Conqueror, rises before us like a stern reminder of feudal times, albeit that it is used to-day, and is not a ruin like so many of the old English castles. We have no time to stop to investigate it closely, so snapping a Kodak at it, we follow what seems to be the main street, finding on every side quaint, old, half-timber houses and brick buildings of the early Georgian period that cause us to exclaim with wonder and delight. Chester indeed was interesting, but there everything seemed to be on show and waiting to be admired by the ever-present American tourist. Here, on the contrary, the quaint buildings seem so unobtrusive, quiet and restful, fitting in naturally with the people. Not that Shrewsbury is a sleepy place, it is a bright and bustling town of some 30,000 inhabitants, but the life seems to fit into the surroundings and there is a conspicuous absence of the tourist class so apt to make their presence objectionably felt at Chester. Here on our left is a quaint old gateway, leading under a house, into a court-yard where there are yet other houses. We enter and look around, and as we do so are struck with the massive oak gates that are intended to close this portal and shut out the little court from the outer street, so that its inhabitants form almost a little world by themselves. Heavy wrought-iron strap-hinges, with ends fashioned into rude fleurs-de-lys bind this massive piece of joinery together, and the outer face of it is studded with iron nails. How little would all this show of strength avail against the modern burglar!

Now a shop catches our eye with quaint gable in broken curves, resembling, for all the world, the picturesque gables of Antwerp or Rotterdam. Here we come upon the Church of St. Mary, with its lofty spire, a jumble of architectural styles from Norman to late Perpendicular. In the square off the High Street is the Market-Hall, an interesting building of the Elizabethan period (1595), the hall proper being in the second story, while the first story is open, and forms what might perhaps be termed an arched loggia. As we come to the fine, old, stone bridge across the Severn, whence we get a beautiful panoramic view of the town, we turn to the right and stroll along the banks of the stream reaching in a few moments a pretty little park called the Quarry, with fine lime trees and a pond of water in which various water-plants are growing luxuriantly.



A Gable, Shrewsbury.

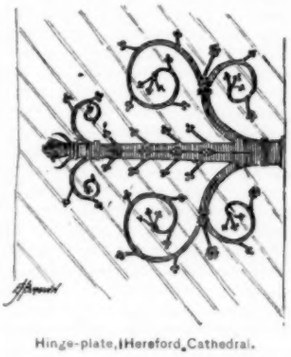
But it is the private houses, and the quaint, old, half-timber shops which attract our attention principally. Entering one of these shops we find a curious plastered ceiling, laid off in square and diamond-shaped panel-work with armorial bearings at the intersections of the mouldings, and traces of the old coloring still visible on the plaster. Red, white and gold seem to have been the colors originally employed, though time has long since dimmed their lustre. The quaint, crooked streets, lined with half-timber houses, tempt us to wander aimlessly about, giving ourselves up to the enjoyment of the moment, and in the abundance of material the sketch-books remain closed. But it would take the pencil of an Abbey or a Pennell to do justice to these crooked old streets, whose perspective is lost in curves, strange to the eye of a dweller in the most rectangular of all of the American cities.

The people, too, interest us, the school-boys with caps, bearing the arms of their school upon the front, the carters in smock-frocks and hob-nailed shoes, and the women with their seemingly utter disregard of the latest fashions, a subject so dear to the feminine heart — be it society damsel or servant girl — on this side of the Atlantic. One thing surprises us. We stop, sketch-book in hand, to note down a sky-line that has struck the fancy: a boy brings out chairs from a neighboring shop and invites us to be seated, then stands respectfully by and watches us as we sketch, speaking only when we ask him questions, though you may be sure we are not backward about doing that. Where do you suppose we would find the average American boy doing that? Some of the older shops are built with the upper story overhanging the street, and many of these, owing to shrinkage and settlement of foundations and timbers, are sadly out of line, which adds undoubtedly to their picturesqueness, but would probably scare an American building-inspector into a "stiff fit."

We feel, as we stroll about the town, as if we could not exhaust the good material in a week's steady sketching, but as we had not foreseen, from the brief mention of Shrewsbury in the guide-book, that such a feast of riches awaited us there, we had planned to go on to Hereford by the afternoon train, and as railway time-tables are imperative, even in this slow-going country where no one ever seems "to hustle," we turn our steps back again toward the station. On our way, we note the Free Library, an institution occupying a fine, old, Classic building in the style of Sir Christopher Wren or Inigo Jones, having a cut-stone basement story, while the principal story is of brick, with engaged Doric pilasters in stone, and a finely proportioned cornice surmounted by a balustrade, ornamented with delicately-fashioned urns. This was at one time the seat of the Grammar School founded by Edward VI, a school which ranks as one of the best in England, and which has had for pupils men of such note as Sir Philip Sidney, Wycherley and Judge Jefferys. The school is now located in the suburb of Kingsland, just across the Severn from the Quarry Park.

HEREFORD.

As we enter Hereford, the old cathedral city, some fifty miles beyond, we are struck with the air of quiet dignity which seems to characterize it, and this is still further impressed upon us as we take the hotel omnibus, in waiting at the station, and are driven to the Green Dragon, one of the old-fashioned hotels that are frequented by the county aristocracy — such a hotel as Major Pendennis might have patronized had he visited Hereford, quiet, dignified and staid, as becomes a hostelry amid such surroundings. Here we are shown, by various winding passages, upstairs and down, to a pleasant room, but, after dressing for dinner, find that we get lost as we try to retrace our steps to the coffee-room, for we discover that the two doors of our room lead to two separate passages and separate staircases, and we have inadvertently taken the wrong one; so back we go and try again, and this time succeed in getting down stairs, where we soon have the satisfaction of seeing spread before us a well-cooked and well-served meal. After an hour or so we feel rested, and start for a stroll through the town in the long spring twilight: it is light until long after nine o'clock in these northern latitudes at this season of the year. Of course, our first thought is for the Cathedral, which stands quiet and peaceful in the midst of the green close, a beautiful monument of the past, and a truly fit offering for man to make to his Creator. The interior, we must wait until the morrow to see, but the beautiful proportions of this majestic and venerable pile, with its great square tower rising proudly over the intersection of the nave and transepts, impress us so that we linger lovingly about, although warned by the fading light that if we wish to see anything of the town before nightfall we must stroll onward. So we wander about the streets, stopping to look at the quaint brick and half-timber houses, ever and anon reaching the banks of the Wye and pausing to gaze on its rapidly flowing waters, then strolling on.

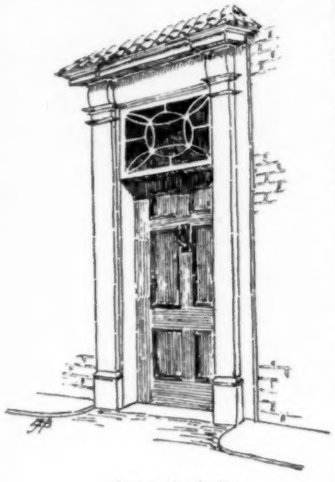


Hinge-plate, Hereford Cathedral.

Entrance to Cloister, Hereford.

The next morning we were up bright and early — that is, early for England, where it is impossible to get breakfast, even in a country hotel, before nine o'clock in the morning unless you give the order for it the night before. Our sketch-books were brought into play before breakfast, however, and a quaint collection of roof lines from some old brick houses on a side street was one of the results of our expedition. While out we took several snap shots with the Kodak at the "Old House," an interesting half-timbered dwelling-house dating from the sixteenth century, which occupies a prominent position in a sort of triangular area at the intersection of three streets. We could not help fancying that it might have been

just such a house as this that Hawthorne had in mind when he wrote the "*House of the Seven Gables*," for here they are, sure enough. The third story overhangs, and is broken by seven dormer-like gables, three each on either of the longer sides, while a broader gable fills up the broad end of the irregular-shaped figure. Under each of the gables is a many-mullioned bay-window, with small leaded panes of glass. The ground-floor is overshadowed by a narrow pent-house roof, which runs round the entire building except where it is broken for the entrance-porch, the barge-board, pediment and lintel of which are excellent examples of Elizabethan wood-carving. This curious building is now used as a bank, so we had no difficulty in gaining admittance to the interior, where we found some very fine old wainscoting and panelled ceilings. After breakfast our first thought of course is the Cathedral. This, though not one of the great cathedrals, in point of size, is still one well worth studying. Started in 1079 it was not finished until 1530, and hence shows an interesting mixture of architectural styles. The heavy Norman nave appears in strong contrast with the Decorated windows and other features of the exterior. The interior shows everywhere traces of the handiwork of Sir Gilbert Scott, who restored the building about 1860. One of the curiosities shown to us by the verger with a great deal of pride is the famous *Hereford Mappa Mundi*, a curious mediæval map of the world as it was known by the monks of the thirteenth century. This bit of ancient geographical lore is hung in its original frame, but carefully preserved by modern doors of oak.



Door at Hereford.

Going out by the south doorway, we enter the cloisters, a fifteenth-century building with a carved wooden roof, which was built to connect the Cathedral with the College of Vicars' Choral, an interesting building of the same period. But the Cathedral is not the only thing worth seeing in Hereford, although the ordinary tourist possibly thinks when he has seen this he has "done" the town. We find subjects for sketches in the houses around the Close, which in their way are quite as interesting. One old doorway from a brick house of the Early Georgian period would be looked upon as typically Colonial, were we to come upon it on the American side of the ocean. From one corner of the Close, leads one of those picturesque and narrow lanes so often found in English towns, bordered by high brick or stone walls, over which hang masses of green foliage, through which the sunlight breaks, giving deep shadows and patches of light and shade in charming contrast.

We follow another narrow winding street with a high wall on one side and tall warehouses on the other, ever and anon pausing to look backward, seeing always the great tower of the Cathedral as a termination of the perspective, until finally we reach the massive bridge across the river Wye, five great stone arches, crossing the rapidly flowing stream. Across the river is a long street bordered with quaint old plastered and half-timbered shops on the one side, and the residences of the town aristocracy, the doctors, the solicitors, and the general well-to-do class of an English Cathedral town on the other. Interesting houses, too, just as if they had stepped out of one of Dickens's or Thackeray's novels, they seem familiar to us, though of a different type from any we are accustomed to at home, or at least in any of the smaller towns where the frame house and saw-mill architecture is the prevalent type. Queer old taverns, we come across now and then, among them the "Red Lion Inn," as its sign painted in large letters upon the plastered wall informs us, a low, picturesque old place with three gables, and windows and doors spaced along the walls just as they may have happened to come.

A Lane, Hereford.

Before we leave Hereford we follow Widemarsh Street, until we come to the Coningsby Hospital, a sort of almshouse or asylum for old soldiers and servants. It is a neat little building, or rather group of buildings, dating from early in the seventeenth century, and grouped around a court-yard in the centre of which is an exceedingly picturesque old stone water-fountain and pump-trough. One of the old pensioners, in a red coat, takes us round, and shows us the chapel with evident pride. The hospital occupies the site of an old Commandery of Knights Templar, and is also known as the Black Cross Hospital from the ruins of a priory of Black Friars in the garden. The most striking one that the guide points out to us is an old preaching cross, which is reached by several steps. We would like to stay to see the old pensioners at the morning service, which is just about to begin, but time is pressing us, and we hasten back, through picturesque streets, with here and there buildings of modern type in them, showing that Hereford is by no means a dead place, buried altogether in the past, in order to reach the hospitable Green Dragon in time to gather together our luggage, for the train which is to take us farther on into these English bye-ways, these out-of-the-way nooks that the average American tourist fails to penetrate.

EDWARD HURST BROWN.

BRUNELLESCHI'S AID TO ITALIAN ARCHITECTURE.

Font. Dalby Church, Sweden.

THE foundations for Santa Maria del Fiore were laid in Florence in 1298, on Christmas Day, and the edifice is one of great interest and instructiveness in the history of architecture, and gave the idea for two grand architectural monuments, St. Peter's at Rome and St. Paul's at London. Many years elapsed, however, after laying the foundations before the building began to assume its definite style and character. Its superintendence had successively been entrusted to many architects of eminence, among whom were Giotto, Taddeo Gaddi, Andrea Orgagna and Filippo di Lorenzo; but its completion was reserved for the great Brunelleschi, the first of the modern masters who exercised any powers of originality in the formation of the Italian school of architecture.

The revival of the Classic orders in practice is, indeed, so connected with the life of Brunelleschi that a slight sketch of his studies and employments will throw a considerable degree of light upon the history of the art of his time. Brunelleschi was born in the year 1377, the son of a notary in easy circumstances, in the city of Florence. It was the intention of the father that his son should succeed him in his own profession, but the inclination of the youth bent so strongly toward the arts that his father yielded to it, though not without some reluctance. He accordingly placed the youth with a goldsmith, an occupation at that time so nearly connected with sculpture that even the most accomplished artists of the time applied themselves to the chasing and casting of their ornamental designs in the precious metals. The young man soon attained much skill in his new profession, and promised to become a clever, if not a distinguished sculptor.

But in this line of art it would appear that he had many rivals, and, naturally ambitious to be first in the art to which he should apply his powers, he determined to devote himself entirely to architecture, in which the field was then comparatively unoccupied. In company with his friend, Donatello, he therefore visited Rome, and applied himself with the highest ardor and diligence to the study of the ruins in the Eternal City. He became every day more and more impressed with the dignity of his art, and more enthusiastic in its study and practice. It was while in Rome that he began to meditate upon the scheme of uniting the four arms of the Church of Santa Maria del Fiore of Florence by a grand cupola rising over their intersection, a project which, until his time, was considered almost impossible. He appears, indeed, to have fully matured his plans at Rome, though it is stated that he never communicated his thoughts on the subject even to his friend and companion. During his residence there, he also measured and settled in his mind the parts and proportions of the orders of ancient architecture from the Classic examples which the city afforded, and in regard to which no regular rules had survived the decay of the system.

The science of construction, as practised by the ancients, also engaged his attention, and from them, observes Mr. Gwilt, he learned that perfect accordance which always exists between what is useful and what is beautiful, both of which (in the works of the of the ancients) are made reciprocally subordinate to each other. There, also, he discovered the principles of that nice equilibrium of the masonry which is equally necessary both for the beauty and solidity of an edifice. Having thus qualified himself by these preparatory studies for the difficulties of the great work in which he sought to engage, he returned to Florence in the year 1407, and the thirtieth year of his age. It was in the course of this same year that the citizens of Florence called together an assembly of architects and engineers to deliberate upon the various plans which had been suggested for finishing the Duomo, as the Church of St. Mary is usually called, a name given to the cathedrals of the principal cities of Italy.

To this assembly Brunelleschi was invited, and, bringing forward the project which he had so long had at heart, he gave his advice for raising the drum of the base, or the attic story, upon which the cupola should be placed. It would be very natural to suppose that the jealousies of so many rivals materially impeded his project, and such we accordingly find the fact to be, as recorded in the history of his career. Even when the commission was at length confided to him, it was not without the disgraceful assignment of Lorenzo Ghiberti as a colleague, a man every way his inferior both in talent and knowledge, and whose constant interference materially retarded the execution of Brunelleschi's designs. Finding himself thus encumbered, our architect perceived that it would be necessary to take a bold and independent stand, and to prove the incapacity of his rivals, no less than his own professional knowledge, which he soon made so manifest as to procure the dismission of Ghiberti, leaving him free to execute his own superior designs without hindrance from any quarter. The work went on slowly but surely, and before his death he had the satisfaction to see the great dome or cupola finished, with the exception of the exterior of the attic story on which it stands and of the lantern, which crowns the highest summit of the structure. For the completion of both these portions, he left behind him all the necessary drawings, which, however, through some unaccountable carelessness, were subsequently lost. One of the directions he left particularly insisted upon the necessity of following the model he had prepared for the lantern, and that it was essential that it should be constructed of large blocks of marble, so as to prevent the cupola from opening; but the lantern and the exterior of the drum were completed from the designs of other architects, his successors.

This singular edifice differs very essentially from the Gothic buildings to which it immediately succeeded. Instead of a high, square, central tower over the intersection of the nave and transepts, rises a vast dome, which is octagonal on plan, and is formed by two portions, an *inner* and *outer* shell. The two are, however, united in one solid body of masonry at the foot. It is 138 feet 6 inches in diameter at the springing, which, of course, is the widest part, and from the cornice of the attic, on which it rests, to the base of the lantern it is about 133 feet. Before it, nothing had appeared in the whole history of architecture with which it could be fairly put in comparison. It was a novel and highly original conception. The domes of St. Mark's at Venice and the one at Pisa are far below it in grandeur and simplicity of construction. In size, it only yields to St. Peter's at Rome, for which, it is probable, it served as a model to Michael Angelo. It is well known, at least, that his admiration of it was so great that he used to say that "to *imitate* it was indeed difficult, to surpass it, impossible." And in his own stupendous dome of St. Peter's the same method of construction is followed, both the inner and outer domes being connected in one mass at their springing. It might well be supposed that such a work as the great Church of St. Mary's was sufficient to occupy the whole time and engage all the thoughts of a single artist, but this was not the case with Brunelleschi. The Duke Filippo Maria engaged him on the fortifications at Milan, and, besides, he was employed on several other military works to the great acceptance of the Government, a proof of his singular industry and of the great diversity of talent which he unquestionably possessed. From the extensive employ, therefore, which he enjoyed, not only in Florence, but in many other parts of Italy, and from the widespread reputation which he acquired, it is quite certain that he infused a new taste into its buildings, and that we are to look to him as the originator of that elegant mode of architecture which has come down to us under the title of the Italian style.

Brunelleschi died in the year 1444, and was buried in the noble church which he had raised. But he left behind him a number of pupils, who spread throughout Italy the effects of the vast change that had been begun by their master. A taste was excited for the architecture of ancient Rome, its principles were subjected to critical study, and, in a short space of time, as if the matter (it has been observed) had been one of previous arrangement between them, the illustrious family of the Medici, the Dukes of Milan and many of the princes and nobility of the country contended who should most patronize its professors, and extend a generous encouragement to the art. But the Italian School, although it finally appropriated and adapted the ancient Roman orders to comparatively modern purposes — still for a long time continued to engraft them upon, and amalgamate them with, features which were essentially Gothic. This clearly appears in many buildings which still remain in Florence, Pisa, Sienna and other Italian cities.

We must conclude that Brunelleschi made a strong effort to emancipate himself from the anomalies created by the mixture of two such discordant styles, and from what appears in his wonderful dome of St. Mary's it is evident that he, in some measure, succeeded. Still there continued a lingering fondness for the mixture, in the works of his successors, as evinced in the Riccardi and Strozzi palaces, and in some other structures of the same period. They appear very naturally, to have had great difficulty in shaking off the fascinations of the Gothic manner.

But yet, notwithstanding this propensity, when the architects of this period came to the crowning members of their edifices, they placed on them such massive, deep and finely composed cornices, that the other parts became of inferior importance, and are subdued and overpowered by the expression which is thus imparted to the whole structure. In this portion of their designs, however feeble or trivial the others may be, it is evident that the early Italian architects were influenced by those feelings of breadth and unity that gave so much value to the best works of the ancients.

Though that wonderful artist, Michael Angelo, was a Florentine, his works do not belong to the period during which the Florentine school flourished, a period which commenced with the practice of Brunelleschi, and extended from the beginning of the fifteenth to the beginning of the seventeenth century. G.

BETTER WOOD CONSTRUCTION.[1] — III.

Font from Tvarreo Church, Sweden.

THE wrought-iron stirrups commonly used are open to serious objections, among which are the small bearing given to the joist and its change of level due to shrinkage. An unseasoned twelve-inch timber will sometimes shrink one-half inch in drying, which is a serious matter where it is desired to have the floor-timbers flush on top. To overcome this difficulty to a degree, to give a better bearing to the joist and to make a generally neater and better job, I use the cast-iron bearing indicated in Figure 9.

This innovation will be opposed by people who are averse to the mortise, but it may be made so as not to weaken the girder, if proper skill is used.

Let Figure 10 represent the section of a timber to be submitted to transverse strain. Its sides might be deeply grooved as dotted and it would be better able to bear a load than before; for if the amount of wood retained at *b b* and *c c* were barely such that less work were required of the fibres at these levels than at *a a*, when the timber is loaded, it would be able to carry a working-load greater by so much as the weight of the inert material taken from itself. Such a reduction of the size of the timber would be analogous to "training down" for atheletic contests.

Now it is contemplated in Figure 9 to cut the mortise so as to leave fibres which shall not be strained under loads more than are the upper and lower fibres of the beam.

Under the head of "Slow Transmission of Heat," the cost, etc., of the solid construction shown in Figure 1 have been considered. It will be noted that a judicious use of building-paper would render this very tight, and that the arrangement is very strong and "slow burning."[2]

Figure 1 shows the solid construction of outer walls for frame buildings in a sort of perspective, and Figure 7 shows some additional details with another thickness of boards on the inside for further warmth and stiffness. If people who look upon this as an extravagant use of lumber will take the trouble to compare the cost per cubic foot in the building of different materials, they will find structural lumber to be about the cheapest thing used, and that such a comparison will do much to encourage its intelligent use.

Mr. Edward Atkinson has caused several plates to be published, suggesting methods of substituting solid-wood construction, in whole or in part, for the "balloon frame" in such buildings as dwellings, hospitals, etc. While these contain valuable hints they also retain some of the more unfortunate traditions of the common ways of building. Recognizing the difficulty, for instance, of using the "mill floor" above the first floor of dwellings, he admits the usual thin joists, but cross-furs to support the laths and plaster of the first-story ceiling. Yet cross-furring is among the most effective of all the devices which secure the rapid spread of fire in common construction; while the cases are rare where a good basis for plastering cannot be secured without it at a less cost than with it.

Another of the traditions of ordinary building methods which these plates retain is the furring about chimneys. This tradition is local, and while New England architects use it to a large extent, there are others, who, "brought up" where it was not the practice, have always managed just as well without it, saving their clients the cost, the space and the added fire-risk.

As in practice, no end of trouble comes from the shrinkage of lumber in a direction across the grain, the structural timbering in the accompanying sketches has been so arranged as to eliminate this difficulty to a degree. In Figure 7, the sill is placed flatwise and rebated, for the double purpose of making easy nailing for the workmen and to give a minimum of horizontal wood under the vertical planking. In Figure 9, the oak cap or bolster shown on the post may be quite thin and still be strong enough to perform its work, because owing to its elasticity it ultimately breaks under a shearing strain. If reasonably dry and not made unnecessarily thick, the objection of undue shrinkage will not apply to this construction.

In Figure 8, the block or corbel placed under the large wooden

[1] Continued from No. 845, page 157.

[2] In Western New York, near Rochester, stands a frame-house, probably sixty or seventy years old. To a frame of heavy hewn sills, posts and plates, one and one-half inch planks are nailed vertically. On the outside, ordinary clapboards are laid in the usual manner, and to the inside of the planks is nailed the old-fashioned split and spread thin boards on which plaster was laid before the days of sawn laths. Plastering completed the thickness of the outer wall. Building-paper was unused and unknown in those days. This farm-house is not the only one of the kind in the region, although the builder of it, was so far as known, alone in using that method in those parts, he having brought it from the valley of the Connecticut, in the State of the same name, where it was the common thing.

joist is for the purpose of preventing much of the change of level that would occur if it were simply framed into the wood casings of the I-beams. For such cases as second floors of schools where this combination is used, it might be sufficient to simply frame into the casing of the I-beam, which should be reasonably dry. The top of the casing and joists should be left slightly above the I-beam, however, as shown in the figure.

In general, the substitution of plank outer walls and partitions for the usual studding will lessen the evil of plaster cracks which follow the angles of buildings built with studs.

Plastering suffers much in density and strength when applied on laths which span the spaces between studs and joists, because these laths yield to the pressure of the plasterer's tools, and do not permit him to pack the materials of the mortar so solidly as when working on solid surfaces. For this reason plastering applied on laths separated from a backing of plank by thin furring-strips, permitting the "clinches" to lay against the plank, as in the roof, Figure 2, or on wire-lathing fastened to the planks with but a small intervening space, will be much firmer and stronger than when applied to laths not so backed by solid material.

The grooved sheathing-lath is shown in several of the figures; when of stuff not wider than four inches, and not too dry, it makes an excellent basis for good solid plastering.

Systems of lathing which give a solid backing for plastering not only retard the spread of fire, but they reduce the damage from blows to a minimum.

In many situations where it is common to use interior wood-finish, a hard plaster on a solid backing may be substituted with a saving of cost and reduction of the fire-risk. In a slow-burning school-house, for instance, much of the wainscot might be profitably replaced by some of the hard plasters which have sulphate of lime as the cementing base; and the slow-burning idea suggests substituting plaster-finish about windows for the wood-casings as shown in Figure 12.

Judged from the standpoint of common roof-constructions the roofs shown in Figures 2 and 5 would be called too costly. They, however, involve in general less supporting material, and in the school-house of which Figure 2 is a detail, the usual ceiling of the second story and a considerable height of side walls were saved. This slow-burning roof requires greater thickness of roof-boards, but when these, in the panels between the large timbers, are properly reinforced with an arrangement of plastering which admits, as in Figure 2, of only small and disconnected spaces, the saving to the fuel-pile is very marked. The lathing in such cases should be very open, so that the plaster will everywhere clinch against the backing.

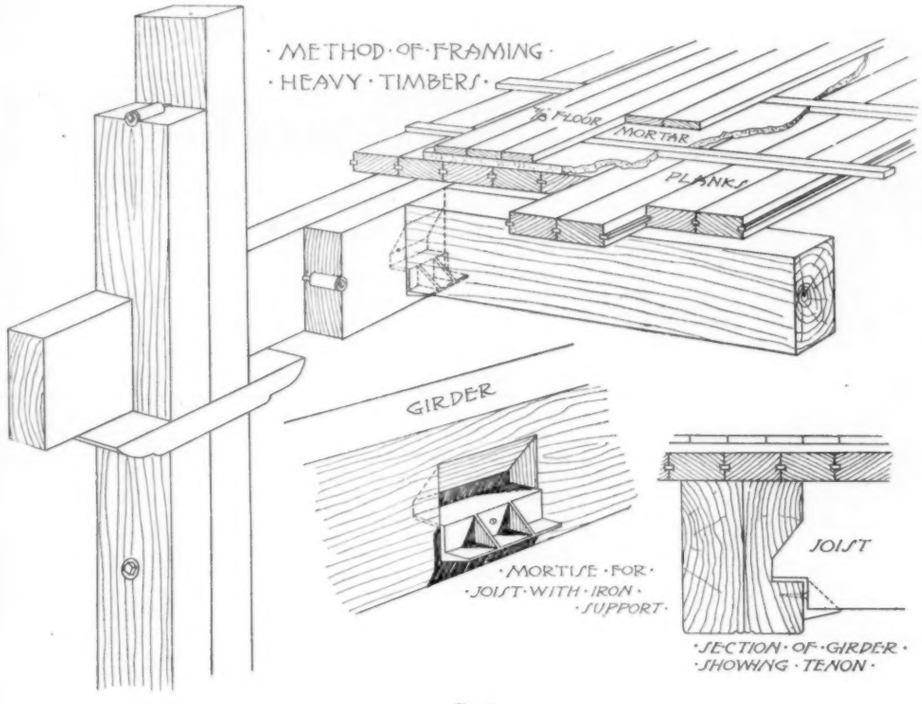


Fig. 9.

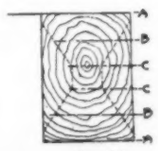


Fig. 10.

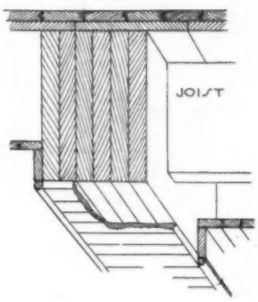


Fig. 11.

Fig. 13.

DECAYING TIMBER.

Buildings are not supposed to be so constructed as to be subject to decay from moisture direct. The woodwork is assumed not to be in contact with the ground, and the roofs and siding are supposed to convey the water of storms perfectly, so that the structural woodwork is left dry. However, the diseases commonly grouped under the name of "dry-rot" are wide-spread, and invade buildings in nearly all climates.

The evidence is so conflicting on the subject of the proper treatment of this disease that one's notions after reading the leading writings on the subject are apt to be more confused than ever. Consistent theories of its cause even are by no means common, but there seems to be a tendency of late to attribute its presence to one or all of the following conditions:

a. Imperfectly seasoned timber.

b. Imperfect circulation of air about the timber.

c. The presence of fungi, which in most, if not in all cases, begin their destructive work at the surface.

d. The disease is further hastened by the presence of sap in the wood. Trees cut at seasons when the circulation is dormant, or after having been girdled for a time, are less susceptible to the disease, the wood being freer from sap. Some few varieties of timber are exempt, but these are rarely available for building.

The testimony in a great majority of cases is only consistent with the theory that spores of the various fungi are deposited on the wrought surface of timber, which, being poorly seasoned and placed in confined and unventilated situations, combine the conditions necessary to the development of the plant.

The sap of the wood is a favorite food of the fungi.

Britton[1] advances the idea that the spores falling upon the ground are taken by the roots into the circulation of and deposited in the tree, remaining in the timber ready to germinate at a favorable opportunity. Such a course is so unusual in nature that the theory can only be accepted if accompanied by very good proofs. Fortunately for building interests these proofs do not exist.

Britton gives a few examples of timber rotting upon the inside and leaving a sound shell upon the outside, and almost in the same breath insists that these fungi begin their work at the surface. In the one or more instances of wood cited as rotten within and sound without, there is no good reason why the infection may not have proceeded from deposits of the spores in the pith of timbers, in knot-holes or in "season-cracks," which from some cause became closed from the air.

Let Figure 13 represent the section of a timber that has been partially seasoned at the time of placing in the building, so that the outer surfaces were more or less opened by the "season-cracks." Germs of the fungi may have lodged in the upper one which would be closed from the air by the flooring.

Analogous to the destruction that would follow in the above case, is that which compelled the removal of a large number of girders in a Minneapolis wholesale building some years since. These girders were made of joists as shown in Figure 11. For appearance's sake a large percentage of these were cased with planed and matched stuff. This on the underside of the girder, was in short pieces crosswise. A timely discovery of the condition of one girder thus cased, led to an examination of all. The girders not cased were in every instance sound, while those cased were nearly all so badly affected as to require renewal.

That all surfaces of timber are infected with the germs of these

[1] T. A. Britton: "*Dry-rot in Timber.*" London: E. & F. Spon, 1875.

fungi at the time of using is not to be supposed. Some climates are doubtless pretty free from them at all times owing to excessive dryness. Periods of immunity may occur in places commonly subject to the pest.

Where the disease is prevalent it may be escaped in great measure by a method of building that leaves the timbers well aired, and by disinfecting such parts as are not aired. The solid-wood construction without concealed spaces is, for this reason, a much safer way to build where dry-rot is prevalent.

Viollet-le-Duc stated that in parts of France it was dangerous to lath and plaster old open-timbered ceilings, as decay had been known to set in afterward, destroying the timbers.

Preventive devices without number have been used, some very efficient under all circumstances, some of indifferent value and some worthless. The more expensive, kyanizing, creosoting, etc., need not be considered here, as they may be readily referred to in standard works and are generally out of the question, in common building operations. What is wanted is some cheap and easily applied remedy that may be used on the premises, in cases where the timber is neither seasoned, nor of a variety exempt from taint.

Artificial seasoning for structural timbers is usually out of the question. There may, however, be cases where the ends of timbers may conveniently be treated by heat: here a good steaming or boiling in fresh water would destroy any germs and the sappy principles in the wood, the presence of which seems necessary to the development of the fungi.

Steaming is a most excellent way of seasoning wood for joiner-work, as wood dries rapidly after a thorough steaming, and once dry

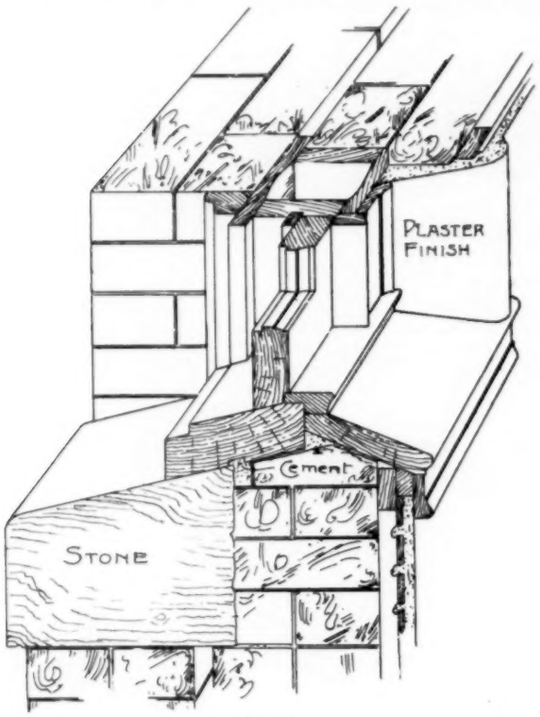


Fig. 12.

assumes a degree of permanency not reached by most hot-air drying processes.

Salt water has been shown to be an antidote to dry-rot, many instances being recorded of vessels once infected, which after sinking in salt water and being again raised were found to be cured. The use of salt about timbers in building cannot be recommended, however, as it has a tendency to accumulate moisture from the air and to corrode iron.

There is much conflicting testimony about the effect of quick-lime on lumber. Mr. Woodbury in "*Mill Construction*" recommends lime-mortar on the floor-planking of factories, etc., (under the finished flooring) as a fire-resisting material and as an aid in preserving the woodwork with which it is in contact. He also, with what looks a good deal like inconsistency, recommends that an air-space be left all around the ends of timbers laid in walls to prevent dry-rot.

I have seen several instances cited of ends of timbers decaying in walls; but while I have known of several cases where they have become infected where framed together, as in trusses; and where timber struts have set in iron angle-blocks, of box-like form; yet I have never been able myself to find any well-authenticated case of dry-rot in timber placed in contact with fresh lime-mortar. My own practice has never brought me in contact with conditions so favorable for the development of dry-rot as are to be found in some climates, so that my convictions might vanish under other surroundings, but I firmly believe that, under the conditions in which I have worked, if a thin hot wash of freshly slaked quick-lime had been applied freely to parts of timbers to be placed where the air was to be excluded, it would have prevented the later development of the fungi.

If, for instance, the joists composing the girder (Fig. 11) had been thoroughly coated with a thin "white-wash" of slaked-lime applied hot, I think the spores with which the surfaces were infected would have been destroyed and the subsequent decay would not have appeared, although the joists were not seasoned sufficiently. The lime is furthermore non-corrosive, does not burn nor have an offensive smell.

Petroleum is said to be a valuable antiseptic in case of dry-rot. The cases given probably refer to the use of the crude oil, although not so stated. Its usefulness in buildings is, however, somewhat restricted by its inflammability and bad smell.

Preparations of creosote, applied under pressure to dry timber, have long been perhaps the prime favorites among wood preservatives: but for the simple operations of building it is not practical to use them in that way. If, however, such surfaces of timbers as are to be closed in from the air were well coated with creosote when about to be placed in the building, I presume they would remain sound. The objections of the inflammability and smell apply to some extent to this as well as to petroleum.

Writers on the subject give recipes without number, not neglecting the potent "quarters" of the moon. People who would be the last to take pains to trace the history of any given lot of lumber from the time of its cutting to its final using, are, as a matter of course, readiest in their assurance that lumber cut in such a "quarter" of the moon may be depended on to resist decay or shrinkage; or to be subject to these as the case may be.

F. G. Corser.

ILLUSTRATIONS

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

HOUSE OF GUIDO PLESSNER, ESQ., LINCOLN PLACE AND PLAZA STREET, BROOKLYN, N. Y. MR. FRANK FREEMAN, ARCHITECT, NEW YORK, N. Y.

[Gelatine Print.]

NEW POST-OFFICE BUILDING, WASHINGTON, D. C. MR. W. J. EDBROOKE, SUPERVISING ARCHITECT, TREASURY DEPARTMENT.

THIS building is to be erected for the accommodation of the Washington City Post-office, which will occupy the first floor, and all that part of the basement not required for heating-apparatus or elevator and electric-light plant. It is also likely that a large part, or perhaps, the whole of the second story will be required for offices connected with the City Post-office, and in the topmost story sitting-room, dormitory and other accommodations will be provided for the use of Railway Postal clerks.

The Act of Congress authorizing the erection of the building provided that it should be eight stories in height, but no assignment has yet been made of the large number of office-rooms which will be available in the upper stories. The building will occupy the entire block (Square 323) bounded by Pennsylvania Avenue and D Street on the north, by 11th Street on the east, by 12th Street on the west, and by C Street on the south. The main front on Pennsylvania Avenue will be 200 feet in length, and the depth of the building to C Street, will be about 300 feet. The elevators and staircases for access to the upper stories, will be near the entrances on 11th and 12th Street fronts. The main post-office entrance is on the Pennsylvania Avenue front, and the entrance on C Street will be used entirely by the City Post-office for the receipt and dispatch of mail. The height of the tower from the sidewalk to the finial is about 300 feet; the clock-faces, 20 feet in diameter, are about 250 feet above the pavement. The width of the tower is 40 feet and it will be visible from the Capitol along the entire length of Pennsylvania Avenue, and from the greater portion of the various sections of the city. The material used for the exterior will probably be granite. Over the entrance arches of the main front, a projecting balcony, over each, above the second story, will form supporting pedestals for groups of statuary emblematic of the postal service, the coat-of-arms of the United States, etc. The spandrels of the arches at all the entrances will be enriched with carved ornaments, but there will be but little other carved-work on the exterior of the building. The general plan of the building is that of a series of offices around an interior court. The entire central portion above the second story will be an open light-well about 100 by 200 feet in dimensions, roofed over with ornamental iron trusses and covered with glass skylight, around which will be a clear story of moderate height furnished with movable sash. At the level of each story the corridors extending around the entire court and affording access to the various offices, will be floored with glass. These corridors are supported by a colonnade and relieved by ornamental wrought-iron work. The main body of the post-office working-room is immediately under this light-well, and will be protected by a curved glass

ceiling supported by elliptical ornamental trusses which spring from columns independent of those that support the galleries. The spring of these trusses will be at a level somewhat below the first-story ceiling, which admits a series of openings above the post-office screen, which will give direct light and ventilation to the public lobby of the first story. The corridor partitions of all the first-floor offices will be of glass, and as glass is used, as before stated, for the ceiling, it is believed that this lobby will be well lighted.

The following are the main features of the arrangement of the post-office floor: On the east of the front entrance will be the public and private offices of the Postmaster and Assistant Postmaster, with necessary toilet-rooms, vaults, etc. Between these offices and the 11th Street or east entrance will be three elevators and a commodious staircase. Beyond the entrance is placed the Cashier's office and other subordinate departments. On the west of the principal entrance, extending on 12th Street to the staircase and elevators on that side of the building is located the money-order office, with vaults, toilet-rooms, etc. Beyond the 12th Street entrance is placed the Registry Division with its public lobby. South of the Registry Division are vaults, toilet-rooms, etc., and the southwest corner of the building is occupied by the apartment for accommodation of mail for both Houses of Congress. The main lobby between the offices heretofore enumerated and the main post-office working-room is 15 feet in width. The work-room of the office has an area of over 34,000 square feet. Each floor above the first story will have about 20,000 square feet of actual office space, exclusive of corridors, vaults, toilet-rooms, etc.

PEOPLE'S SLAUGHTER-HOUSE AND REFRIGERATING CO., NEW ORLEANS, LA. MESSRS. J. GRAHAM GLOVER, ARCHITECT, HENRY CLAY CARREL, ASSOCIATE, BROOKLYN, N. Y.

THESE plans show the use to which the refrigerator of the present day is put for the preservation of meat. The subject treated is a stock-yard and slaughter-house and sales-room for a local trade, as well as for shipping by refrigerator-cars. This plant is contemplated to be erected in the city of New Orleans, on the Mississippi River, but, with a few changes, could be used in a colder climate. It is fitted out with all the latest scientific and sanitary appliances used for handling the stock in the best manner, and housing them to the best advantage in the stock-yards and killing them in the slaughter-houses.

But the most interesting and most important part of the plant is the several stages of cooling to which the meat is subjected before it is in shape to keep any length of time or to be used at once. The plant is planned to allow the increasing of the capacity by the simple addition of adjoining buildings, without in the least interfering with the present arrangements of the slaughter-houses and refrigerators; space being left in the engine-room for an additional refrigerating-machine and brine-tanks. The last named is the secret of the success of the business of preparing refrigerated meat. Ice itself is not used at all, but the slaughter-houses, the chill-rooms, the storage and sales rooms are so supplied with pipes from the refrigerating-machine as to allow these several rooms to be kept at the several necessary temperatures. The meat, as it comes from the killing-beds, is allowed to stand a certain length of time, in accordance with temperature of atmosphere, after which it is placed in the cooling-boxes or chill-rooms to remove the animal heat It is then taken to the wholesale storerooms, which are kept at a temperature allowing it to be preserved for an almost indefinite length of time if so desired. From the storerooms (in which meat hangs very close together) it is removed to the retail storerooms or show-rooms, where it hangs on each side of an alley, down which the salesman and purchaser walk to inspect the meat. After the purchase, the beef, mutton, lamb, pork or veal is taken off the show-tracks, hung on the delivery-track and sent out to the sales-room, where, after being weighed, it is removed by buyer, sent back to the refrigerator for temporary storage, or shipped in the refrigerator-cars. During all this progress, from the killing-beds in the slaughter-house to the buyer's wagon or cars, the meat is suspended from an overhead single-track railroad, hung to hooks on rollers, which travel the overhead tracks as shown. The tracks are continued from the beds out over the scales and down to the corner doors and into the several refrigerators, with numerous switches, branches, cut-outs, etc., needed to move the meat without lifting it by hand. The slaughter-houses are fitted up with exhaust-fans for mechanical ventilation, to assist the natural ventilation in very hot weather. They have water-tight floors, separate pipes for blood and waste, a platform, up which the offal is wheeled and dumped into a car, and then it travels on the railroad tracks to the rendering house, which is well removed from the refrigerators. The abattoirs have improved catch-pens, power from the engine in the power-house, abundance of light and ventilation from side windows through slat headlights and turret or monitor skylights. The refrigerators are insulated with asphaltum sheathing-paper and $\frac{7}{8}$″ tongued and grooved boards, forming a series of air-spaces, the doors being some 6″ or 8″ thick, with air-spaces and rubber on edges, and the windows having four sashes, all being as near to air-tight as possible.

An important feature of the plant is the fact of its being built on the slow-burning construction principle. That is, the first floor is 5″ or 6″ thick and rests on girders about eight or nine feet apart, the roof being formed the same way, with 3″ or 4″ plank and girders about ten feet apart. The advantages of this method of building are many, chief among which is the fact of there being no enclosed spaces for the harboring of vermin as in the ordinary construction, and the rates of insurance being greatly in its favor as is shown by the rates on the mills built in this manner. The particular benefit of this timber flooring in refrigerators is not so much the reduction of insurance which, of course, is low from the nature of the business, and the use of electric-lights, but because by using this flooring the hangers by which the tracks are supported can be placed in any spot, regardless of the beams or girders; whereas the old method of securing the hangers was to locate the floor-joists with reference especially to the tracks, and in making the necessary curves and switches this was a very difficult task. This plant is arranged with the view of having the business centre at the office-building, on each side of which are the sales-rooms, one for beef and one for small stock (meaning mutton, lamb, veal and pork), each being kept in separate departments. The office-building, also built on the slow-burning theory, is a very substantial structure and has in the upper portion a large tank, supplied from a pump in the power-house and having pipes extending in every direction to supply the several fixtures in the usual way and out to the troughs in stock-yards and to the slaughter-houses, with large fire-plugs and hose-pipe at suitable spots for a fire-guard as well. The tank-house is thoroughly ventilated by tower-house as shown. The plant is supplied with a large power-house containing the several pumps, dynamo, engine, refrigerating-machines and brine-tanks. Adjoining is the chimney-stack and boiler-room, with coal-sheds attached. The rendering-house and granary stand on the railroad track and the whole plant is enclosed with a stockade, except where the main buildings run out to the street-line. These last are designed in a style of architecture very suitable to the particular locality, being an adaptation of Spanish Renaissance, and taken as a whole, make a pleasing impression. The architect has made a special study of this class of buildings for years, and believes that he has succeeded in combining a satisfactory exterior with an interior in which are combined special features that are very necessary in the business. A business, by the way, which in the good old times was relegated to the most out-of-the-way place, in any old tumbled-down building, in every community, and to be shunned because of the supposed necessity of the accompanying filth and odors. But, as now conducted in the most improved slaughter-houses, it is obliged to be as cleanly as any other producing industry. The Government has inspectors to pass on every animal killed and tag all meat before it can be exposed for sale, and the competition in this business, as in all others, compels the men in it to use every effort to produce the best results, which means good, wholesome meat prepared with the cleanest possible surroundings and put in the most attractive shape.

DETAILS OF SEWAGE DISPOSAL AT ISOLATED HOUSES.

SEE article elsewhere in this issue.

[Additional Illustrations in the International Edition.]

THE GENERALSTABSAMT, BERLIN.

[Gelatine Print.]

DETAILS OF THE SAME.

[Gelatine Print.]

A SIXTEENTH-CENTURY BEDSTEAD.

(Copper-plate Engraving.)

JAMES STREET, BUCKINGHAM GATE, LONDON, S. W., ENG. MR. R. T. BLOOMFIELD, M. A., ARCHITECT.

COMO, FROM THE LAKE.

COMO must be interesting to many youthful Englishmen, because it was selected as the most fitting spot in all Europe in which to erect the ideal palace which Claude Melnotte proposed as a shrine for the "Lady of Lyons." But it is not necessary to have recourse to a romantic play to gain interest for the place. Both on account of its architecture and history Como is interesting, and although he could only comprise in his drawing a small part of the lovely scene with which all travellers are familiar, Prout was able to combine many interesting features both of a natural and artistic kind.

HOUSE AT DEGANWY, NORTH WALES. MR. FRANK W. MEE, MANCHESTER, ENG., ARCHITECT.

THIS house has been built for Mrs. Moon, of Llandudno, at the mouth of the River Conway, and some of the most charming views in North Wales are obtained from it. On the left it commands a view of Conway Castle and the old town of Conway, and in front looks right across the estuary of the river on to Puffin Island, while on its right it has the Great Orme's Head. It is built of local rubble,

with Ruabon brick facings, the upper faced with pebble-dashed cement and the gables filled-in with timber framing. The roofs are covered with red Ruabon tiles.

CITY OF OXFORD NEW MUNICIPAL BUILDINGS. MR. THOMAS R. RICHARDS, ARCHITECT.

The elevation given is that of the principal front facing St. Aldate's Street. It has been the author's endeavor to design a building dignified and picturesque, in contrast, as regards style, with the older work of the city so worthy our admiration, this the better to distinguish municipal from ecclesiastical and scholastic surroundings, and it was thought more modern spirit and feeling would be appropriate to the work in hand, with its greater freedom of treatment.

The features of the design grow from the plans, the various masses indicating the principal subdivisions of the structure. The tower improves the general perspective effect, and serves to emphasize the principal entrance, and for other useful purposes. Stone is the material selected for the fronts.

The arrangement of the various departments is shown on the plans, viz, municipal offices (including council-chamber, mayor's apartments, etc.), town-hall and concert-room, public-library, requirements for administration of justice (including sessions court) and accommodation for police.

The areas of the various rooms are of the full size required in instructions, and on the floors desired. There is a fall of nearly six feet in the level of the ground in the length of the front illustrated, so that on ground-floor the library is placed at a lower level than the municipal offices, as are also the police quarters. The first floor is on the same level throughout, except the sessions court, with its adjuncts, which are lower. The buildings have good frontage to two streets, and balconies open on each, which would doubtless be found useful at times to address meetings from.

The library occupies the corner at junction of St. Aldate's and Blue Boar Streets, and is in itself complete, with news-room, reference and lending libraries, reading-rooms, etc., and its own special entrance, arranged for working under the Free Libraries Act. The rooms are lofty and permit of galleries round.

The principal entrance, fourteen feet wide by fifteen feet high (from floor level), is situated in St. Aldate's Street. It leads direct to the hall and principal staircase, and thence to the town-hall and concert-room, council-chamber and assembly-room, situated on first floor, and to the committee, aldermen's and mayor's rooms, the whole forming a fine suite of apartments, with roomy landings, corridors and ante-rooms. The principal staircase is of ample dimensions, lighted from above with large lantern. Close at foot is the hall-porter's room, opposite main entrance. For the service of these rooms there is also a subsidiary staircase. The first floor of library could be added to the suite of apartments just referred to for any special occasion.

The dimensions of the town-hall are one hundred and ten feet by fifty-five feet, and forty feet high. It has shallow galleries round three sides, and raised platform with proscenium at one end, and dressing-rooms under platform. The hall is lighted with windows at one side and end above gallery, also by roof lights. In addition to the entrances to the town-hall in St. Aldate's Street there are two others in Blue Boar Street, each with a special staircase to the hall. Ample cloak-room and lavatory accommodation is provided at both street entrances on ground and first floors. Good service-rooms in connection with the kitchens, etc., in basement, with lifts, etc., from same, adjoin town-hall and assembly-room. The council-chamber is thirty-one feet six inches by fifty-six feet, and the assembly-room thirty-six feet by fifty-nine feet, both twenty-eight feet high, and each having gallery at one end.

The municipal offices are on the ground floor, conveniently placed for public use, with separate entrance from St. Aldate's Street, and are also approached by the main entrance. These offices fronting St. Aldate's Street are fifteen feet high; the staircase next same enables the town-clerk, engineer and others to get quickly to the council-chamber or committee-rooms. The offices also have easy communication with each other.

The sessions court, administration of justice and police departments are entered from Blue Boar Street, where a good wide entrance is provided. To the right of this a light, easy staircase leads to sessions court, etc., on first floor, where the accommodation required for administration of justice is mostly located. The police quarters are on the ground and second floors. The sessions court is thirty-six feet by fifty-two feet, and twenty-eight feet high to flat of ceiling. It has a large lantern light in centre, giving twelve feet of additional light; it is also lighted by windows on side. A gallery is provided over the corridor and lobbies at end of court, and a special staircase from prisoners' cells leads direct to the dock in court; there is also a special prisoners' entrance from exterior of building. The arrangements comprise, in addition to the court, accommodation for the justices, jurors, witnesses, barristers, solicitors and the public. Under the town-hall is situated the spacious police-parade room, and next the entrance in Blue Boar Street is police-superintendent's room, charge-room, etc.

Vaults are constructed under the whole of site, giving plenty of room for heating, lighting and ventilation purposes and the machinery required for same. There will also be an amount of space for letting; the kitchens also are situated in basement, as already referred to. Various entrances are provided to the vaults from the streets.

The various departments have been planned so that each is kept separate and distinct and can be approached by its own entrance without traversing other parts of the building. The municipal offices may be shut off when desired from communication with other parts of building without interference to business proceeding as usual, the principal entrance and staircase being reserved in such cases solely for the use of town-hall, assembly-room or council-chamber, as occasion requires.

COMMUNICATIONS

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

A SHUTTER-HINGE.

Scranton, Penn., March 2, 1892.

To the Editors of the American Architect: —

Dear Sirs, — In your issue of January 23 there is an article headed "Interior Woodwork," signed "A. C. N.," in which, on page 58, there is an illustration marked "Figure 4," showing a blind butt with a long throw "which admits of the third leaf closing in between the first and second."

I have made several vain attempts to find this butt. Will you kindly inform me by whom it is made, or being unable so to do, kindly refer this letter to A. C. N.; you will thereby confer a favor which will be appreciated.

Yours respectfully, F. L. Brown.

[The writer of the paper referred to answers our inquiry by saying that the hinge in question can be furnished by A. G. Newman, 1180 Broadway, New York, N. Y. — Eds. American Architect.]

TRADE SURVEYS

An unsatisfactory condition of things exists in business throughout the country. While the volume of business is large, it is transacted at lower margins than have prevailed for years. Buyers are supposed to be benefited by this condition of things, but they do not seem to accept the opportunity to buy for forward requirements. New York jobbers, even, go so far as to say that, with the extraordinary low prices for all kinds of goods, a minimum of business is being done, and that the lower the prices seem to go the less is bought. It is a difficult thing to state the truth, and the facts in the commercial and industrial world at this time. Production, while not curtailed, is restricted within certain limits; consumptive requirements are heavy; railroad traffic is enormous. The business world seems to be living in almost daily expectation of something of a surprising nature happening. The struggle for gold in foreign countries continues; the brightest lights there admit the dangers of the situation. Within the past three or four days, admissions have been made by eminent foreign financiers that new methods and policies must be adopted, or they will be forced. Several unfavorable influences are at work in Europe. The practical heads of the different governments seem to be befogged; discontent among the lower classes seems general; there is evident dissatisfaction among the so-called middle classes; cliques and factions exist in some of the legislative bodies of Europe, and ominous threats are being made. The magnitude of the debts which the European Governments are carrying is attracting attention from the lower classes, who are supposed to have no business with such things. The possibilities of bankruptcy face three or four governments. The possibilities of war are strong; the armies are poisoned with socialism and kindred political heresies. The treasuries are empty, and those in charge of money-gathering are at their wits' ends. In some sections of Europe the land-holders demand high tariff, while the masses of the people demand freedom in foreign intercourse, which would bring them cheap bread. Jealousy exists among the crowned heads themselves, despite the arts of diplomacy to hide the fact. In our own country, things are entirely different. The politicians are growing desperate for want of some live political issues. The masses of the people understand their interests too well to be deceived by false cries of reform. Our financial situation, while sound, as measured by old standards, is weak when measured by what is required. The silver agitation is growing in force, and bankers who have been old-time opponents of silver legislation are not heard strenuously in opposition to some of the proposed measures. It is scarcely probable that any of the proposed measures now before the country will pass, because they ought not to. The subject needs to be more thoroughly understood before wise legislation is possible; the interests at issue are too important for experimental legislation. None of the industries are crowded. Reductions of wages are going on in quite a number, particularly in iron-making. It is claimed by one or two authorities in railroad construction that there is less work projected this year than last, but this conclusion is open to question. It is true that the actual projected construction is less so far as measured by final railway surveys, but the projected mileage, as measured by preliminary surveys, is greater than it has been for two or three years past. The financial reports from most of the larger cities show a healthy condition; gold has been attracted to Europe in large quantities; the outflow will probably continue. Railroad securities are, as a general thing, gaining strength. Loans are expanding, and the surplus reserve is falling off. There is a growing demand for money and credits. The industries are running with their brakes on, and there is no probability of such an increase in production during the next two or three months as will unsettle the present low range of values.

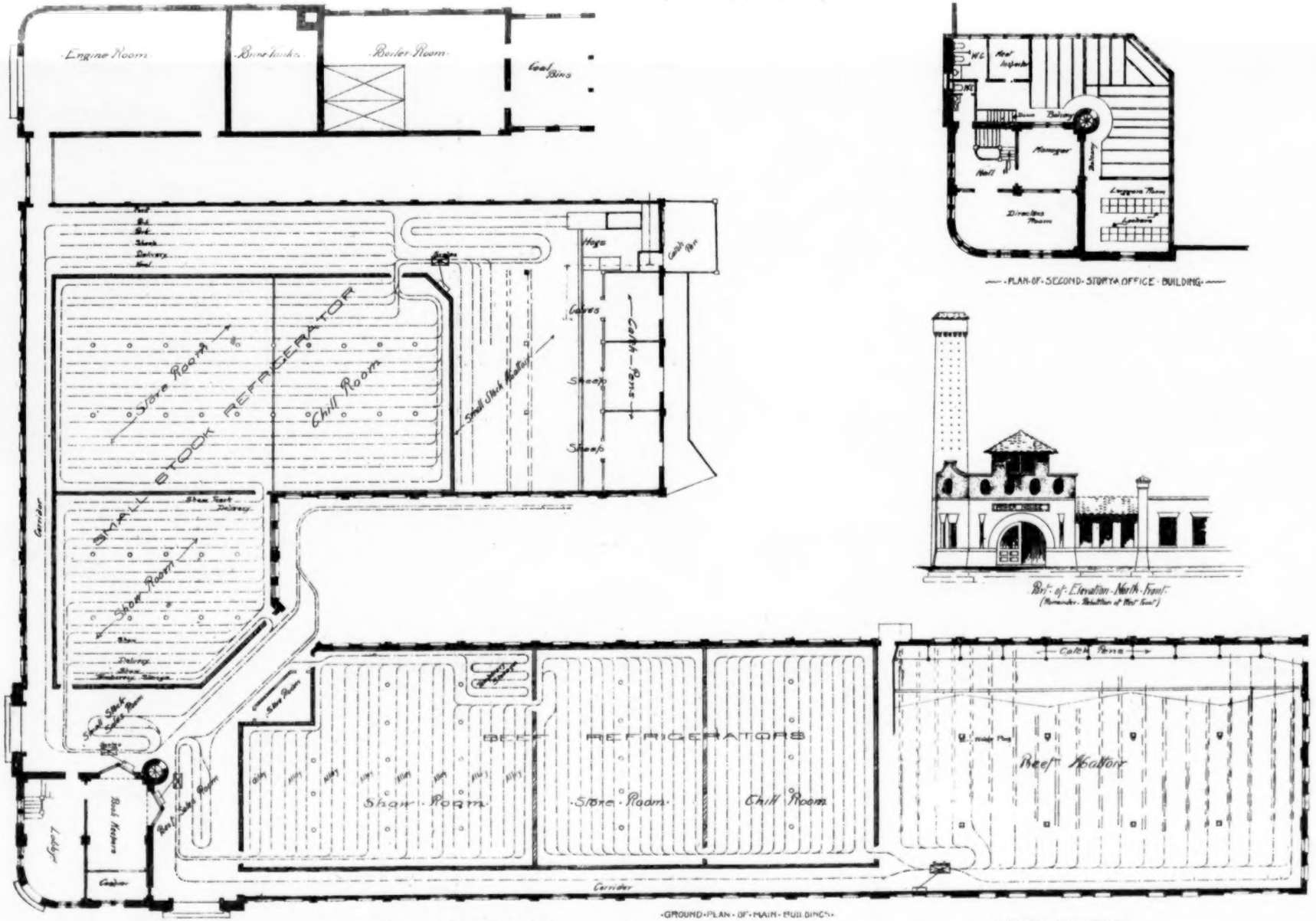
S. J. Parkhill & Co., Printers, Boston, Mass.

DESIGN FOR U.S. POS
WASHINGTON

SUPERVISING ARCHITECT,
U.S. TREASURY DEPT.

S. POST OFFICE Etc
NGTON D.C.

Isometrical View of Buildings & Stock Yards.



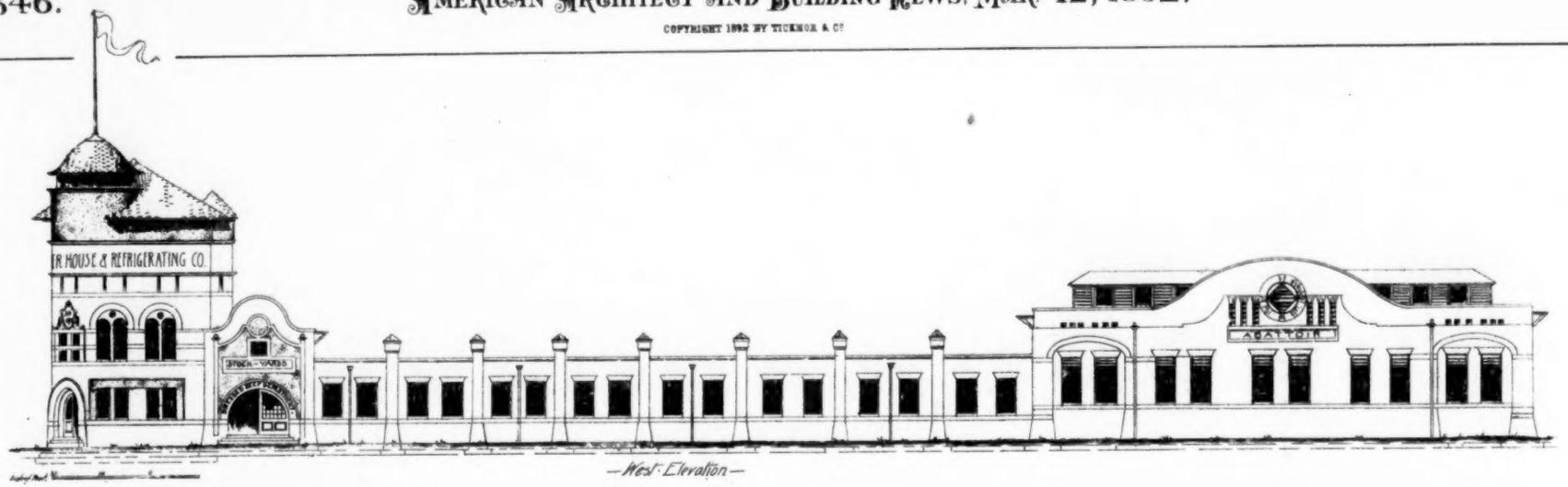
PEOPLES SLAUGHTER HOUSE & REFRIGERATING CO.
New Orleans Louisiana

GROUND PLAN OF MAIN BUILDINGS

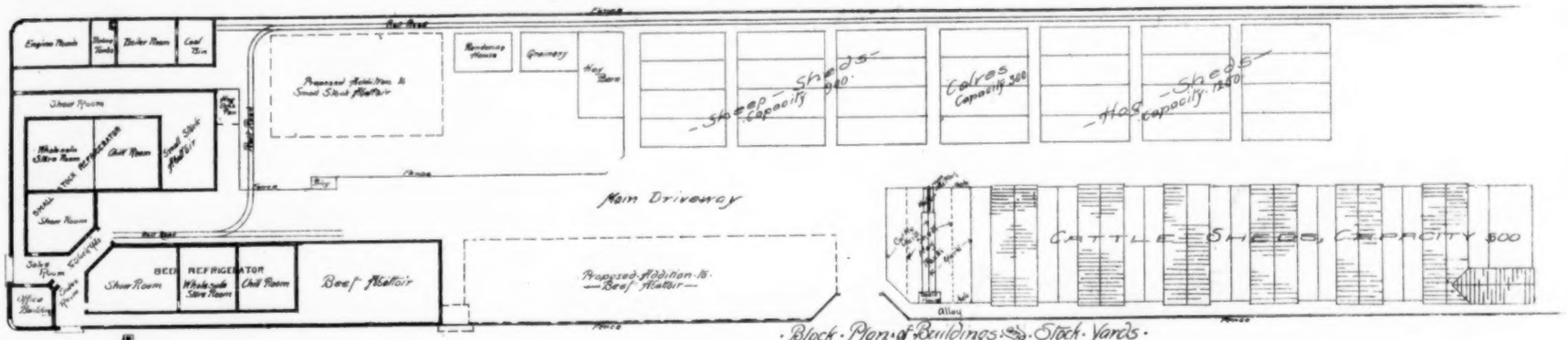
PLAN OF SECOND STORY OFFICE BUILDING

Part of Elevation North Front.
(Remainder Similar to that Shown)

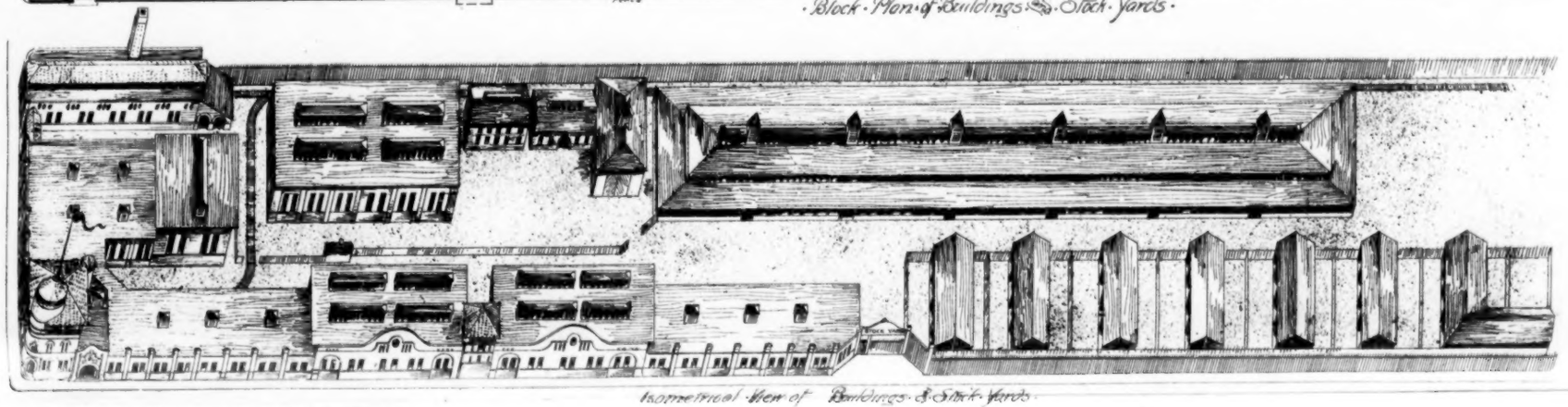
J.G. GLOVER ARCHITECT
H.C. CARREL ASSOCIATE
184 Ramsen St
Brooklyn N.Y.



—West Elevation—

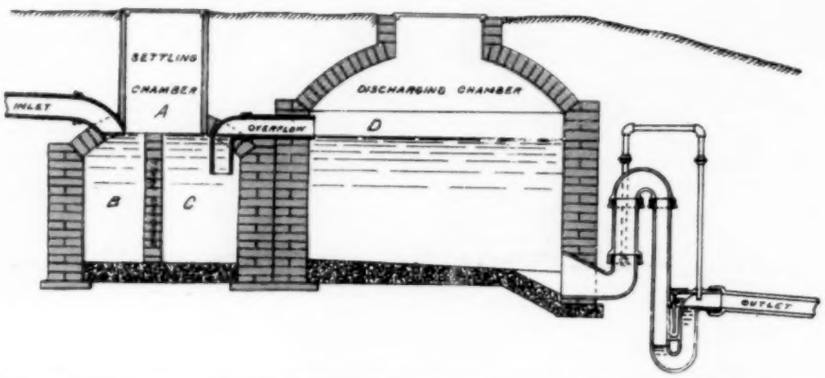


Block Plan of Buildings & Stock Yards



Isometrical View of Buildings & Stock Yards

FIG 1



DETAILS OF S

DEVISED BY

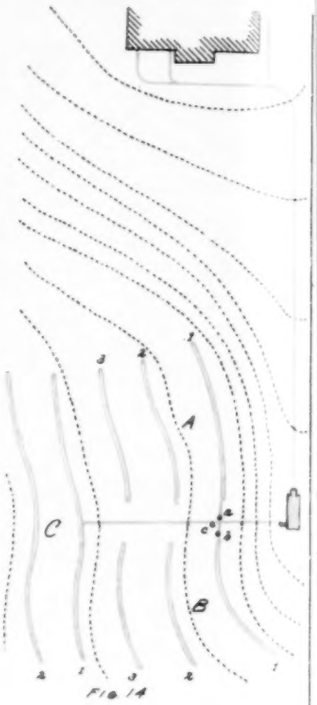


FIG 14

FIG 3

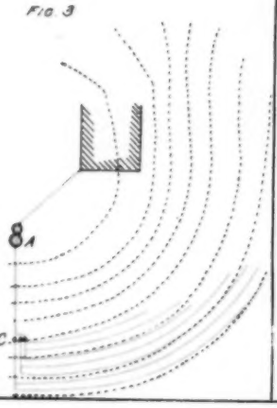


FIG 4

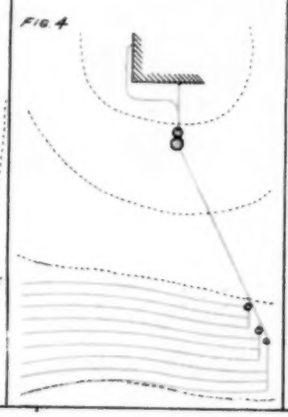
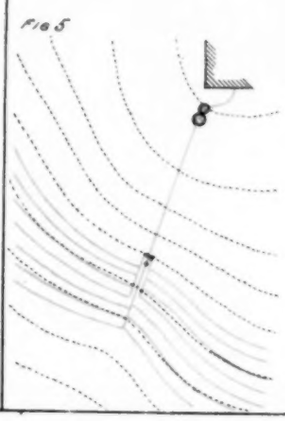


FIG 5



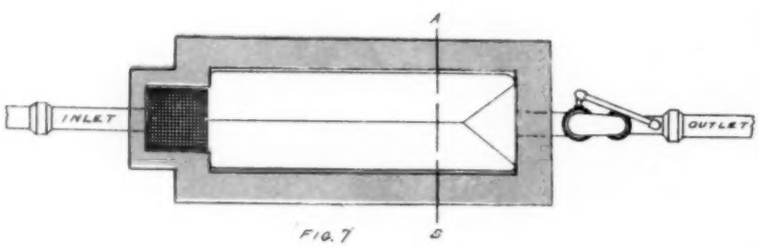
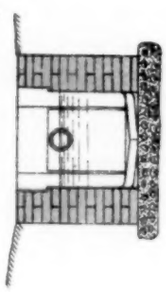


FIG 7



SECTION A-B
FIG 8

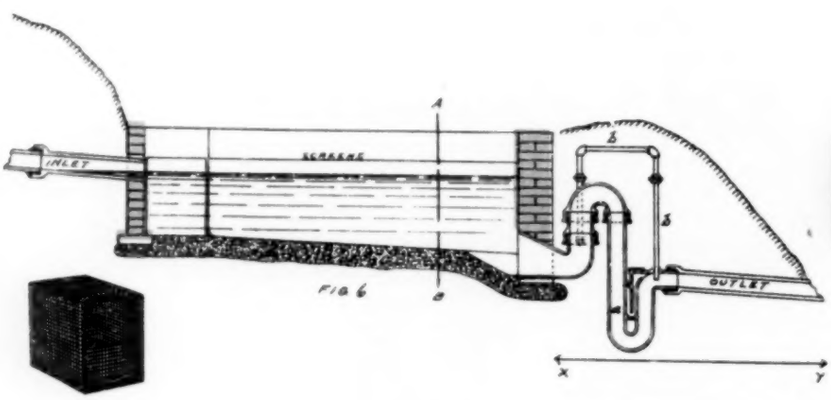


FIG 6

FIG 9

FIG 10

FIG 16

OF SUB-SURFACE IRRIGATION.

BY GEORGE E. WARING, JR.

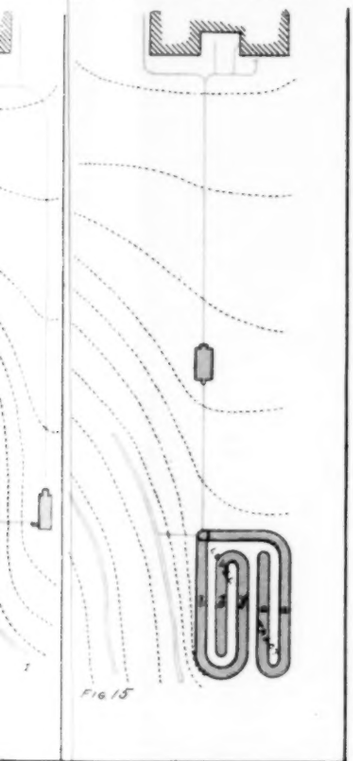


FIG. 15

FIG. 17

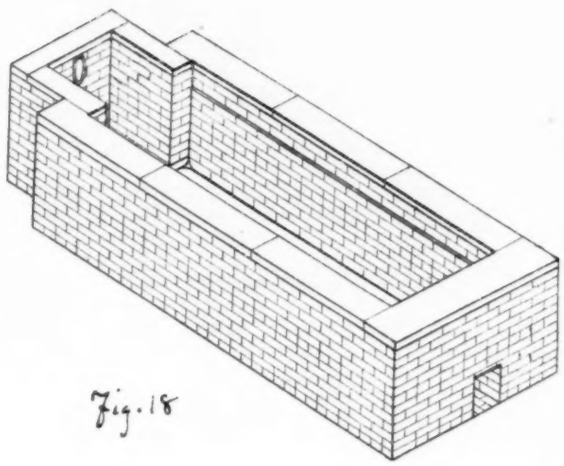


Fig. 18

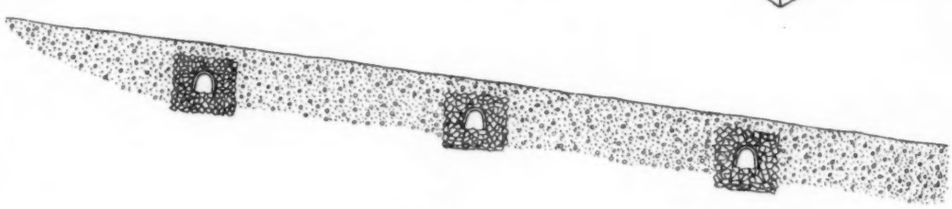


FIG. 11

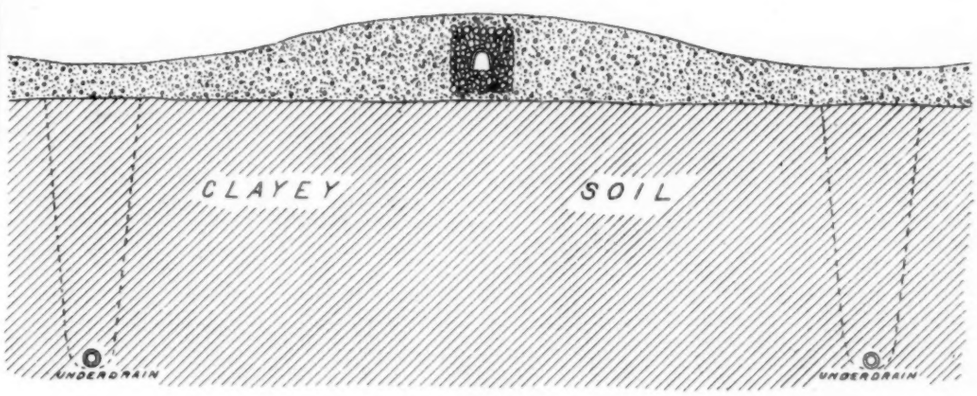


FIG. 12

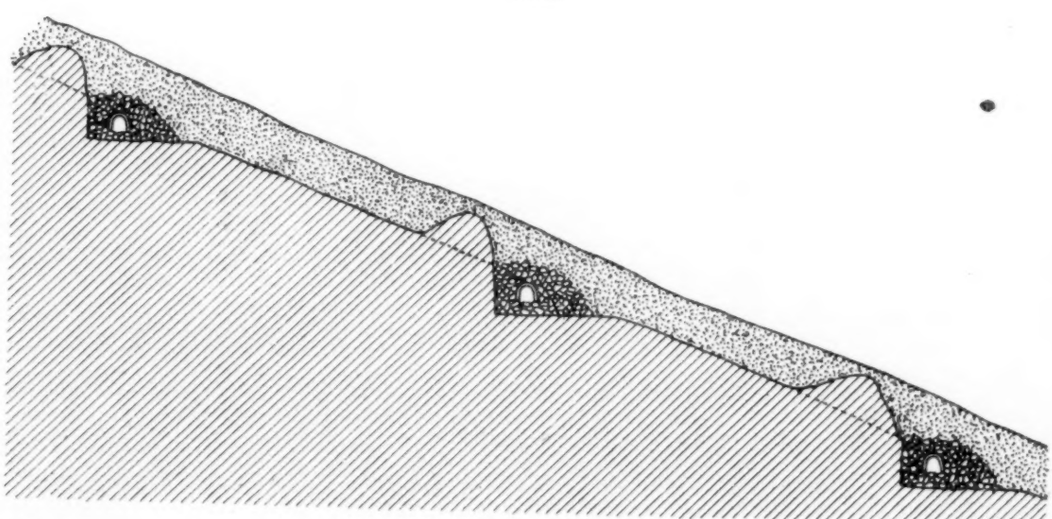


FIG. 13.

HELIOTYPE PRINTING CO. BOSTON.