THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XXXVII. Copyright, 1892, by TICKNOR & COMPANY, Boston, Mass. No. 862.

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

JULY 2, 1892.

CONTENTS.

THE Legislature of Massachusetts has this year passed, without material change, the building-law which was drawn up two years ago by a commission of three members: Mr. Minot, representing the real-estate owners; Mr. Stearns, of the firm of Peabody & Stearns, representing the architects; and Mr. Sayward, the Secretary of the National Association of Master-Builders, and of the similar local society, and himself a builder of great experience, as the representatives of the builders. As we said last year, the law proposed by these commissioners is in many ways far superior to anything of the kind yet devised. Nearly every building-law hitherto in force in this or in other countries is, perhaps naturally, a mere incoherent mass of rules, adopted at different times to meet new exigencies, and often practically inconsistent with each other. There is no reason why the codes of American cities should resemble those of Europe in this respect, as most of them are of quite recent adoption; but it seems to have been the practice here to use as a model the Metropolitan Building Act of London, which is the rambling growth of more than two centuries, and has impressed its own character on all its imitations.

THE Boston Commissioners were sensible enough, in the matter of form, to follow their own judgment, and they threw the collection of rules which they proposed, all of which are familiar enough, at least as matters of discussion, into a shape infinitely superior to that of any building-law with which we are acquainted, dividing all city buildings into three classes, and specifying the details of construction separately for each class, so that no one can possibly make any mistake henceforth as to the class to which his proposed building belongs, or fail to understand the set of regulations provided for that class. This itself, as every one who has had any experience with laws intended to apply to all kinds of buildings alike will acknowledge, is a great gain, and the detailed regulations for each class are clear, condensed and scientific, embodying the conclusions long ago reached by architects, builders, underwriters and fire-engineers in a practical and well-considered form. It is a striking testimony to the judiciousness with which the work of the commissioners was done that so little change should have been made in the draft before the enactment of the law. The most important change, by which the open area of second-class buildings, limited in the draft to six thousand square feet, was extended by the Legislature to ten thousand, is much to be regretted, but we may hope that more mature consideration, which will probably be assisted by observation of the conflagrations which will still be inevitable, may lead later to the restoration of the Commissioners' limit; and, when this shall have been done, Boston will be able to boast of having, perhaps, the best building code in the world. It will, of course, take many years to bring the city into anything like conformity with the new regulations, for Boston is full of ancient fire-traps, which the law cannot require to be removed or altered, and which constantly menace the property about them; but, as these are slowly eliminated, to give place to such structures as those for which the new law provides, the city will gradually assume a solidity and security superior to anything yet known in this country.

THE power-station of the Seventh Avenue Railroad Company, now being built in New York from the designs of Messrs. McKim, Mead & White, with Major G. W. McNulty as consulting engineer, presents an interesting peculiarity in the matter of foundations. As the land on which the building stands is very costly, it was desirable to utilize the upper stories for renting for stores and offices, and it became a serious problem whether this could be successfully done, on account of the vibration of the huge engines which were to be placed in the basement. If the vibration of the engines were to be communicated to the superstructure, the offices would hardly be rentable; yet such communication would inevitably take place if the foundations of the engines had any connection with those of the building. Fortunately, the soil under the building was sandy, and the difficulty was met by sinking hollow iron cylinders, which were afterwards filled with sand and concrete, and served to support both the engines and the walls. The cylinders on which the walls rest are entirely independent of those which support the machinery, and it is believed that the soft sand which intervenes between the two sets of cylinders will nearly or quite prevent the transmission of vibrations from one to the other. Of course, as the machinery has not yet been placed in position, it is impossible to say whether the scheme is entirely successful, but it certainly promises well. If, after all these precautions, the vibration should be unpleasantly perceptible in the upper stories, it seems not impossible that the French plan of bedding the engines on coal-tar concrete or asphalt might give additional relief. It is found that coal-tar concrete has a remarkable power of absorbing vibrations, and it would be an easy matter to fill the cylinders with it for the whole or a part of their depth. For transmitting the power from the fly-wheels of the engines to the counter-shafts from which it is distributed over the railway line, cotton ropes are employed, thirty-two, set side by side in grooves, being used for each fly-wheel. Although rope transmission is becoming quite common in this country, hemp or wire rope has been generally used, and manufacturers will watch with interest the result of the employment of cotton on such a large scale. It seems, however, likely to answer its purpose admirably, being much less subject than hemp to variations of length through alternations of dryness and dampness, while, as the railroad engineers think, it will convey power more noiselessly.

LA Semaine des Constructeurs, in commenting recently on the discussion which took place at the late Congress of Architects, at Hamburg, on workingmen's dwellings, to which we referred at the time, happened to say that the solution of the problem of the construction of such dwellings was not so far advanced in France as in Germany. This observation has brought out an answer from M. E. Cacheux, perhaps the best authority on the subject in Europe, the author of an admirable book in relation to it, and the associate of the lamented Müller in nearly all his successful schemes for improving the material surroundings of workingmen and their families. M. Cacheux says that, so far from being behind the Germans in the matter of workingmen's dwellings, the French are far in advance of them, both in theory and practice, and he adds some interesting statements, based upon the long experience of M. Müller and himself. It will be remembered, by those who have read M. Cacheux's book, or who recollect our review of it, that

French workmen are, as a rule, very unwilling to accept anything which presents itself to them as a charity; and that the better class of them, while they are glad to find good tenements, at a rent that they can afford to pay, avoid those which profess to have been built out of philanthropy, and which put, so to speak, those who live in them under obligation. It is obvious that it is of the highest importance to preserve this spirit of manly independence among the poorer class of citizens; and M. Cacheux now says that, on the other hand, there is no more need of appealing to the generosity of the rich to provide suitable houses for the poor than there is of making people who prefer to live in clean rooms feel that they owe the privilege of doing so to the benevolence of some unknown patron. Instead of this, he says that, in France, at least, "the day that they will pay regularly a suitable rent, houses and lodgings will be put at their disposition, under the same conditions as the other necessaries of life." We should be inclined always to make a certain reserve in the statement of such principles, in favor of children, who cannot be pauperized by kindness, and who need all the attention that the rich and benevolent can give them; but no proposition needs to be more clearly stated in these days of misapplied philanthropy, than the one that decent poor people are willing to pay all they can afford for wholesome dwellings, without calling upon charity to help them; and that there are plenty of rich men ready to build such dwellings, if they can be sure of reliable tenants, who will pay them six per cent net on the cost. That, notwithstanding this disposition on both sides, so few wholesome tenements are built, is the fault of circumstances, which have, at present, so adjusted ordinary wages and the cost of building, that decent and airy tenements cannot be built and rented for what workingmen can afford to pay. What the cause of this imperfect adjustment may be, we will not attempt to say. Probably the tyranny and folly of the trades-unions connected with building, which have made building enterprises costly and uncertain, have something to do with it; and, undoubtedly, the legal restrictions put on building, which increase the cost, increase the rents and diminish the number of those who can afford to live in good houses. M. Cacheux says that, in Paris, a similar influence acts very seriously to discourage the erection of separate houses, which he, with all other authorities on the subject, regard as much better for poor men and their families than rooms in tenement-houses. This influence is the disproportionate taxation on detached houses. Where a man living in three rooms in a tenement-house has no taxes to pay, and only six francs a year for water-rates, and the same amount for cesspool emptying, one who owns or rents a detached cottage with the same accommodation, has to pay from thirty-six to forty francs a year for taxes, twenty-eight francs for water-rates, and fifty francs for cesspool emptying, a discrimination of about twenty dollars a year, or forty cents a week, against the better and more wholesome dwelling. Whether a similar discrimination exists in this country, we do not know, but we suspect that it does, and our "improved dwelling" enthusiasts might with advantage apply themselves first to studying out and remedying the preferences thus given by law to bad habitations, and then to the development of a cheap and substantial method of construction. There are many improvements to be made, in the way of economy, upon the prevailing methods of building, and, as M. Cacheux says, nothing but strict economy in expense of construction and maintenance, and consequent reduction of rental to what they can afford to pay, will enable workingmen to live in good houses instead of dirty flats; while, after the necessary economies have been made, there will be no lack of demand for the good houses, or of capitalists ready and willing to build them.

Le Génie Civil, in describing the methods and mediums suitable for decorative painting, mentions the antique encaustic process, in which the colors are mixed with wax, as the best and most durable yet discovered, and adds a detail which is new to us, — that colors for encaustic painting are now made, by mixing various pigments with wax, and casting them in sticks, like pastels. These sticks of wax-color can be bought at the artists' supply-houses, and must greatly facilitate the process of painting in encaustic, which, when the artist was obliged to buy the dry pigments, and mix them himself with melted wax over a lamp, as Mr. LaFarge had to do at Trinity Church in Boston, was one of the most troublesome of all methods of painting. Having furnished himself with a suitable assortment of color-sticks, the artist takes his palette, which is of metal, divided into little cells, and drops into a sufficient number of cells bits of such colors as he wishes to use. The palette is then warmed until the colors melt, and they remain liquid long enough to be applied with a brush to the plaster or canvas. Naturally, there is not much opportunity for stirring the colors about after they are in place, and the painting must be done by means of a succession of touches; but this is rather an advantage to a decorative painting, and when the picture is done, the colors can be to a certain extent softened and blended by moving a hot iron about in close proximity to the surface. In practice, artists usually have several of these irons, of different sizes and shapes, according to the dimensions of the portions to be blended. The colors, in this mode of painting, being protected by the wax, are almost imperishable, and the wax does not change color, like oil. No varnish is needed for protection, and the quality of the painting, just as it is left by the brush, is peculiarly suited for decorative effect, but the Romans were accustomed to polish their smaller encaustic paintings, by rubbing them with a cloth, and this process might be useful in certain cases. Now that the art is so simplified, it might be well worth while for some of our younger architects to take it up as an instructive recreation. The pupils of the school of painting at Antwerp are sent out, in vacation time, to try their skill in decorating the village churches of the surrounding region; and a few architects who could draw and paint, with some artists who understood decoration, might, in a summer vacation, win considerable renown for themselves by transforming some old country "meeting-house" into a splendid piece of decorative color.

PARIS is on the point of being supplied with a new convenience. Three or four years ago, some five hundred "*postes avertisseurs*," or alarm-boxes, were established in various parts of the city, somewhat resembling ours, but set up separately, on top of short columns. The operation of these was about the same as that of our signal-boxes, but the practical French mind soon observed that the signals sent by means of them only showed approximately the location of the fire, or other disaster, and gave no indication of its exact character, so that it was common to see there, as it is with us, a train of scaling-ladders, fire-engines, Babcock extinguishers and protective wagons thundering by in answer to an alarm sent out, perhaps, to summon assistance for fishing a baby out of a canal, or to relieve the excitement incident to the explosion of a soda-water fountain. As fire-engines and similar apparatus are costly, and the wear and tear caused by dragging them furiously over pavements is something serious, it occurred to the standing committee which studies the requirements of the Parisian fire-service that an alarm which should describe the nature of the distress which the fire-brigade was summoned to alleviate would be an improvement on the old sort; and, with this idea, it has been decided to establish telephonic signal-boxes in place of the old ones. These new signal-boxes, like the old ones, stand on short pillars. They have three sides, which are inscribed with appropriate instructions to the public, and a door, in the middle of which is a glass plate, with an iron knocker resting against it. If anything happens which seems to require immediate relief from the public authority, any person interested may run to the nearest "*avertisseur*," and break the glass in the door with the knocker. As soon as the glass breaks, a bell begins to ring, and the door opens of its own accord, revealing a telephone mouthpiece, and an inscription, which directs the applicant to wait until the bell stops ringing, and then speak through the telephone mouthpiece, describing distinctly the nature of the alarming occurrence, the street and the number, and to repeat this information at short intervals until a roaring noise should be heard, which would indicate the departure of the fire-engines for the scene. At the other end of the line, in the nearest fire-brigade station, the breaking of the door is followed by the ringing of a bell, and the unwinding of a slip of telegraph paper, on which is found to be printed three times the number of the box from which the alarm is sent. After the printing is done, the paper slip ceases to unroll, and the officer on duty will by this time be ready with the telephone at his ear, and a sheet of paper at his hand, to hear and write down the message spoken into the mouthpiece at the signal-box.

MODERN ARCHITECTURE.[1] — I.

UNDER this title we propose to show briefly, by a few examples, the present tendencies of architecture in some of the different countries. In articles on the architecture of Austria, Italy, the United States, etc., several specimens of contemporary structures have already been reproduced. Others will be found in later treatises on Swiss and Dutch architecture, etc.; we shall not devote much space here to the above-mentioned countries; as for Germany, Hungary and England, it will be necessary to supplement what has already been given with fuller details. Our researches have discovered no really original style of the present day; all our architects borrow elements from the past, which they appropriate and endeavor to modify and adapt to modern demands. The sources from which these elements are obtained vary. Sometimes the inspiration comes from Classic antiquity, sometimes from the Italian Renaissance; the latter, which is taken as a model in nearly all art schools, furnishes an almost universal type which we may term Academic. These two styles are adopted everywhere indiscriminately; they have become, so to speak, impersonal, and the modern application of them differs but very slightly in the different regions where they are met with. At the same time, on the contrary, there is a demand in every country that inspiration be drawn from the various periods of its own architecture, sometimes from the Gothic, sometimes from the Renaissance, sometimes from later times. It is this multifold origin of modern art which we shall endeavor to bring out in the following study.

Architecture has passed through many vicissitudes in England, and here, as in most other countries of modern times, it has been subjected to very diverse influences. As has been shown in another article ["Gothic Architecture"], architecture was imported into England by the Normans. There does not appear to have been an Anglo-Saxon architecture of sufficient importance to leave very deep traces on history. But when what we term the Romanesque style was transplanted to the new soil it immediately took root and sent out shoots through which coursed a native sap. Doubtless community of origin and the close relations maintained between the two countries long preserved an air of kinship between the English Gothic and French art, which it would be futile to attempt to overlook. It is also a well-authenticated fact that certain French artists were engaged on English works, and this doubtless counts as a large factor in the establishment of Continental influence over the development of English art; it is at the same time true that the latter follows a way peculiarly its own; little by little the separation became more clearly defined. Even in religious architecture the primitive plan underwent changes: the characteristic square apses came in; their number grew; the construction of the vaulting was modified, leading at length to the introduction of timber vaults or the fan vaults which are encountered nowhere else. The system of ornamentation, the rectilinear ogive and perpendicular divisions, the adoption of the battlement as a decorative element, all take us farther and farther away from the Gothic as it is seen on the Continent. When the Tudor style is reached the source of English art is still clearly recognizable, but it must be said that its growth and natural development have imparted to it a wholly new physiognomy.

It was perhaps at this moment that it exhibited its greatest originality. Later, foreign influences in turn modified it and altered its characteristic features. In the so-called English Renaissance period, Germany and Flanders were certainly taken as models. Community of political interests, as well as of religious interests after England became Protestant, and participation in the Continental wars account for this influence, which made itself felt chiefly in civil or domestic architecture. The façades in sculptured wood, the gables with volutes, the overloaded ornamentation and the interior decorative system, show its effects directly. There are English dwellings of the sixteenth century whose prototypes could easily be found in German and Flemish houses of the same time.

The influence of Italy can next be discerned. The Englishman has always been fond of travel, and, unfortunately, he has often drunk in inspiration from architectural productions abroad, which he has attempted, on his return home, to adapt in some fashion to the requirements of his own climate and customs [see "English Architecture," *American Architect* for February 21, 1891 *et seq.*].

Inigo Jones has left us some remarkable seventeenth-century

Fig. 1. Chapel, Mayfair, London, Eng.

[1] From the French of P. Planat, in Planat's *Encyclopédie de l'Architecture et de la Construction.*

examples of such adaptations, which were usually ill-advised. Not that compositions of the kind are destitute of merit; their defects are due to a disregard of the necessary changes in the Italian models to make them tenantable and habitable in

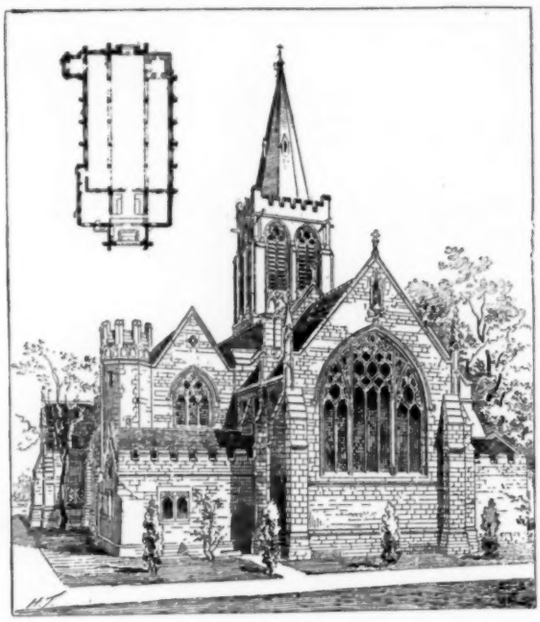


Fig. 2. Saint Peter's, Ruddington, Eng.

England. Even if we admit the possibility of importing an architecture Classical in origin and traditions into a country whose ideas, sentiments and traditions are contrary, if not antipathetic, to the Classical spirit, and that a race so totally different in customs, manners and instincts could assimilate to itself an art entirely foreign to it, we must nevertheless insist that this could not be accomplished without, at least, some preparatory steps.

With Wren, the great architect of St. Paul's, the sway of Italy was affected by the introduction of French influence. Like most other European countries, England felt the power of the charm exercised by the court of Louis XIV; Versailles dictated the law to all Europe. This brings us to the fatal period when the excavations of Pompeii, the researches of scholars and an infatuation for a pseudo-Greek art inflicted upon the generations of the early part of the present century Hellenic temples in plaster and rough stones, turned to the most incongruous uses: they served as barracks, engine-houses, clubs, theatres, stock-exchanges, restaurants, — anything.

English art had not, however, reached the end of its vicissitudes. At the close of the last century a very natural reaction had directed attention — soon transformed into a genuine cult — toward the edifices of the Gothic period, in which it was at first thought that the work of the national, or Anglo-Saxon race had been discovered. The error was soon detected, but the infatuation did not die out and a Neo-Gothic school soon grew up by the side of the Neo-Greek. Though French studies in Gothic art have been pushed farther, perhaps, or at least have been prosecuted with more scientific exactness, owing to the helps obtained from our well-equipped École des Chartes, it is none the less a fact that the English can justly claim the honor, by no means inconsiderable, of having taken the initiative in these investigations. It might even be said that they opened our eyes to the value of certain constructions on our own soil which had been generally regarded as absolutely barbarous; English archæologists were, for instance, the first to study our Norman structures.

If space and the scope of this article permitted, we should be glad to present to our readers at this point the original figure of Pugin, the Romantic architect and archæologist, the forerunner of our Viollet-le-Duc and the prototype of those exclusive and earnest admirers of an art that has disappeared, and who gather consolation from the cherished belief that they are the sole survivors of past generations.

Barry, the head of the modern school and in certain directions a disciple of the Neo-Gothic teachings, was, however, more eclectic, and from the moment that he gained distinction England, in common with other European countries, embarked with all sails set on the ocean of eclecticism. Thenceforth, according to the inspiration of fashion, according to temperament, education, or individual caprice, art passed through the most varied revivals, adaptations and rejuvenations of the past; it copied crudely, scrupulously or whimsically all the hitherto known styles, whether foreign or native.

It follows as a matter of course that, among all these quite divergent conceptions, some are happy while others are less so. In the resurrections for contemporary use, as well as in the arrangement and combination of often heterogeneous materials, individual taste, deftness of hand, the instinctive sense of a possible harmony between elements borrowed from former times and their modern application; in a word, the wholly personal qualities of the artist thenceforth played a predominant part. It was no longer a question of rules or of a uniform and universally accepted style. The artist ceased to be guided or restricted by laws imposed on all without distinction; he was perfectly free to invent; and yet, if the truth be told, nothing was or has been invented. In England, as elsewhere, the inventive genius of artists has never been more completely dormant than during the present period, and still artistic freedom — we might almost say license — was never more widely recognized. Individuality now exists in art as in manners.

We cannot hope to enter upon even the briefest description of the vast number of modern constructions in England, even though a rigorous selection be made of those worthy of interest. In the *ensemble*, we will merely call attention to some points of difference between England and France. With us, it cannot but be noticed, religious architecture seems to live simply an official life. With a few noteworthy exceptions, the faithful are found willingly bequeathing to the State, the departments, or the great municipalities, all the care of rearing the few churches called for by the increase in the population. The government makes the choice of site, fixes the amount of money to be expended, names the architect, taken from among its regular functionaries, and sends him to the spot to direct, to manage, to accept or reject propositions, etc. Consequently we have two or three types of churches, differing according as the commissions presiding over their destinies take their inspiration from diocesan and Gothic committees or from Academic; but it would be difficult to find any more. The result

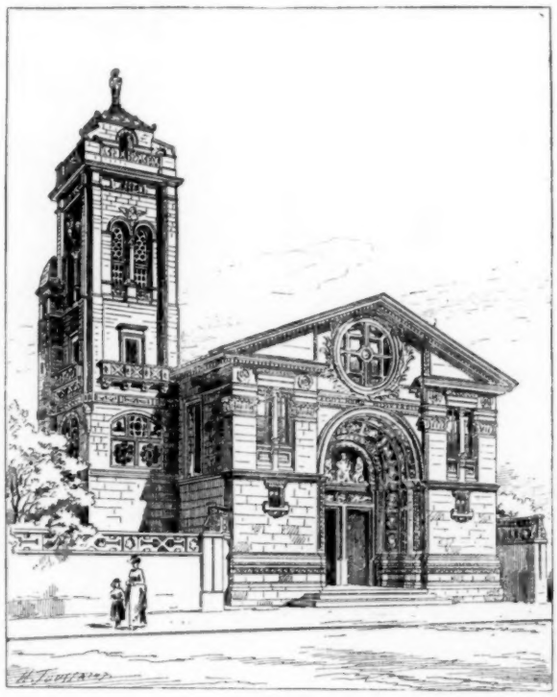


Fig. 3. Church of St. John the Baptist, Brighton, Eng.

is a certain staid correctness, few very fanciful departures, and few very gross errors, whether a Gothic, a Romanesque, or even a Byzantine restoration be attempted, or whether the models be taken from some period of the Renaissance.

The same is not true of England. It is in the nature of Protestantism that the individual mind should maintain its sway and preserve a peculiar, aggressive vitality in religious sentiments. This separatist tendency, due as much perhaps to the spirit of opposition to one's neighbors as to faith in God, is liable, unfortunately, to split up the religious forces into very small bands; but it nevertheless sustains the interest in doctrines and feeds the financial zeal of the faithful. Therefore the number of chapels and churches erected by the different sects of Protestantism is constantly increasing. The French find a perennial source of wonder in the multitude of edifices of the kind reproduced in English publications, and forming for certain of them, as we know, one of their most remunerative departments; for they interest not only men of the trades, but also the throngs of persons connected with the various parish managements.

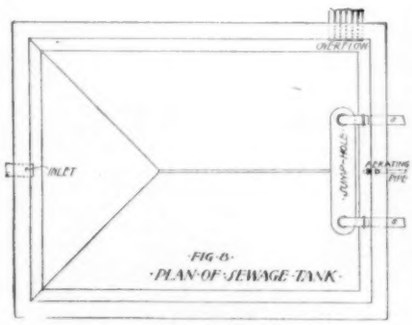
We will refer our readers to a few specimens of religious architecture which are well calculated to show the eclecticism prevailing here as in other branches of the art. The first place is given to a work by Mr. Waterhouse, who stands in the front ranks of contemporary architects and whose name will be found more than once in the short list presented here, attached to examples exhibiting a great variety of application. The chapel in Mayfair, London (Fig. 1), belongs to the modern Romanesque style, on which Mr. Waterhouse has put the characteristic stamp of his talent, and which enables one to recognize his hand as he would that of a painter, which always appears in an individual *manner*.

St. Peter's at Ruddington, by Messrs. Bell and Roper, is a derivation of that Gothic type which is characterized by a principal bay of unusual size, by more nearly rectilineal ribs, taking the place of the French Flamboyant dispositions, and by the almost inevitable battlements of the English Gothic.

If the Romanesque and Gothic styles furnished the inspiration in the two cases cited above, the source of the architect's study for the church of St. John the Baptist at Brighton (Fig. 3) seems more obscure at first sight. It is by S. J. Nicoll. If we mistake not, a Byzantine revival is discernible, combined quite unexpectedly with a few traces of the Romanesque and touches of the Renaissance. But does this mean that we consider the combination defective? Not at all. On the contrary, a regard for noble proportions and an attempt at harmony, coupled with a most careful study of details are exhibited, to which English architects have not always treated us. We do not know how the English themselves rate this structure, which is evidently derived from forms common in the country; but French artists will, we think, take pleasure in noting its more quiet qualities and a purity of details peculiarly gratifying to French taste.

[To be continued.]

SEWAGE DISPOSAL AT WAYNE, PA.



MESSRS. A. J. DREXEL and Geo. W. Childs some years ago bought a large estate lying on both sides of the Pennsylvania Railroad, about fifteen miles out of Philadelphia. The country is one of great beauty and salubrity, and is most conveniently reached from the city, by express trains, in twenty-five minutes.

They have slowly, and with great care, established there a purely suburban residence town, called Wayne. The population is now nearly 2,000 and is increasing rapidly. There are no manufactures; there is no business, beyond the few retail stores required by the population; no liquor is sold in the place, and the conditions of the sale of property are such as to prevent nuisances of any sort. There are no poor people and there are no rich people. The value of the places probably ranges from $5,000 to $20,000. The town has a complete system of sewerage, a good and universally distributed water-supply, and a well-established steam-heating plant, reducing the necessity for fires, to what may be required for cooking and laundry purposes. The houses are all of good architectural effect; the lots are large; there are few fences; and it is not too much to say that Wayne is, on the whole, the prettiest and best regulated suburban town of which I have any knowledge.

At its beginning a few houses and two residence hotels of considerable size were drained by pipe sewers, delivering into a brook running through the valley. These sewers received household wastes and roof water. About ten years ago I was employed for an extension of the sewerage system. I provided for the exclusion of roof water and for the construction of sewers for the removal of household wastes solely. This system was brought into connection with what had already been done, the sewage being collected in a large flush-tank and from this discharged into an eight-inch pipe, running on a fall of 1 to 400, 2,925 feet to a point on the brook well below the proposed improvement, but still within the lines of the estate. Later, this was supplemented by a twelve-inch pipe, laid parallel to it along the lower part of its course, taking sewage from a large new area. The brook is rather a copious one, and it was decided by the proprietors that, as it ran through a purely agricultural district and flowed into Darby Creek, already much polluted by factories, the question of disposal would be thoroughly and finally settled. Here my first connection with the work ceased. In time it was found that the fouling of the brook and the obvious deposit of coarse sewage along its banks was subject to objection on the part of owners below. An attempt was made, and was maintained for several years, to obviate these complaints by delivering the sewage into a large cesspool, or settling-basin. Subsequently the overflow of this was taken into another basin, and still later into a third, the liquid effluent only reaching the brook.

In a few years farms along the valley below were bought for residence purposes, and the condition of the brook became a subject of complaint. Legal proceedings, looking to an injunction against the discharge of sewage into the stream were threatened. I was again consulted in the spring of 1890, with a view to adopting a system of disposal which should withhold all fouling matters from the brook. I recommended purification by surface irrigation on a tract of land lying somewhat isolated at the lower side of the property. The objecting owners below suspended their action under verbal protest, and had evidently no confidence in the success of the proposed scheme. They, however, refrained from active opposition pending the experiment.

The tract to be used was of unfavorable character, but it was the only one available. It consisted mainly of an old pond, surrounded by ancient pollard willows, a large area of swamp through which the brook meandered, about four acres of slightly sloping cleared land, and a very steep, thickly wooded and rocky hillside, rising about one hundred feet from the level of the brook to one corner of the nearly square tract.

The pond was obliterated, the willows and much other vegetation were cleared away, the brook was confined between stone walls, and all except the steep hillside was thoroughly underdrained. The arrangements for sewage disposal were so far completed as to be brought into operation in September, 1891, only the land south of the brook being then ready for use. An exhibition of the working of the system was at that time made. It was attended by some of the more active opposers of the scheme. A little later an exhibition was made before the officers of the State Board of Health. All expressed themselves as entirely satisfied with the result, the effluent reaching the brook being much purer than the then unpolluted water of the brook itself. The result was so satisfactory that the proprietors were disposed not to bring the other part of the field into use. This policy was not, however, insisted on, and the whole eleven acres, divided into five tracts for alternate use, are now available. It is needless to say to those who understand the principles of sewage-disposal by this process, that the land is constantly improving in its capacity for purifying sewage, and that there is no doubt that it will continue to improve.

The following is a detailed description of the method adopted.

The existing sewer was intercepted at a point above the settling-basins, or cesspools, by a vitrified-pipe sewer twelve inches in diameter, 1,220 feet long, laid with a fall of 1 to 125, which carries the sewage to the edge of the disposal-field. This field contains eleven acres. It is highest at the southerly corner and at the northerly corner, as shown by contours. The creek enters it at the westerly corner, near which there was an abandoned pond, filled with silt, and bordered with old willow trees. Below the dam of this pond the creek was irregular in its course and insecure as to its banks, much of the land along its lower course being a nearly level tussock swamp.

The improvement included the removal of the dam and willows and of all brush growth, in fact of all growth less than trees of eight inches diameter. The creek was straightened, deepened and walled with stone, the bank sloping back from the stone walls being sodded. The land on the south side of the creek was high and dry and required little modification of its grading. Above contour 340, where the land is very steep and rocky, there was a closely grown forest, ranging from large trees to thick underbrush. This was cleared of loose stone and of small growth and its minor irregularities were graded. The whole area on the north side of the creek was thoroughly underdrained and brought to a smooth and uniform grade. That on the steeper part of the other side of the creek needed no general underdrainage. A header drain of six-inch pipe was laid on the course shown to prevent the escape of the filtered

effluent at a portion where heavy rains showed slight springs. For the better protection of the pumping-station a catch drain five feet deep and filled to within six inches of the surface with broken stone was carried around that tract.

The land on the north side of the creek was divided into two fields by a slightly elevated road serving as an embankment. The land on the south side was divided into three substantially equal tracts by embankments about one foot high, with foot-paths laid on them. These embankments converge at the distributing-well above the 410-foot contour. This distributing-well is shown in Figures 2 and 3. It receives the sewage through the bottom at its centre. It has three outlet-gates, one opening upon the tract *A*, one upon the tract *B* and one upon the tract *C*, either or all of which may be used at pleasure. The details above given and the following description are illustrated in Figure 1.

Just below the distributing-well the land is covered for a width of about fifty feet with broken stone (macadam) eight inches deep. The upper edge of this has a considerable fall, and the sewage is discharged along this upper edge on the beginning of the macadam, where a depression is made for it. The fall of this stone work is very steep, about one to four. Along the lower edge of the macadam there is an elevated bank of broken stone, forming a porous dam to catch the rapid flow, so as to discharge it uniformly over the land below it.

The heavy lines marked *X* in each of the three sections are banks of porous material, mainly locomotive cinders (see Figure 4) about one foot high and three feet six inches wide, laid on a graded strip following the actual contour. These cinders are backed and loaded with heavy stones to prevent their being washed away. It is the purpose of these banks to collect again the irregular flow from the tracts above them, and to start it uniformly over the tracts below. The main portion of the sewage fills the space back of the banks and flows over their tops. Some of it filters through the banks. After the flow ceases, the accumulation behind the bank, which would otherwise be retained to putrefy, leaks rapidly out through the cinders, leaving the ditch dry.

The mass of macadam stone over which the sewage first passes retains practically all of its solid matter, mainly paper, smaller shreds of rags, clots of grease, etc. As it leaves the stone bank it is apparently quite half purified. After passing the first cinder bank it has no perceptible discoloration, and as it accumulates behind the lower cinder bank it is sparkling, seems to be absolutely pure, and when bottled and kept in the warm boiler-room it remains clear. The final escape into the creek is largely through the outlets of the header pipe-drain, through the stone catch drain and through the underdrains, a little flowing out through the stone bank as seepage. This water is obviously far more clear than the water of the creek itself.

The tract on the north side of the creek, which is divided into two sections, has the equality of its distribution secured in the same manner, but, by reason of the gentler slope of the land, the broken stone tract is much smaller and the cinder banks are smaller.

On both sides of the creek, the uniformity of distribution between the banks is aided by shallow surface-gutters, cut in the grass, with a spade, after the manner of ordinary irrigation-fields.

From the point where the main sewer enters the field, it is continued along the line *O*, Figure 1, at first underground, then in an embankment, and then as an iron and cement pipe on piers, with a constant fall, across the creek to the back of the screening-chamber, from which the screened sewage passes into the sewage-tank, whence it is lifted by two duplex Barr pumps, with a capacity of about 22,000 gallons per hour, through a force main, which is laid, first on

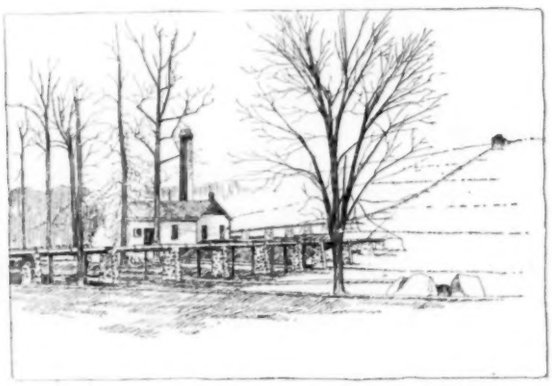


Fig. 12. View from Point marked *F* on Fig. 1.

piers and then in the ground, to the outlet in the distributing-well at the top of the hill. The location and arrangement of the sewer, force main, etc., are clearly shown in the views of the field.

The foregoing relates to the sewage which is to be used on the south side of the creek.

The sewage reaches the sections on the north side by gravity. At a point about 400 feet back of the entrance to the field the main sewer is intercepted by an eight-inch sewer, having a fall of 1 to 250, and delivering through the pipe *P* into the screening-chamber *R*, whence the sewage flows to the broken-stone tract on sections *D* and *E*. It is in contemplation, should experience show it to be

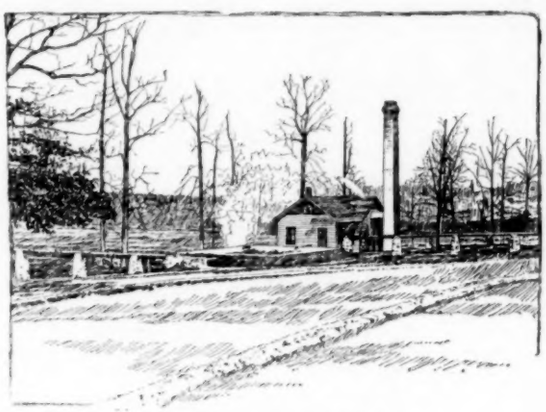


Fig 13. View from Point marked *G* on Fig. 1.

desirable, to carry a force main from the pump-house to the screening-chamber *R*, so that the sewage to be delivered on the tracts *D* and *E* may have the advantage of the pumping.

Figures 5, 6 and 7 show the plan, longitudinal section and cross-section of the screen chamber adjoining the sewage-tank. The inflow is through the sewer *A* upon the movable screens of one-inch mesh, open to the sky and easily accessible. Here all such matters as rags, coarse paper, lemon rinds, etc., are withheld, but the stream is sufficiently vigorous to carry through a small amount of fæcal matter that has withstood the long flow through the main sewer, aggregations of grease, etc. The screened sewage escapes through the iron connecting-pipe *B* and flows into the tank near its top.

Figures 8 and 9 show in plan and vertical section the sewage tank, which holds, to the mouth of the inlet, 90,000 gallons of sewage. The bottom of this tank is so graded that when it is emptied the last of its contents flow into the sump hole, which is entered by the two suction-pipes *S S*. A high overflow, through six six-inch pipes, leading to the creek, is furnished as a relief in case of accident to the pumps.

Figure 10 shows a ground plan of the pump-house, and the arrangement of suction and discharge pipes, also a portion of the tank. Figure 11 shows an elevation of the pumps with the suction and discharge pipes. In Figures 10 and 11 there is shown a four-inch aerating pipe, the use of which is described below. Figure 12 shows the iron extension of the sewer leading to the tank, and the force main, running to the top of the hill, where the distributing-well is covered by a small building. Two distributing barriers are shown passing under the elevated sewer. Figure 13 is a perspective view of the tank, pump-house, etc., with the aerating jet in operation; also the lower two barriers on section *C*.

The operation is as follows:

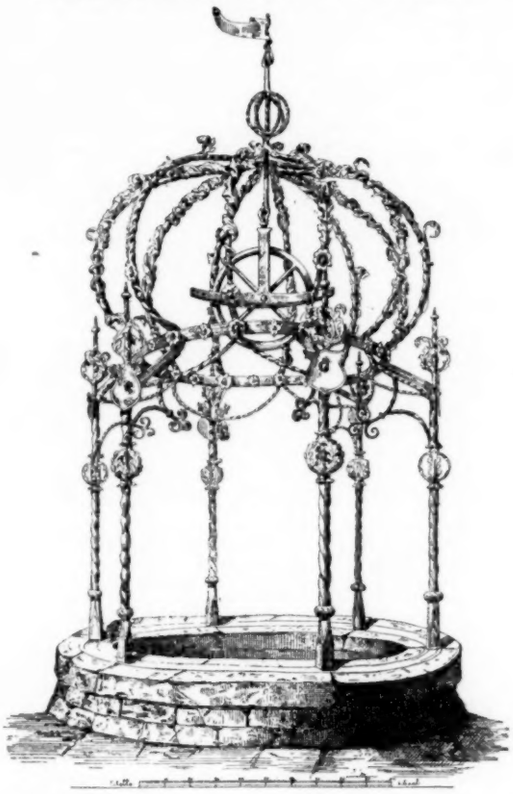
The sewage flows constantly through the incoming sewer and screen chamber into the sewage-tank. When this is nearly full, the valve of the four-inch aerating pipe is opened and both pumps are run at full speed. Sewage is drawn from the tank and is forced up the force main, which has a rise of about 100 feet. So long as the four-inch valve is kept open there is no discharge into the distributing-well, but a very strong flow is established out of the aerating pipe, which plunges into the tank, setting the accumulation of sewage in active motion and filling it with air. One effect of this is to carry off the slight odor the sewage contains; another, and more important one, is to give the sewage a maximum of oxygen. This aerating process is carried on for from sixty to ninety minutes. The four-inch valve is then closed, and the discharge, usually by one pump only, is delivered at the distributing-well, passing out, for example, at gate *A*. It flows in a strong stream along the upper side of the macadam stone, spreads out, and flows rapidly through that stone to the equalizing stone wall at its lower side. It then flows down over the rough hillside, the current being guided by surface gutters and equalized by the cinder banks. As the flow is constantly entering the tank while pumping, it takes somewhat over five hours to empty it. From six to twelve hours elapse before the tank is again filled. The surface flow over the distributing-tract ceases within half an hour after pumping has stopped, the water then having passed off, mainly underground, in a purified condition. Each of the three tracts is used from one to three days in succession, and then has an interval of rest during twice that period, while the other tracts are being used. These three tracts have been in use since September, 1891.

Tracts *D* and *E* were not completed in time to become well covered with vegetation before winter, and they have not yet been sufficiently used to determine whether or not the aeration and agitation of the sewage in the tank is sufficiently important for the gravitation delivery to be given up and a force main substituted.

So far as it is possible to speak from the experience of seven or eight months, the purification of the sewage is absolutely complete and satisfactory. There seems no reason why it should not remain so. In fact there are already indications that the land is improving in absorptive capacity and feeling the improving effect of increased vegetation due to irrigation. During the winter there has been no suggestion of difficulty from frost. GEORGE E. WARING, JR.

SUGGESTIVE FORM OF CONTRACT.

PRINTED FOR THE BOSTON SOCIETY OF ARCHITECTS.



Wrought-iron Well Crown, Now in the Musee de la Porte de Hal, Brussels.

THE following form of agreement is printed in accordance with a vote of the Boston Society of Architects. It is not intended so much as a form for general adoption, as a suggestive form, covering as far as possible all points likely to arise. Each architect is likely to prefer a particular form suited to his special practice. No one form is, therefore, likely to be very generally used, but a form to which each architect can turn for reference in drawing up a contract to meet the special requirements of a given case, or of his general practice, may be widely useful. In addition, the executive committee thought it useful to print the letter of Mr. Louis D. Brandeis, by whom the form was drafted, comparing the form of agreement, as finally adopted by the committee, with that of the American Institute of Architects.

BOSTON, MASS., April 28, 1892.

H. LANGFORD WARREN, ESQ., *Sec'y Boston Society of Architects, Boston, Mass.:* —

Dear Sir, — I have, as you requested, compared the building agreement, as finally approved by your committee, with the form of contract which has been adopted by the joint committee of the American Institute of Architects, the Western Association of Architects and the National Association of Builders, since your Society first consulted me in regard to the preparation of a form of contract. The draft adopted by the American Institute, etc., is in many respects an improvement upon the various forms of contracts which were in use by architects at the time when I was first consulted by your Society. It differs from the form approved by you mainly in the omission of provisions which you deem to be desirable. The principal differences are as follows:

1. Our Section One provides specifically in relation to labor and material, that the contractor shall supply "also, all which are reasonably required for the completion of said building, although not specifically referred to in the drawings or the specifications." The Institute's form of contract uses the expression, "including all lumber and material incident thereto," which is, perhaps, less explicit. Section One of the Institute form makes the architect the agent of the owner, which is objectionable.

2. Our Section Two provides explicitly for a right in the owner to direct alterations in the contract with the consent of the architect. The Institute's contract leaves this to implication. Our Section Two provides as to extra work, that the owner and contractor shall agree, and that in the absence of agreement, the matter shall be referred to arbitration. The Institute's contract makes the architect determine the value of the extra work, giving the right of appeal to an arbitrator. Our Section Two provides that no charge shall be made for extra work, except upon a written order; that the extra work shall be done in all respects conformably to the agreement; that extra work done by the day shall not be charged for, unless a statement of such work done is delivered to architect the week following that in which the work is alleged to have been done; and that any claim of the owner for deductions on account of alterations must be made in writing. The Institute's contract contains none of these provisions.

3. Our Section Three names a day for the commencement of the work, and that no work shall be done in unsuitable weather. The Institute's contract leaves it indefinite when the work shall be begun, and fixes only a time for completion. Our agreement has the parties fix upon any extension of time on account of delays. The Institute's agreement leaves it to the architect.

4. Our Section Four provides that if the work is not commenced at the time stipulated, or if there shall be a failure to prosecute the work for a certain period, or in case of bankruptcy, insolvency, or assignment for the benefit of his creditors, or of an attempt to assign the agreement, the owner may terminate the agreement. The Institute's agreement does not provide for the right to terminate in case of failure to begin work, or in case of bankruptcy, insolvency or of attempt to assign. Our draft provides, that in case of termination, the contractors shall not remove fixed tackle or scaffolding, and for deducting damages due from contractors for breach of the agreement, and freeing the owner from liability for mode of completing agreement. The Institute's contract does not contain these provisions.

5. None of the provisions of our fifth article are contained in the Institute's contract.

6. Our article six provides that the contractor shall dismiss any employee who, in the opinion of the architect, is incompetent, or who has misconducted himself. The Institute's agreement does not.

7. Our seventh section provides for the removal of any condemned material at the contractor's expense. The Institute's agreement does not provide that it may be done by owner at contractor's expense.

8. The provision contained in the first sentence of our eighth section is not found in the Institute's agreement; neither is the provision contained in the second sentence.

9. To our ninth section there is no corresponding provision in the Institute's agreement.

10. To our tenth section there is no corresponding provision in the Institute's agreement.

11. Our eleventh section provides that no payment shall be made to the contractor except after written request; that the architect shall certify that the extra work is included; and for protection against future liens and claims of like nature. These provisions are not contained in the Institute's agreement.

12. As to our twelfth section, the Institute's agreement has no corresponding provision.

13. As to our thirteenth section, the Institute's agreement has no corresponding provision.

14. Our fourteenth section provides that all claims and disputes arising under the agreement shall be referred to the architect for decision, with the right of appeal to arbitrators. The Institute's agreement provides for such reference and arbitration in specific cases only.

15. As to our fifteenth section, the Institute's agreement has no corresponding provision.

16. The Institute's form of contract contains no provisions corresponding to Articles 3, 4, 5, 7, 8 and 9 of the Specifications.

17. Our tenth section of the Specifications leaves it blank who shall effect the insurance, and provides that it shall be in the name of the owner. It provides for a division of the expense and that the insurance shall be in companies authorized to do business in Massachusetts. These provisions differ from those in the Institute's agreement.

18. Besides the differences above indicated, we should call attention to the fact that in the Institute's agreement the contractor is excused from liability for any delays which may be caused "by the unusual action of the elements or otherwise." This clause is so vague, that we think it might render, in a large degree, nugatory the general provision against delays.

Some of the clauses inserted in our agreement, and not contained in that of the Institute, seem to me to be of such importance that you would hardly wish to advise your clients to dispense with them; notably, the provision guarding against alleged oral variations in the way of extra work, etc., and the provisions as to terminating the contract; while the provision of the Institute's contract making the architect the agent of the owner, increases unreasonably the architect's responsibilities. Some of the clauses are of lesser importance. Yours truly, LOUIS D. BRANDEIS.

AGREEMENT.

THIS agreement, made this —— day of —— 18—, by and between —— of ——, party of the first part, hereinafter called the owner, and —— of ——, party of the second part, hereinafter called the contractor.

WITNESSETH: The contractor agrees as follows:

1. *Work to be done.* To build completely a certain —— to be erected on —— and to furnish all the labor and materials for that purpose; all to be of the best quality unless otherwise specified. The contractor shall perform this work under the direction of —— hereinafter called the architect, without assigning or sub-letting the whole or any part thereof, except with previous consent in writing of the architect, to —— satisfaction and in accordance with —— plans and specifications, including all labor and materials provided for either in the drawings or in the specifications, and also all which are reasonably required for the completion of said building, although not specifically referred to in the drawings or specifications. The contractor shall apply to the architect for whatever further drawings or specifications may be necessary to explain the work to be done, and shall conform to such additional drawings and specifications as if they had been originally part of this agreement, provided they are reasonably consistent with the original plans and specifications, which being identified by the signatures of the parties hereto, are to be deemed a part of this agreement.

2. *Extra Work. Alteration.* The owner may, with the consent of and through the architect, at any time direct any alteration in, addition to, or omission from the plans and specifications or work above mentioned, and the work so ordered shall, in all respects, be governed by the provisions of this agreement as if it had been originally provided for in the plans and specifications. The contractor shall not, on account of such alteration or addition, be allowed any further compensation or any extension of time for the completion of the whole work, unless he shall within —— days of the receipt of such order send to the owner, through the architect, a request in writing for such additional compensation or time demanded, and thereupon the owner and contractor shall, in consultation with the architect, agree what additional compensation and time, if any, shall be allowed. If they cannot agree, the question shall be decided by arbitration as hereinafter provided for. In no event shall additional time and compensation be allowed for any work or material furnished unless such work shall have been performed or materials furnished in pursuance of a written order, followed by a written request on the part of the contractor, as above provided. In case of a claim for extra work by the day, no amount shall be held to become due on account thereof, unless a statement in writing of such day's work is delivered to the architect not later than the week following that during which the work is alleged to have been done. In case of any omissions from the plans or specifications, made upon a written order of the owner, reasonable deductions shall be made from the amount hereinafter agreed to be paid, if, at the time of giving such order, the owner shall, in writing, claim such deduction, and if the parties cannot agree to the amount so to be deducted, the question shall be decided by arbitration as hereinafter provided. And it is mutually agreed that the architect shall have the right to direct such changes in construction as in his judgment shall become necessary or desirable during the progress of the work, provided that the same shall involve no additional expense, and provided that, should such change make the work less expensive, a reasonable amount shall be deducted from the contract price hereinafter agreed to be paid.

3. *Time for doing the work.* The contractor shall commence the work on or before the —— day of —— 18—, or within —— days after the delivery of the premises to the contractor, and delivery of copies of the contract, drawings and the lines and levels of the building, whichever shall later happen, and shall at all times thereafter prosecute the work diligently and complete the same and any additions thereto or alterations thereof, within —— months from the day when the work should have been commenced as above provided, without performing any part of said work in unsuitable weather. Upon failure to complete the work at the time so fixed, the contractor shall pay to the owner the sum of —— dollars for each day after said time and until the work is completed, such payment to be taken as liquidated damages and not as forfeiture. Provided, however, that if, during the progress of the work it shall be damaged or destroyed by fire; or if it shall be obstructed or delayed by the acts or omissions of the owner or of some person who has entered into an independent contract with the owner, for work on, or materials for the premises; or if there shall be any delay caused by a strike or lockout in the building trades, then the time for completing the work shall, at the request, in writing, of the contractor, made within —— days after such damage has occurred or such delay has commenced, be extended by such time as is reasonably necessary to repair the damage, or to compensate for the delay thus occasioned, and as shall be agreed upon in writing, to be signed by the parties and to become a part of this agreement. If the parties do not agree upon the extension of time thus to be allowed, the question shall be determined by arbitration as hereinafter provided.

4. *Right to terminate agreement.* If the contractor shall not commence the work hereunder within —— days after the time above stipulated; or if he shall at any time thereafter, during the continuance of this agreement, fail for the period of —— days after notice in writing from the owner or the architect, to employ a sufficient number of competent workmen, or supply sufficient materials of proper quality; or for such period shall fail in any other respect to prosecute the work in conformity with the provisions of this agreement; or if he shall become bankrupt or insolvent or make an assignment for the benefit of his creditors; or, if he shall, without the consent in writing of the owner, attempt to sub-let or assign his interest or any part of his interest in this agreement; in each of these cases the owner may, upon notice in writing given to the contractor, terminate his employment under this agreement, and may forthwith enter upon and take possession of the premises and of all materials thereon, and employ any other person or persons to complete the work. In such event no scaffolding or fixed tackle of any kind, belonging to the contractor shall be removed, so long as the same is needed for the work by the owner. If the expense of so completing the work shall exceed the unpaid balance of the sum agreed to be paid the contractor under this agreement, the contractor shall pay such excess to the owner upon the final completion of the work. After the termination of the agreement as above provided, no payment shall be made to the contractor until the work shall have been completed as above provided, and the total cost thereof finally ascertained. From any balance so due the contractor at the time of so terminating the agreement, the owner may deduct the damages for breach of the agreement by the contractor, and the owner shall not be liable to the contractor in any way for the manner in which the work has been completed.

5. *Indemnity to owner.* The contractor shall conform, and cause his agents and employees and any sub-contractors to conform, to all laws, ordinances and regulations, which, during the continuance of the contract, shall be in force where said premises are situated, relating to the operations to be carried on under this agreement, and the contractor shall assume and indemnify the owner against all liability, loss or damage whatsoever, arising either from the violations of such laws, ordinances or regulations, or from the injury to any persons or property, including breaches of contract which shall arise from the negligent acts, omissions or delays of the contractor, his agents, employees, or any sub-contractor, under whatsoever supervision any of them may be acting. Among other things, where there are other contractors employed on the work, each shall be responsible to the other for all damage to work and persons or property, or for loss caused by neglect, by failure to finish work at the proper time, and preventing such portion of the work being finished by the several contractors at the dates named in this agreement for its completion or for any other cause.

6. *Improper work, materials, or workmen.* The contractor shall, within —— hours of receipt of written notice from the architect, remove any material from the premises condemned by —— and proceed forthwith to take down any portion of the work which —— shall deem as unsound or improper, or not in conformity with the drawings and specifications, or dismiss any employee who, in the opinion of the architect, is incompetent or has misconducted himself.

7. *Default by contractor.* If the contractor, after written notice, shall refuse or for —— days omit to perform any specific work or supply any materials for any specific work, or to remove any objectionable work or materials, the owner may provide for, or remove such work or materials, and reimburse himself by deducting the cost thereof from any money then due, or thereafter to become due, to the contractor herein. The certificate of the architect of the cost to the owner of so providing such labor or materials, shall be final and conclusive between the parties hereto.

8. *Damage to work. Loss of material.* The owner shall not be accountable for or affected by any loss or damage which may happen to said building, from any cause, nor for any other articles or material used or employed in or about the same, during the period of construction, nor until he shall be notified in writing by the contractor of the full completion of the same. The owner shall not be responsible for any damage arising from any alleged act or omission by him, his agents or servants, unless notice in writing is given him by the contractor, within three days after he has knowledge of said act or omission.

9. *Foreman.* The contractor shall supply a competent foreman of the work, satisfactory to the architect.

10. *Vouchers.* The contractor shall, when required by the architect, produce for inspection all vouchers showing the quality of the materials used.

11. *Payment.* The owner will pay to the contractor the sum of —— as the work progresses, subject to additions and deductions on account of alterations as hereinfore provided, such sum shall be paid in instalments as follows:

Provided, however, no payment need be made until ten days after a request in writing to the owner therefore, accompanied by the delivery of a certificate signed by the architect, that this agreement has been fully performed by the contractor up to the date of such certificate, which shall also state the amount earned on the contract up to the date of the certificate; and a further certificate of the proper officials that the premises are free from any lien or encumbrance for the work or materials furnished by or to the contractor under this agreement, and thereupon the contractor shall be entitled to receive —— per cent of the amount so certified to have been earned. Payments made to the contractor during the progress of the work shall be deemed general payments on account, and the certificate of the architect on which such payments are based, shall be held to have been given only for the purpose of fixing the sum then to be paid, and no such payment shall be deemed an acceptance of defective work, or a waiver of any right of the owner, nor be held to prejudice the final settlement of account. In —— days after the final completion of the work herein contracted for the owner shall pay, upon the presentation of a certificate of the architect that the same is due and includes all extra work, the balance then unpaid and due of the full contract price of the work contracted for; but no payment shall be considered due until the contractor shall furnish to the owner satisfactory evidence that the building is free of and unencumbered by any lien of mechanics, labor or material-men, and shall also give to the owner such reasonable and proper protection as may be required against all future liens and claims of like nature. At the time of final payment, all plans, drawings and specifications shall be returned to the architect.

12. *Architect's Substitute.* In case of the absence or temporary disability of the architect, —— representative duly appointed by —— in writing, shall, for all purposes, be substituted for the architect herein named. In case, for any reason, the architect herein named shall cease to act for the owner, any architect appointed in writing by the owner who is a member of the Boston Society of Architects, shall, for all purposes, be substituted for the architect herein named. In either case, the representatives of the architect so appointed or substituted shall possess all the power hereby provided to be exercised by the architect specifically named.

13. *Agent of owner.* Any person appointed by the owner in writing as his representative, shall have the authority and exercise the power herein granted or provided to be exercised by the owner.

14. *Arbitration.* All claims and disputes arising under this agreement shall be referred by the parties to the architect for decision, and except in those matters as to which such decision is hereinbefore declared to be conclusive, either party dissatisfied with such decision

may, upon giving ten days' notice in writing to the other party, have the question referred to three arbitrators, to be chosen one by each of the parties hereto, and the third by the two so chosen. Each of the parties hereto shall pay one-half the expense of such reference. If such notice of appeal is not given within ten days, the decision of the architect shall be final.

15. *Supplemental agreements.* Neither party shall make any claim upon the other based upon any alleged verbal agreement supplementary to or in alteration hereof.

IN WITNESS WHEREOF, the owner and the contractor have hereunto and to another instrument of like date and tenor, set their hands on the day and year first above written.

SPECIFICATIONS: GENERAL CONDITIONS.

1. *Inspection.* The contractor shall at all times during the progress of the work, afford the owner and architect, and any person thereto authorized by either of them, free, safe and convenient access to all parts of the building for the purpose of inspection and criticism.

Protection to work. 2. The contractor shall at all times keep the work properly protected, and shall use proper precautions to prevent injury thereto.

3. *Night watchman.* The contractor shall, whenever requested in writing and so long as required by the owner, furnish a night watchman for the premises, and shall receive for each night's watch so required, in addition to the compensation above provided, the sum of —— dollars.

4. *Premises to be left clean.* The contractor shall remove all dirt and rubbish resulting from his operations from time to time as the architect may direct, and shall, upon the completion of the work, leave the premises and the whole of the work clean, whole, tight and fit for occupation.

5. *Drawings.* All the work shown on the drawings is intended to be correct according to the scale at which the drawing is made; but figured dimensions and detail drawings are in all cases to be followed, though they differ from the scale measure. The architect will supply full-size drawings of all details, and any work constructed without such drawings, or not in accordance with them, must be removed and replaced at the contractor's expense.

6. *To whom Drawings belong.* All drawings and specifications are the property of the architect, and must be returned to him on completion of building. The final payment will not be made until they are so returned.

7. *Obtaining licenses, etc.* Each contractor shall give to the proper authorities all requisite notices relating to the work in his charge; obtain all official licenses for temporary obstructions, enclosures, etc.; be responsible for any accidents resulting from either contract or extra work under his charge; make good any damage, injury or delay caused by him to other contractors, to neighboring premises or sidewalks, or to the person and property of the public, which he or his workmen may occasion; and comply with all city or town rules, and pay all city or town fees.

8. *Water.* Each contractor is also to pay for city or town water used in his work.

9. *Repairing defects.* The contractor will, at any time or times within twelve months after the completion of said building, at the request of the owner, without any charge or claim of compensation therefore, make any repairs in the work undertaken or done by him, and will also indemnify the owner for any damage that may occur to him by reason of the defects which rendered such repairs necessary; provided such repairs or damages were not occasioned by the fault of some other person who entered into an independent contract with the owner, or a wrong doer.

10. *Insurance.* The —— shall, in the name of the owner, effect insurance against loss or damage (in companies authorized to do business in Massachusetts) to cover both the interest of the contractor and of the owner in the building, and the material in or about the same, payable to the parties as their interest may appear; one-half of the expense of such insurance to be paid by each of the parties hereto.

MUD, A MATERIAL IN PERSIAN AND EASTERN ARCHITECTURE.[1]

Fig. 1. The Meshed Gate, New Sarrakhs, on the Heri Rud.

IT is necessary to premise that under the term "Mud" I include sun-dried bricks. When bricks have been burnt in the fire the material becomes entirely changed, and ceases to be mud, so I exclude them from consideration in the present paper as a building material. Wet earth made into blocks and dried in the sun differs in no way from a layer of the same laid on a wall.[2] Both methods were used in the East, and often combined in the same building. The reason for this is soon found out if you attempt to raise a mud wall. A layer of two or three feet thick must be allowed to dry and consolidate before another is placed on it, because the weight above would press out the soft material below, and the whole would tumble down. In some localities a layer of mud is put down at the commencement, and while that is drying, bricks are made to be placed above.

It was during the cold season of 1884–85, in travelling through Persia at the time of the Afghan Boundary Commission, that the importance of mud in connection with building and architecture first

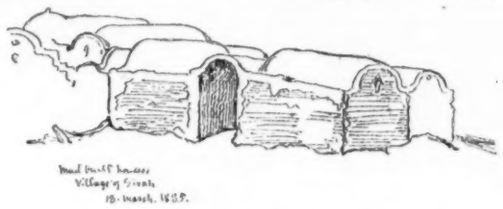


Fig. 2. Mud Built Houses, Village of Sivah, Khorassan.

attracted my attention. I had to pass from Teheran eastward, through Khorassan, and into Afghan Turkestan.[3] Along the whole of this route mud is the building material. Some of the serais, that is, caravan serais for the accommodation of travellers, are of burnt bricks, but these are about the only exceptions. Not only villages, but large towns, are built of mud or sun-dried brick. The defensive walls are of the same material; even such large towns as Sabzawar, Nishapur and Meshed are fortified with walls of this kind. Fire-burnt bricks may have been more frequently used in former times, that was, when the country had been more prosperous and before Turkoman raids began. On the remains of former towns a few fire-burnt bricks[4] might be seen scattered about, but the great mounds seemed nothing but earth, suggesting that these were the exceptions. On realizing this almost exclusive use of one building material in one region, my mind naturally recalled what I had seen in India, where, although stone and fire-burnt brick are largely used, yet the villages are over very large districts wholly constructed of mud. In Afghanistan it is the same. The fort at Peshawur, which was Afghan territory up to Runjit Singh's time, is a mud one. Jellalabad is surrounded by a mud wall. From the Khyber Pass to Teheran the towns and their defences, as well as the villages, are almost identical in their material as well as in their general appearance.

These statements show that over a large geographical space in the Eastern world the building material at the present day is almost exclusively mud. I have been thus far speaking of what I have seen with my own eyes. To this may be added the practice of other countries. I believe that it is the same over most of Central Asia. It is now accepted that in Mesopotamia it was largely employed; and we know that in Egypt, from the earliest times to the present day, it has been the principal means employed in structural erections. It was largely used in Greece in ancient times and also in

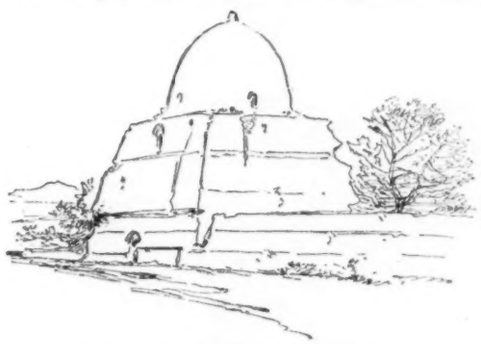


Fig. 3. Tomb constructed of Mud with Dome.

Spain. It was known in South America and all along the Pacific Coast, from Peru to San Francisco. The word "dobies" for sun-dried bricks is a familiar term — this is derived from the Spanish word *adobes*.[5] In 1873 I visited the original church dedicated to

[1] Society of Arts: a paper read before the Applied Art Section, May 17, by William Simpson.

[2] Bricks of this kind, "when placed one upon another after being imperfectly dried, combined, under the influence of the weather and their own weight, into one homogeneous mass, so that the separate courses became undistinguishable. This latter fact has been frequently noticed in Assyria by those who had to cut through the thickness of walls in the process of excavation."—(Perrot and Chipiez, "*A History of Art in Ancient Egypt*," Vol. I, p. 113.)

[3] In "*Experiences on the Afghan Frontier*," by William Simpson, *Journal of the Society of Arts*, March 26, 1886, details of the journey will be found.

[4] At Kala-i-Maur, on the Khushk, he measured some fire-burnt bricks which were 11¾ inches square, and the thickest were 2¼ inches thick. Another was 10¾ inches square. There was an oblong brick 7½ inches long. It looked much like our own bricks, but it was only 1½ inches thick. Perrot and Chipiez state that the ancient bricks in the Euphrates Valley were from 15½ to 15¾ inches square, and from 2 to 4 inches thick. Persian sun-dried bricks are about 8 inches square and 2 inches thick.

[5] *Adobes*, or *dobies*, is probably a variant on the Arabic *tob* or *toob*, allied again to the Coptic *tobi*, which was also the Egyptian word for brick.

St. Francis, and which gave its name to the now well-known town in California — this church was constructed with "dobies." Mud houses were not uncommon in England in the past; and they are yet known in Devonshire, where the stuff they are constructed with is called "cob." I might largely increase this list of localities, but enough has been given to show how extensively mud has been

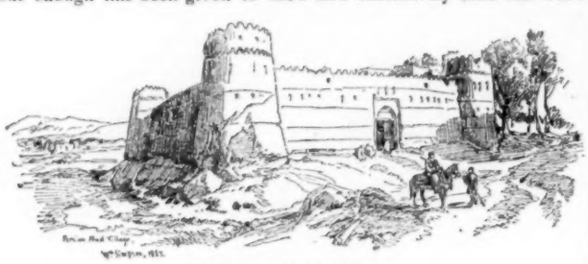


Fig. 4. Persian Mud Village.

used in the past as well as in the present for building purposes. I am under the impression that its importance in connection with building has hitherto been overlooked. The lithic architecture of Greece having been traced back to wooden forms has led to the study of wood as an early structural material; and up to the present little or nothing has been done with mud.

Owing to this it has been generally assumed that wood supplied the first means by which the primitive man had formed a shelter to himself as a protection from the weather. The Australian native, as he was represented some years ago at the Colonial Exhibition, was a good example of the simple beginnings of wooden architecture; but a very slight consideration will bring to the mind the possibility that the use of mud might at least be equally primitive. It would all depend upon where the primitive man found himself; if trees were scarce, or none whatever were to be found, the wetting of earth and raising a wall with it must have been very soon discovered. The children making "mud pies" might have given the first hint. Once begun, the progress of mud architecture would be considerable. Those who began their architectural style with branches of trees could not have made any advance until some kind of implement was invented, by means of which the wood could be cut and fashioned; and the Stone Age, when stone tools came into use, is a comparatively late one in man's history. The mud builder, on the contrary, required no tools; his hands were sufficient for every purpose. He may have been content at first with an enclosure formed by four walls. A covering of grass or reeds would soon suggest itself; this, although rude and primitive, would be the first complete human habitation. But more than that, it would be the beginning of the "house" — the "home," which, from the relations and associations it produced, must have been one of the most important steps in the history of early civilization. This, of course, is only a speculative suggestion as to what took place, but in the nature of the conditions it is a probable one. We find a confirmation of this when we remember that the Nile Valley and Mesopotamia, two preëminently mud-building regions, are now noted for their very early civilization.

The great antiquity of the use of mud as a building material can be established from a number of references to history. Like most things that were important to man in his early condition, this can be traced back even to the mythical period. In Persia, at least, we have traces of it. Firdusi, in the "*Shah Namah*," relates how Jemshid, now known as a mythical personage, introduced a better civilization among the people. Among the improvemonts it is told how, "He taught the unholy demon train to mingle water and clay, with which, formed into bricks, the walls were built, and then high turrets, towers and balconies and roofs, to keep out rain and cold and sunshine." It is naturally inferred that the bricks made by the Children of Israel in Egypt were sun-dried from the use of the straw in them. The making of bricks is often represented in the sculptures of Egypt. M. Maspéro thus describes the process: "The ordinary Egyptian brick is a mere oblong block of mud mixed with chopped straw and a little sand, and dried in the sun. At a spot where they are about to build, one man is told off to break up the ground; others carry the clods and pile them in a heap, while others again mix them with water, knead the clay with their feet, and reduce it to a homogeneous paste. This paste, when sufficiently worked, is pressed by the head workman in moulds made of hard wood, while an assistant carries away the bricks as fast as they are shaped, and lays them out in rows at a little distance apart to dry in the sun."[1] As to the speed with which these bricks could be made, M. Maspéro has to judge from the workmen of the present time, and he says that a modern good workman can easily mould 1,000 in a day, and that after a week's practice he may be able to produce 1,200 or 1,500, and some can turn out as many as 1,800. As the modern appliances are the same as were used in former times he assumes that the results would be similar. The dimensions generally adopted for ordinary bricks were 8.7 by 5.5 by 4.3 — I presume these numbers represent inches. A larger size were 15.0 by 7.1 by 5.5.[2] He says, "Burnt bricks were not often used before the Roman period." In a note he adds that such bricks "are found of Ramesside age at Nebesheh and Defenneh; even there they are rare, and these are the only cases I have yet seen in Egypt earlier than about the third century A. D." This note is valuable from its showing how exclusively sun-dried bricks must have been the rule in ancient Egypt.

Mr. Flinders Petrie has, in his explorations, come upon, in more than one instance, what might be called the "foundation-stone" of Egyptian buildings, but as there was no stone, but a number of articles, such as gold, silver, lapis-lazuli, etc., a more exact term to give it would perhaps be that of "foundation deposit." Among the articles, and generally in a very central position, he always finds a small model of a mud brick.[3] This will show that along with the other objects it had most probably acquired some symbolic signification.

Maimonedes gives a description of building mud walls. He says, "The builders take two boards, about six cubits long and two cubits high, and place them parallel to each other on their edges, as far apart as the thickness of the wall they wish to build; then they steady these boards with pieces of wood fastened with cords. The space between the boards is then filled up with earth, which is beaten down firmly with hammers or stampers; this is continued until the wall reaches the requisite height, and the boards are then withdrawn."[4] I understand that this is taken from the Talmudical authorities, but the great Rabbi does not explain in what part of the world it was practised.[5]

Sanchoniathon, or whoever it may have been that wrote under that name, mentions Chrysor, and identifies him with Vulcan, as having invented many useful things; and it is quoted that "Men worshipped him after his death as a God, and they called him Diamichius, *i. e.*, the Great Inventor, and some say his brothers invented the making of walls and bricks. After these things of his race were born two young men, one of whom was called Technites, *i. e.*, the Artist, the other, Geinos Autochton, *i. e.*, Earth-born, or generated from the earth itself. These men found out how to mix stubble with clay, and to dry the bricks so made in the sun."

According to Professor Sayce, the Assyrians had a month called Sivanu, which he translates the "month of making bricks." The Accadian name had the same signification, and it corresponded to the month of May. This would be the season after the rain, when the sun had begun to be hot, and the drying of the bricks would be easily accomplished.

These references will show at least how important this building material must have been looked upon in very early times. Its first use or invention was ascribed to mythical personages, thus attributing to it a kind of divine origin. In our own age it is difficult to realize how such ideas could have existed in the past, but from the authorities quoted there can scarcely, I think, be much doubt on the subject.

I shall now give a few details of the manner of building in mud, most of which are derived from what I saw in Persia. Many of the methods I saw there I have since found are also practised in other parts of the world.

It was pointed out to me that in the larger towns, on entering a house, you have often to descend from the level of the street to the ground floor. It was explained that this results from utilizing

Fig. 5. The Mud Walls of Nishapur, Khorassan.

the earth on which the house stands, and thus save the expense of transporting the building material from outside the town.

In good houses a foundation is laid, varying from two to four feet in depth, formed of rough stones or broken fire-burnt bricks, and piled up with mud and lime. This is carried up a foot or so above

[1] "*Egyptian Archæology*," p. 3.

[2] In a note at the end of the volume the author says that, "In the Delta at least the sizes of bricks, from the Twenty-first Dynasty down to Arabic times, decrease regularly. Under the Twenty-first Dynasty they are about 18 by 9 by 5 inches; early in the Twenty-sixth, 16½ by 8½ by 5; later, 15 by 7½; in early Ptolemaic times, 14 by 7; in Roman times, 12 by 6; in Byzantine times, 10 by 5; and Arab bricks are 8 by 4, and continue so to our times." Persian sun-dried bricks at the present day are generally about 8 by 2.

[3] In the *Illustrated London News* for September 11, 1886, drawings of these objects, with their relative sizes and position, are given.

[4] *Transactions of the Society of Biblical Archæology*, Vol. VIII, p. 409.

[5] The Hebrew word for brick is *Lebanah*. This also means "white." The term is also applied to the moon, owing to its whiteness. Rawlinson, in his "*Herodotus*," suggests that there was some connection between the word "brick" and *Sin*, the Babylonian deification of the moon, who was God of Architecture. This would be a very interesting point if it could be established, but I understand that it is as yet doubtful.

the ground, before the mud wall is commenced. In villages, where everything is rude, this foundation is made of any kind of rubbish that is found handy. This is a very interesting feature of mud architecture, to which I shall have something to say farther on. Its object is no doubt to give strength where the wall would be liable to friction from the street traffic, and probably to prevent, to a certain extent, damp from rising. It would also be a safeguard against another serious danger — that is, if water were to accumulate by any chance round the base of the mud walls, and remain long enough to soak through, a very serious catastrophe might take place from the house tumbling down. I cannot recall to my memory any foundation of this kind in the mud-houses of India. Village houses in the northwest of that country are usually built on a *chabootra*, which is a raised platform of mud, about a couple of feet in height, and this forms the floor of the house. This platform, by raising the foundation of the walls above the ground, may perhaps serve some of the purposes of the layer of stones in the Persian foundations.

The walls of Persian houses vary from two to four feet in thickness. This depends entirely on the quality of the house and the means of the builder. Thick walls make a cool house, and that is a desirable thing in the climate of Persia. If upper rooms are required a greater strength of wall will be necessary. The mud is either laid on in layers or in the form of bricks.[1] As already explained, a layer of two or three feet of mud must be allowed to dry to a certain extent before another is laid on it, else the soft mud below will give way from the weight above. On this account both methods are generally practised. I remember an officer who tried to make a mud-hut for himself, when General Sir Samuel Brown's force was in Jellalabad. In this case the walls were run up at once the full height required; this was not very high, for it was a small place, and he had dug a foot or two down below the surface for his floor, but his walls tumbled in. When he adopted the system of layers — letting each dry before the other was laid on — he succeeded, and made a very comfortable place for himself. In garden walls hollow bricks are used for the top, to give lightness. These bricks are called *sanduk*, a word meaning "box," which is descriptive of their character.[2] The tendency in mud building to produce thickness below in the walls and lightness above, is most marked in the walls of villages and towns. These are all built with a visible batter. The earth taken out to form the ditch gives an abundant supply of material for a town wall, and a thick, solid mass at the base is necessary to give strength to the defence.

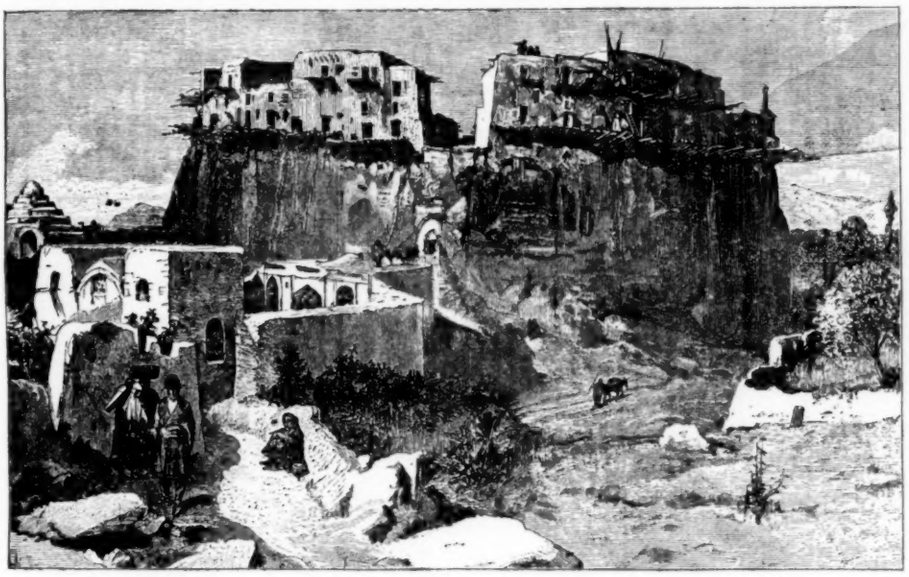


Fig. 6. Lasgird.

Where wood is plentiful, as in the province of Mazenderan, flat roofs are the rule. In large districts of Persia wood is scarce. I understand that south of Teheran there is very little timber, and there is also great danger from the white ants, so the vault or barrel-roof is the usual means employed. According to Strabo it was the same in Mesopotamia. He says, "All the houses are vaulted on account of the want of timber."[3] These vaulted roofs were frequent enough along the route I travelled. I have seen whole villages with them. Square buildings would have a dome, and a semi-dome at one end of a barrel-roof seemed to be a favorite method in that part of Persia. What struck me with surprise was the facility with which these villagers could construct such roofs. If there was any irregularity in the plan of the house, the barrel-roof was extended or drawn in, as the case might be, to cover the space. Of course in the villages it was all a very rough-and-ready kind of work, evidently done by no better principle than that of rule of thumb.

I was still more surprised when I learned that these vaulted roofs were constructed without centres. I can suggest so far how this is accomplished. Their bricks are said to be about eight inches square and only two inches thick; this gives a large, flat surface and not a very heavy brick for its size. They place these bricks, not perpendicularly, but at an angle, so that the one rests partly on the other, and by the use of a little *gatch*, or gypsum, which is plentiful in Persia, they can be made to adhere till the key-brick is put in. Perrot and Chipiez give a drawing of an arched conduit at Khorsabad,[4] where the bricks are shown in the construction almost similar to what I have just described, and I feel sure that these conduits were also made without centres. In describing the construction of these conduits, the writer says: "We may believe the notion of building in this way would never have occurred to the Assyrian architects but for their habit of dispensing with timber centres."

As the possibility of forming a vaulted roof without centering may be new to many in this western part of the world, I shall add further evidence, which is supplied by Perrot and Chipiez. They say: "We may refer those who are especially interested in constructive methods to M. Place's account of the curious fashion in which the workmen of Mossoul will build a pointed vault without the help of any of those wooden centerings in use in Europe. In our day, certainly, the masons of Mossoul use stone and mortar, but their example none the less proves that similar results may once have been obtained in different materials. A vault launched into mid-air without centering, and bearing the workmen who were building it on its unfinished flanks, was a phenomenon calculated to astonish an architect."[5] Rich gives details of a similar method, which is practised in Bagdad. It also affirmed that the Byzantine architects produced arches, if not domes, without the aid of centres. M. Place[6] describes one method of making vaults without centres which he saw in Kurdistan, and in this case they were women who performed the operation. They placed rings of dried clay, each smaller than the other, till the dome was completed. The evidence of these authorities, added to what I learned in Persia, would seem to establish that this was the practice over all the wide space from the Mediterranean to Central Asia.

In Persia, the mud walls are covered over with a mixture called *kahgill*,[7] which is composed of mud and chopped straw; this serves to prevent the rains from washing away the walls, as it hardens the surface. The application of this mixture is generally repeated every two years.

Thus far I have been dealing mainly with details of construction and with ordinary dwellings. The general impression in most minds will, no doubt, be that mud building only belonged to a rude condition of civilization, and produced houses that were little better than hovels. I have now to point out that this manner of building was developed into a highly decorative style, which, in itself, would entitle it to a place in the history of architecture. This position, it appears to me, has been almost entirely overlooked by those who have written histories of architecture. Architectural writers always treat upon primitive wood constructions, because forms can be traced from it up to the highly-developed styles of Greece, Egypt and India. The same process can now be gone through with the primitive mud as a building material. Before I have done I shall point out architectural forms which owe their origin to this source.

[1] Sun-dried bricks are called *khest* in Persian; the fire-baked bricks are *ajur* or *aujur*. In Afghanistan *khist* is used for both burnt and unburnt bricks. *Gill*, with a hard *g*, is Persian for mud.

[2] This recalls an old practice of Eastern architects in constructing domes with pots, thus producing a considerable reduction of weight and consequent diminution of thrust. A well-known example of this is the dome of St. Vitale at Ravenna.

[3] *Strabo*, B. xvi, ci, 5. See also B. xvi, ciii, 10.

[4] See "*History of Art in Chaldea and Assyria*," Vol. I, p. 232, Fig. 93. See, also, Fig. 92, p. 229.

[5] "*History of Art in Chaldea and Assyria*." By Perrot and Chipiez. Vol. I, p. 167.

[6] "*Ninive et l'Assyrie*," Vol. I, pp. 266–267. The church of Mousta, a town in the centre of the island of Malta, was built in the present century by the local masons, and they constructed the dome, said to be the third largest in Europe, without centres.

[7] The word is *kah* = straw, and *gill* = mud. In Indian villages, the mud floors are washed over with a thin mixture of mud and cow-dung.

At present, my purpose is to show that it was carried to a pitch of finish and refinement that rendered it worthy for the palace or the temple. The following letter, sent to me by General Sir Charles Wilson, would in itself be a sufficient evidence. Sir Charles is well acquainted with Western Asia, and, being an engineer officer, he may be trusted as an authority. He says: "It may interest you to know that in Anatolia there is much mud-building, and that most of the great buildings of the Seljuks, more especially their great palace at Konieh, were of mud, faced with glazed tiles. Some of the minarets of their mosques, built with sun-dried bricks, arranged in patterns and faced with glazed tiles, or with the ends of the bricks glazed, are extremely beautiful in their decay. The Seljuk architecture is Persian, with a development of its own." Here are mosques, or temples, and a palace constructed with sun-dried brick, which are declared by this high authority to be beautiful even in their decayed condition.

A somewhat similar development was reached in Peru, but with different materials. Squier, in his "*Land of the Incas*," describes the palace of Chimu, where the *adobes*, or sun-dried bricks, were covered with stucco, on which beautiful arabesques were produced in relief. From these ornaments, he calls one of the great apartments the "Hall of Arabesques,"[1] of which he speaks in warm admiration, and adds: "No description can give an idea of the character of these *rilievos*." In describing other ornamentations of the same kind, he says: "Here, as elsewhere, there are traces of color."[2]

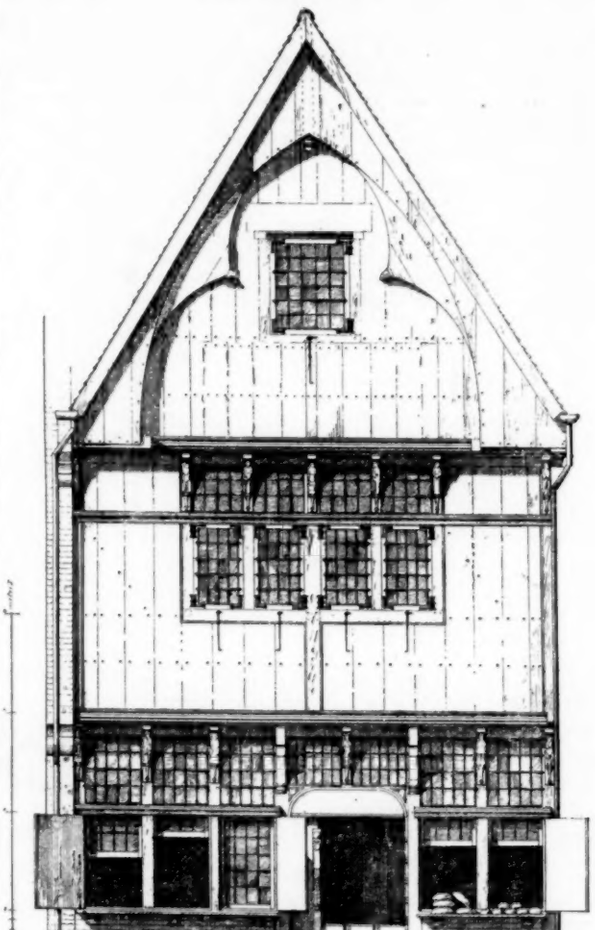
I understand that the higher developed condition of this style of architecture in Persia was attained by covering the mud walls with glazed tiles. The tiles, it must be understood, were covered with ornament. Those who are familiar with the artistic qualities of Persian tiles may be able to form some idea of what could be thus produced. I regret to say that I saw very little of it. The part of Persia through which I passed had been so utterly devastated by the Turkoman raids, scarce a vestige of anything ancient remained. At Meshed only I saw a gateway built with sun-dried bricks and covered with ornamental glazed tiles, but it was a very poor specimen of art; yet it told me what might be done in this style if the work could be put into the hands of real artists. Meshed is celebrated and is a well-known place of pilgrimage, from its having the tomb of Imam Reza in it. The shrine is said to be decorated with some very fine tiles, but the whole enclosure, which is in the centre of the city, can only be entered by the faithful.

The interior of a mud building may also be decorated with glazed tiles; but in Persia *gatch*, or gypsum, is plentiful, and, where ornament is required, it is much used. In an old tomb at Sarrakhs I saw some particularly good ornament in this material, and it appeared to me to be all handiwork. I chanced to come upon one room that impressed me with the capabilities of this manner of decoration. It was at a place called Mazinan, on the first march eastward within the Khorassan frontier. There appeared to be the remains of more than one town here. I strolled over to that which was nearest, and found that it was all formed of mud. It was rough work scrambling over the heaps, but at last I reached a mass that had probably been the *arg*, or citadel, and here is the description I jotted down at the time, immediately after the visit: "It was with some difficulty that I was able to climb to the top, as the mound had been used as a quarry — a mud quarry — of the building material of the region. The mass forming the mound was artificial, for I found bits of red burnt bricks or vessels embedded in it. The top was a curious maze of rooms, courts, stairs and roofs, much of it in a tumble-down condition, and it was rather difficult to find a way in places. From the superior finish of some of the rooms, I concluded that a governor or some important man had lived in this place of security, but there were ruder additions, which showed that servants, or perhaps, a more simple kind of people, had in all probability used some part of the place at a later time. The solid mass of mud or earth was about twenty feet high, and the houses were above that; still they were not all on the same level, for I went up and down short flights of steps. The whole was of mud or sun-dried bricks. Here I found at least one illustration of what can be done with such material, which, from the high finish it presented, was rather a surprise to me. It was the best room in the place; the dimensions were small, somewhat about fifteen feet by ten feet. The lines of the interior were all perfectly straight, and at right angles to each other. The best houses in London are not more exact or more finished in their details than what I found here. The mud must have been carefully put on at first, but the high finish was produced by *gatch*, or gypsum. There were very handsome niches all round the walls, and the fireplace had been elaborate, but some act of destruction had taken place, and the fragments lay on the floor where they had fallen. The ornament was simple; there were some slight mouldings on the space between the niches. Lines had been drawn into the gypsum, and an ornament had been repeated by means of a stamp which had been pressed or imprinted when wet, producing raised pattern; the impression left was so clean and perfect it might have been gilt, and it would have been quite equal to the work we have at home on picture-frames. The contrast between this highly-finished interior with what was outside was very striking."

[To be continued.]

[1] "*Peru, or the Land of the Incas*," p. 135.
[2] *Ibid.*, p. 154; also at p. 411.

LITHO-CARBON.



Wooden House, Rue de Lille, Ypres, Belgium.

SOME years ago a sportsman was fishing from the bank of an inviting stream south of the centre of the State of Texas. At the base of a pool, a ledge standing edgewise, crossed the stream from one bank to the other, forming a dam, over which the liquid flowed, breaking into foam as it fell. The sportsman undertook to cross the crest of this dam where the water was shallow. As he walked through the thin stream, he noticed that the ledge was yielding, like an asphalt pavement baked in the August sun. Reaching the other shore, he observed that there was a broad, high and clearly developed vein of the same material as that of which the ledge was formed, making into the bank. It was of a dark brown color, and contrasted with the reddish earth on either side. This sportsman was something of a prospector, too. He had found mines in Mexico, Arizona and Idaho. It was, therefore, almost an instinct with him to examine all mineral croppings that came under his observation. With a pocket knife he cut out a lump of the clinging brown vein and looked at it closely. It was a mass of sea shells, held together by sand, covered with a dark sticky film of the color of dark brown sugar, and possessing neither taste nor odor. The presence of the shells, which lay thickly in the whole vein, showed that where he stood the ocean had once ebbed and flowed, but what this deposit could be, or by what action of nature's chemistry it had been formed, was to him a mystery. From the top of the bank his practised eye could detect the outeroppings of the vein, running east and west as far as he could see. Whatever it was, he could see that there lay before him an enormous supply of this strange clinging stuff, mixed with sea shells. Tying his lump of new found mineral substance in his handkerchief, the prospector proceeded toward camp. That night he tried to melt the mass. It would not yield to any heat he could produce. Weeks afterward, in New York, he tried acids on it without avail. He began to feel a curiosity about this stubborn stuff that held its secret so closely. He exhausted his knowledge of the art of reducing minerals, without producing a tangible result. The more he experimented the more was he baffled. But the apparent impossibility of producing results only spurred him to further endeavors. He had a kind of instinctive belief that to every

mystery of the earth there is a key, which, when produced, unlocks a treasure chest. So, when he had exhausted his own knowledge, he took samples of his material to chemical experts wherever he could find them. For a long time this process, too, was without result. None of the scientific men could tell him what it was he had found. One day he received word to call on a chemist to whom he had given a small quantity of the matter some weeks previously. He replied to the invitation in person. In the laboratory he was shown a little heap of white sand and sea-shells lying on the table, while in the bottom of a glass vessel was a quantity of brilliantly black stuff of the density of chilled molasses. This matter, the chemist explained, had been extracted from the combination of sea-shells and sand by the application of a bath of common benzine. Where all the scientific methods of reduction had failed to make an impression, a benzine bath instantly dissolved the sticky film and separated it from the sand and shell. Quantities of the material were quietly brought to New York, and a series of experiments followed, covering a period of more than two years' time. Dr. Frederick Salathe has conducted the various examinations which have unsealed the secret of the Texas mineral, to which he has given by reason of its various properties, the title litho-carbon. He has discovered that it makes an almost perfect insulator; that it may be used as a paint that will resist the action of heat, salt air, salt or fresh water, gases or other influences that destroy the paints now in use; that it will make a perfect varnish which the ammonia gases of the stable will not tarnish, and that will remain undisturbed under all atmospheric conditions; that it may be rolled into a tissue that is free from odor, and practically indestructible when employed in the making of mackintoshes, canvas belting, waterproof tents, etc.; that it possesses peculiar powers of penetration when applied at high temperatures, enabling it to enter and fill the pores of iron and steel, making these metals impervious to acids, etc., making common leather waterproof, and that it may be applied to wood-pulp in such a way as to transform that material into what looks and acts like ebony or horn. These claims of Doctor Salathe have been verified by examinations of technical experts in each of the directions mentioned, as is attested by well-known men who have sifted the claims. Accepting all this testimony it will be seen that a revolution is likely to occur in many important fields of commerce. It is possible to saturate a steamship plate in hot litho-carbon and produce a remarkable result. Thus prepared that plate will not be touched by barnacles, can never rust and will not foul. Covered with a layer of paint made of this matter, a ship or a seaside house will resist the action of atmosphere or water. A portion of the smokestack of the steamer "*Dean Richmond*," where the heat, by the use of a "blower" rises to 800° Fahrenheit, was painted with litho-carbon months ago, and remains undisturbed and unblistered, while other parts of the vessel have necessarily been painted many times. A shingle covered with litho-carbon paint has lain for months in a tank of salt water in a paint warehouse down town, without showing change, while another shingle covered with the best previously known paint, has received coating after coating, to preserve its surface. A piece of sheet-iron covered with litho-carbon japan, was subjected to an actual heat of 415° Fahrenheit without crack or blister, and remains so tenacious that the iron may be bent at any angle without disturbing the glossy surface. The insulating qualities of the Texas product have been tested variously. Professor Hamilton, electrician of the Western electric company, certifies that under tests executed in the most exhaustive manner, a wire prepared with a covering of litho-carbon showed a resistance of over 7,000 megohms per mile. He adds that no other known wire shows a resistance of 1,000 megohms per mile. He reports also that braided or naked wire, merely soaked in litho-carbon liquid, will be covered with a film, notwithstanding temperatures up to 600° Fahrenheit, and that a thin film insures perfect insulation. In the transportation of nitrates, coarse burlaps or gunny sacks are used by the million. One of these sacks rarely lasts for more than a single voyage, owing to the action of the acids, which eat away the fabric. Three of these bags, saturated with litho-carbon and filled to their utmost with destructive nitrates, have been lying for five months in an importing house in New York, and do not show the slightest sign of injury, even under the microscope. A common paper bag, soaked in this black liquid, may be filled with milk, water, acid, alkali or any liquid, excepting petroleum, tied at the mouth with a string, and carried any distance without fear of leakage or injury to its contents. It will be an odd development of household economy, when our milk, vinegar, liquors, etc., come home from the grocer's in paper bags. For varnishing railway cars and private carriages, painting iron bridges, roofs, steamships, houses, etc., this material acts as an insulator, and according to experts will neither crack nor blister under any known atmospheric temperature. At great heat, litho-carbon will soften, but it cannot take fire at any point. Careful and practical investigation shows there are thousands on thousands of acres of the raw material in Texas, the veins ranging in depth from two to forty feet. How it got there is a mystery. Whether it was left as it is in the far back ages when the ocean receded, or whether it was deposited among the sea-shells and sand at a latter period, no man knows. But, whatever its origin, there it is, and its varied and wonderful uses are attracting the attention of scientific and commercial men to a greater extent than they have been attracted by any recent development of the natural products of this country. — *New York Advertiser.*

DISPOSAL OF HOUSE OFFAL.

At a recent session of the Lynn [Mass.] common council the joint special committee appointed to report on a system for the disposal of house offal and garbage presented an exhaustive report.

"The committee," says the report, "travelled 3,100 miles in ten days, visiting nine cities, and in five of them inspecting garbage-disposal works in practical operation. The particular inquiry was relative to the scientific and sanitary aspects of the subject. Two methods only were discovered: First, treatment by chemical process whereby those components having value to mankind are eliminated and preserved; second, destruction by combustion and utilization of the ashes.

"The process for accomplishing results under the first system was exemplified in Providence, St. Louis and Buffalo. In Providence the Simonin process is adopted. Cincinnati has just closed a contract for immediate erection of works to be operated under this process, but with appliances and methods improved over those of Providence. It may be best described in the words of the inventor and proprietor.

'The Simonin process is simply and entirely a chemical one. Garbage is a mixture of water and animal and vegetable matter. The percentage of water being about eighty, any attempt to remove it by drying before treatment would be fatal to the commercial success of the process, and, besides, would prevent its use as a sanitary measure. To deprive it of water in a cheap and sanitary manner, we inclose the offal as soon as received, in a large cylinder, tested to stand 150 pounds pressure. In this cylinder it is completely immersed in a chemical re-agent, with which water will not mix, and which at the same time kills all germs of disease, and in addition acts as a solvent for grease, heat being used in the operation. The specific gravity of the water being greater than that of the re-agent, a large part of it is displaced, and the balance passes off with the vapor of the re-agent, and is condensed and separated therefrom. A series of these immersions causes not only a complete drying of the offal, but also frees it entirely from grease. The expenses to cities or towns using this system would be less than cremation, and it can be profitably introduced in towns producing as low as five tons of refuse daily. It is estimated that this amount is produced by ten or fifteen thousand people.'

"In St. Louis and Buffalo, local companies have been formed for constructing and operating plants under the 'Merz' process, the companies contracting with the cities, for a fixed price per ton, to receive and dispose of offal delivered to them. In the first-named city the works are new, costing about $200,000, and contain all the improved appliances suggested by previous experience with the process in other cities. The Buffalo works were constructed in 1889 and naturally do not rival those of St. Louis.

"The second system, that of combustion or cremation, was examined in Richmond and Norfolk, where 'Engle' furnaces or cremators are in operation. Your committee was aware of four different forms of cremators in the United States, but, as testimony conclusively pointed to the superiority of the 'Engle' apparatus, none other was examined."

The report then goes on to describe the "Merz" and "Engle" processes and the results of the committee's observations, and, after stating that three proposals had been submitted by the proprietors of the "Simonin" process, one from the proprietors of the Engle, but none from the Merz company, it concludes with the following summary:

(1) That the 'Merz' process, although an ideal one, is too costly to warrant its adoption here, unless better terms than those prevailing in other cities can be obtained.

(2) That the 'Engle' process is wasteful, and fully as costly as the preservative 'Simonin' process, and could not like that, be made a disinfecting agency in case of epidemic. Its utility is not guaranteed by its projectors.

(3) That the second proposition of Messrs. Simonin & Simonin promises under guaranty, the best results to the city.

We, therefore, recommend acceptance of said second proposition made by Messrs. Simonin & Simonin, if the financial limitations of the city will permit; if not, acceptance of their first proposition, the same to be merged into the second when those limitations cease."

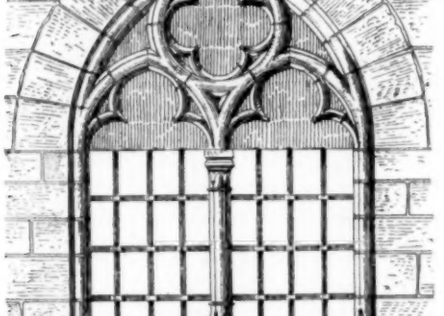
The propositions from the Simonin company alluded to, are as follows:

"(1) To organize, if given a contract covering ten years, a company to erect, operate and maintain works 'for a sum equalling eighty (80) cents per short ton of crude garbage.'

"(2) To transfer to the city for its perpetual and exclusive use all patent rights and all interests in the process; further, to erect for the city a plant of thirty tons per day capacity for $55,000, excluding cost of site, then to lease said works for fifteen years at $1,000 per year, and to treat thirty tons per day of crude garbage to be delivered at the works by the city. When that amount shall be exceeded, eighty cents per ton shall be paid upon the excess, the company providing, at its own expense, all additional apparatus. At the expiration of the fifteen years the original plant shall revert to the city 'in good workman-like condition,' she to pay 'a just valuation' for all such added apparatus. A guaranty bond of $10,000 is to be filed, the first payment $15,000 to be made upon the assignment of the patent rights, the balance as the work of building progresses." — *Boston Herald.*

SUGGESTIONS FOR THE CONDUCT OF ARCHITECTURAL COMPETITIONS.

SANCTIONED BY THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.



Window from the Boucherie, Ypres, Belgium.

1. The promoters of an intended competition should, as their first step, appoint one or more professional assessors, architects of established reputation, whose appointment should be published in the original advertisements and instructions, and whose decision should govern the selection of the designs.

All designs sent in should be submitted to the assessors.

2. The duty of assessors should be:

(*a*) To draw up the particulars and conditions as instructions to competitors, and to advise upon the question of cost.

(*b*) To determine which of the designs conform to the instructions, and to exclude all others.

(*c*) To advise the promoters on the relative merits of the designs admitted to the competition, and to make a selection in accordance with the conditions.

3. Every promoter of a competition and every assessor engaged upon it should abstain absolutely from competing and from acting as architect for the proposed work.

4. The number and scale of the required drawings should be distinctly set forth, and they should not be more in number, or to a larger scale, than necessary to clearly explain the design. If perspective views be required, it should be so stated, and they should be uniform in scale, number, mode of coloring, etc.

5. Competitions should be conducted in one of the following ways:

(A) By advertisement, inviting architects willing to compete for the intended work to send in designs. The promoters, with the advice of the assessor or assessors, should make their selection from such designs. The author of the design awarded the first place should be employed to carry out the work.

(B) By advertisement, inviting architects willing to compete for the intended work to send in their names by a given day, with such other information as the candidate may think likely to advance his claim to be admitted to the competition. From these names the promoters, with the advice of the assessor or assessors, should select: (*a*) an architect to carry out the work; or (*b*) a limited number to compete, and each competitor thus selected should receive a specified sum for the preparation of his design. The author of the design awarded the first place should be employed to carry out the work.

(C) By personal invitation to a limited number of selected architects to join in a competition for the intended work. Each competitor should receive a specified sum for the preparation of his design. The author of the design awarded the first place should be employed to carry out the work.

6. No design shall bear any motto, device or distinguishing mark, but all designs should be numbered by the promoters in order of receipt. Any attempt to influence the decision of the promoters, or of the assessor or assessors, should disqualify a competitor.

7. In every case the amount of premium or remuneration for the competitive designs should be fixed by the promoters, acting under the advice of the assessor or assessors, and should be paid in addition to the usual professional charges for carrying out the work.

8. Where a deposit is required for supplying the instructions, it should be returned on the receipt of a *bonâ fide* design, or if the applicant declines to compete and returns the said instructions within a month after their receipt.

9. A design should be excluded from a competition:

(*a*) If sent in after the period named (accidents in transit excepted).

(*b*) If it does not substantially give the accommodation asked for.

(*c*) If it exceeds the limits of site, as shown on the plan issued by the promoters, the figured dimensions on which should be adhered to until officially altered.

(*d*) If the assessor or assessors should determine that its probable cost will exceed the outlay stated in the instructions, or the estimate of the competitor, should no outlay be stated; provided always that, should the assessor or assessors not have been consulted in the first instance respecting the cost, as recommended in paragraph *a* of Clause 2, and should he or they be of opinion that the outlay stated in the instructions is inadequate for the proper execution of the proposed works, the assessor or assessors shall not be bound in the selection of a design by the amount named in such instructions, but the question of cost shall, nevertheless, be a material element in the consideration of the award.

(*e*) If any of the other instructions are violated.

10. It is desirable that all designs submitted in a competition, except any excluded under Clause 9, should, with the consent of their authors, be publicly exhibited after the award has been made, which award should be published at the time of exhibition.

11. The architect whose design may be selected as the best should be employed to carry out the work, and he should be paid in accordance with the Schedule of Professional Practice and Charges of Architects sanctioned by the Royal Institute. If no instructions are given to him to proceed within twelve months from the date of the selection, he should receive adequate compensation in addition to the premium (if any) awarded to him. In the event of a part only of his original design being carried out, he should be paid a sum to be agreed upon in respect of the deferred portion, such sum to be merged in the usual professional charge when the completion of the design is proceeded with.

It should be understood that the Royal Institute issues these suggestions as a guide to promoters where a competition has been decided upon, but not as necessarily recommending the principle of competition.

Aston Webb, *Hon. Secretary.*
William H. White, *Secretary.*

The Royal Institute of British Architects,
9 Conduit Street, Hanover Square, London, W.
Re-issue after revision, 2d June, 1892.

BOOKS AND PAPERS.

FOR centuries the best friends of the architect and his assistants have been fire and fashion, and of the two, perhaps the second has been the most potent ally in the constant warfare the profession wages with its empty pockets. Fire-losses, if severe, are apt to be made good in a crude way which calls in the muscular effort of the mechanic rather than the mental exertion of the architect. For generations doctors have been accused of prolonging the illnesses of their patients to the consequent benefits of their pockets, lawyers are supposed to pettifog so long as there is any principal left to fight for, plumbers are said to prepare the way for fresh disaster when called in to cure one that has already occurred, and for all we know architects are accused of building carelessly so that their creations may in due or undue time burn up and make an opportunity for new calls upon them. It is bootless to speculate what will be the effect on the professional income of the present endeavor the profession is honestly making to create fireproof and enduring buildings, since, even if it in every case meets with success, the everlasting quality of the results does not of itself create a bar across the current of the architectural career. The tooth of natural decay is a powerful mordant but even it is not so active a destroyer as the mandate of fashion. Great is Fashion and architects are but her slaves!

At this moment the fickle deity declares in favor of the architecture of the European Renaissance, and publishers — who do not have the same organization that hatters and dressmakers have created and so do not themselves introduce the fashions — dutifully follow the current of the hour and produce works dealing with Renaissance architecture with a rapidity that is discouraging to the pocket of the architect who feels that his daily bread depends on his keeping up with the mode.

The imperativeness of the impulse to follow fashion is a thing to be grateful for now as it has been in time past. How deadening would it be to have to live amid many of the structures that now exist simply because their architects had the knowledge to make them fireproof and indestructible! If her power ever wanes then it will become a matter of plain necessity to restrain all but artists of unquestionable capacity from meddling with indestructible building materials. The outlook is not, however, wholly discouraging even where fairly changeless material is used and the manner in which fashion may even in such circumscribed circumstances still befriend the architect is shown by the manner in which the wave of Renaissance feeling changed the face of things architectural in England

without causing a radical change in the anatomy of the structures whose outward guise was altered. The frankness with which owners sought to give their dwellings a glazing of new forms and details so as to be able to feel they and theirs were still in the fashion, is at once instructive and amusing, amusing when and where the effort failed and instructive when it succeeded not less than when it failed. Many a manor-house was treated as was Cranborne Manor-House where a building in an earlier style was brought into fashion by applying to the faces of the plain Gothic buttresses Renaissance pilasters, while a moulded round-arched arcaded porch with strap-work-decorated balustrade served to declare with emphatic importance the real intent and meaning of the alteration.

At Hanford a still slighter treatment serves to give the desired *cachet* to a dwelling built in the latest period of simple Perpendicular work: here a flat pediment of slight projection with its supporting pilasters perched above a straight entablature similarly supported, is enough to make it proper to include this structure in such a collection as this.[1] Elsewhere a more emphatic treatment is required, as at St. Catherine's Court House where a projecting two-story porch is built of which the lower story only is treated in the Classic style, while the one above contains naught but straight-headed mullioned windows in keeping with the rest of the structure.

It is such buildings as these which give such evidence of the mutability of human feelings and preferences that are so interesting, and to the architect — who is really but a bread-and-butter creature after all — so encouraging, much more so than those structures which are all designed and built in one style at the same period.

Such instances as these are encouraging since they show the mutability that may affect the outward forms of fairly imperishable building materials, a mutability which is to be welcomed when it concerns some piece of commonplaceness too substantial to be economically done away with, but to be deplored when a masterpiece complete in one style is, at the dictate of fashion, wholly or partially reclothed after the rules of another. Such mutations when only partial sometimes add to the interest and picturesqueness of the affected building; in fact one of the greatest charms of travel would be wanting if all buildings were archæologically and architecturally correct — if the restorer with his ingenious or perverted ideas of what ought to be or ought to have been had never come upon the scene.

In England those who wished to indulge in Renaissance work so far as ordinary dwellings are concerned, confined themselves to the application of detached features of Classic characteristics rather than embark on an attempt to depart so widely from established usage as would be implied in a whole façade after the Italian, or a whole group of buildings after the French manner. But in the interior they worked more consistently and the plates in this portfolio which exhibit interiors show more coherent results than have been accomplished on the exteriors. The work is often rich and well designed but is not seldom too robust and has the heavy and clumsy movement that is suggestive of an ill-digested meal.

The subject in which most lightness and grace have been achieved is the interior of Croscombe Church which calls from the authors much laudation. The chancel-screen has a general likeness to screens of the same period in Continental churches but the great lightness of its lower and middle divisions poorly comports itself with the heavy panel-work which takes the place of a frieze above, while this in turn is not in scale with the large coat-of-arms which forms the crowning feature. The pews, whose entire surfaces are covered with flat carving, have quite a Byzantine appearance and give an air of richness and distinction to the church, are quite outshone by the pulpit which is graceful in proportion, well designed and generally satisfactory in detail.

Another satisfactory interior is the "Room in the Red Lodge, Bristol," which, except in the decorated plaster ceiling has less of heaviness than is usually found. The mouldings are so small and the decorative sculpture and carving so judicious in movement that, although all is rather overdone, it seems plain that the work must have been designed and executed by workmen imported especially from Flanders and whose taste and skill had not yet become sluggish under the influence of the heavy ales of the north. The room is furnished with an unusually perfect and well preserved example of those curious internal corner vestibules which are peculiar to the period both in England and elsewhere.

This portfolio also contains two or three examples of half-timber work which is of the same period, although it always seems to belong to an earlier and simpler state of architectural advancement than do the stately brick and stone manor-houses. Some of these buildings have endured their three hundred years well and are supposed to be now in nearly their original form and of their original materials, but many, of course, have been entirely rebuilt, perhaps over and over again, yet on their original lines, so that the savor of quaintness still clings to them legitimately. This half-timber work is to be found in most abundance in the western and southwestern counties, particularly along the Welsh marches. Chester, well known to tourists, and Shrewsbury, which is less visited, are rich in work of this kind, and farther along at Ludlow is a famous example known as "The Feathers Inn," which is shown in one of these plates, but unfortunately the inn-keeper's prosperity has not exactly benefited picturesque architecture, for Feathers Inn is one of those examples which have been carefully revamped — a word which to our mind implies that attention has been given to the cuticle of a building and not to its skeleton. At Feathers Inn the paint brush has been freely used on the outside, the wooden posts and braces have been painted a shining black and the interspaces a staring white, and the proprietor, finding that the original black-and-white work was a valuable factor in making a living, has in excess of zeal caused the painters to lay-off the brickwork of the lower story in meaningless black and white divisions. Still an error of this kind cannot take away from the real interest of such a building and Ludlow and its quaint inn will always be visited.

The other example of half-timber work here given, a portion of St. Peter's Hospital at Bristol, is a less elaborate but more agreeable specimen in itself and one less profaned by the enthusiasm of the local painter.

[1] *"Architecture of the Renaissance in England."* By J. Alfred Gotch and W. Talbot Brown. Part IV. Ticknor & Co., Publishers. B. T. Botsford, London. Price $8 per part.

SOCIETIES

AMERICAN SOCIETY OF CIVIL ENGINEERS.

THE American Society of Civil Engineers has accepted the duty of organizing and conducting the deliberations of Division A of the World's Congress Auxiliary of the Chicago Exposition. The subjects deputed to it are those relating to Civil Engineering.

The meetings of Division A will be held in Chicago and, it is expected, will take the place of the Annual Convention of the Society for the year 1893. The sessions will be similar in all respects to the ordinary conventions, except that the deliberations will be participated in by engineers from all parts of the world.

Papers will be classified, advance copies, probably in abstract, sent to those competent to discuss them, and every arrangement made to add to the value of the proceedings.

It is not thought desirable to send out invitations promiscuously, to write papers, but that the best result will be reached by selecting men to write who have had special experience in particular branches of work, to be followed by discussion from others.

THE ILLUSTRATIONS

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

THE BREARLEY SCHOOL, WEST 44TH ST., NEW YORK, N. Y. MR. H. R. MARSHALL, ARCHITECT, NEW YORK, N. Y.

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

GATEWAY TO EVERGREEN CEMETERY, CHESTNUT HILL, BOSTON, MASS. MR. E. M. WHEELWRIGHT, CITY ARCHITECT, BOSTON, MASS.

THATCHED SHELTER. MR. E. M. WHEELWRIGHT, CITY ARCHITECT, BOSTON, MASS.

THE FIDELITY BUILDING, BALTIMORE, MD. MESSRS. BALDWIN & PENNINGTON, ARCHITECTS, BALTIMORE, MD.

HOUSE FOR DR. J. E. GARRETSON, LANDSDOWNE, PA. MR. E. L. SIMMONS, ARCHITECT, PHILADELPHIA, PA.

DETAILS OF SEWAGE DISPOSAL AT WAYNE, PA. DEVISED BY MR. GEORGE E. WARING, JR., SANITARY ENGINEER, NEWPORT, R. I.

SEE article elsewhere in this issue.

[Additional Illustrations in the International Edition.]

FIREPLACE IN THE HOTEL DE VILLE, AUDENARDE, BELGIUM.

[Gelatine Print.]

THIS fireplace is to be found in the *Salle des pas perdus.*

LOUIS XV WARDROBE.

[Photogravure.]

LOUIS XVI WARDROBE.

[Photogravure.]

CATHEDRAL AND BRIDGE OVER THE SAONE, LYONS, FRANCE, AFTER A DRAWING BY SAMUEL PROUT.

SECTIONS THROUGH GEORGE HERIOT'S HOSPITAL, EDINBURGH, SCOTLAND. MEASURED AND DRAWN BY MR. R. S. BALFOUR.

DETAILS OF THE COUNCIL-ROOM OF GEORGE HERIOT'S HOSPITAL, EDINBURGH, SCOTLAND. MEASURED AND DRAWN BY MR. R. S. BALFOUR.

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.*]

THE ARCHITECTURAL STONE CARVERS.

TORONTO, ONT., June 17, 1892.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Would you kindly inform me through the *American Architect* or otherwise if the Architectural Stone Carvers as a body are members of the Granite Cutters Union in the United States, and oblige, Yours respectfully, JAMES TAYLOR.

[THE Architectural Granite Carvers are, as a body, members of the Granite Cutters Union, but other Architectural Stone Carvers are members of the Freestone Cutters Union. — EDS. AMERICAN ARCHITECT.]

A CORRECTION.

PORTLAND, ORE., June 24, 1892.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — In your illustration of the United Bank Building here you gave the architect's name as I. Hodgson, instead of I. Hodgson, Jr. A correction will greatly oblige,

Truly yours, I. HODGSON, JR.

NOTES AND CLIPPINGS

THE POPE AND THE WASHINGTON MONUMENT. — Quite a sensation was created in this city to-day by the publication of a story which, if true, clears up a mystery of nearly forty years ago when the Washington Monument was but a few years underway. The story relates the finding by a diver employed in the construction of new piers for the northern section of Long Bridge, connecting the District of Columbia with Virginia, of a polished slab of marble supposed to have been the gift of the Pope of Rome toward the adornment of the monument in 1853. The stone never found a resting-place in that immense structure, for it was stolen at night and its whereabouts from a time shortly after it was received in this city up to the present have never been known. During the first twelve years of work upon the Washington Monument there were contributed from all quarters of the globe memorial stones to be inlaid on the inner wall of the shaft. Among those received was a block of marble from the Pope of Rome with the simple inscription "Rome to America." The Knownothings saw in the gift an insidious invasion of papacy, and there were ominous grumblings of wrath on the reception of the gift by the authorities at Washington. On the morning of March 5, 1854, the city was electrified to learn that on the night before an unknown band of vigilantes had broken into the stone-shed at the foot of the monument, and that the Pope's gift to the structure was missing. At the time suspicion attached itself to the Knownothings, but the guilt of the theft could never be fixed. But four letters are said to be missing from the original inscription on the slab found. Many believe it to be the long lost stone. — *Washington Despatch to New York Press.*

ELECTRIC CRANES FOR PASSENGERS AT THE COLUMBIAN EXHIBITION. — Visitors at the Paris Exposition of 1889 will well remember the arrangement of overhead cranes fitted with seats, in that manner affording an excellent method of enabling a person to see the general arrangement of the exhibits in Machinery Hall, and after that they could look up details at leisure. This same method is to be carried out on a much larger scale at the Columbian Exhibition at Chicago. Four of the principal makers of travelling-cranes are to place cranes in such a manner that passengers can be carried over Machinery Hall and obtain a birds-eye view of the exhibits. The length of course run by each crane will be 1400 feet, and the cranes will all be operated by electricity, and travel at the rate of 300 feet to 500 feet a minute, if the latter speed is required. The purpose of these cranes is not, however, entirely for a matter of pleasure, as they will be installed in the fall of 1892 and used in placing the exhibits. Then the trolleys will be removed from the cranes while they are in use for passengers, and after the conclusion of the Exhibition the exhibits will be removed by the help of these same cranes. — *Engineering.*

TWO EPITAPHS. — Remarkable are two epitaphs, the first of which is said to be upon a tombstone in the City of Sacramento: "Here is laid Daniel Borrow, who was born in Sorrow, and Borrowed little from Nature except his name and his love to mankind and hatred to redskins; who was nevertheless a gentleman and a dead shot: who, through a long life, never killed his man except in self-defence or by accident; and who, when he at last went under, beneath the bullets of his cowardly enemies in the saloon of Jeff Morris, did so in the sure and certain hope of a glorious and everlasting Morrow." The other, which belongs to a Nevada burying-place, is such a noteworthy achievement in this line that it may fitly conclude our compilation of a few of the curiosities of epitaph literature: "Sacred to the Memory of Hank Monk — the Whitest, Biggest-hearted and Best-known Stage-driver of the West; who was kind to All and Thought Ill of None. He Lived in a Strange Era, and was a Hero, and the Wheels of his Coach are now Ringing on Golden Streets." — *Chambers's Journal.*

HOW THEY BUILD UP THE NEW CITIES. — A comparison of the amount of building going on in Tacoma, Seattle and Los Angeles makes a very favorable showing for this city. During January 65 building permits, amounting to $45,905 were issued in this city, against 93 amounting to $62,535 in Seattle, and 54 amounting to $63,803 in Los Angeles. The next month Tacoma passed Seattle, having $97,380 against $64,457, but Los Angeles was still ahead. In March and April Tacoma passed both Seattle and Los Angeles, and for the four months the totals are $671,070, $356,414 and $495,096 for Tacoma, Seattle and Los Angeles respectively. — *Tacoma (Washington) News.*

WATER-SUPPLY AT GIBRALTAR. — A tunnel is about to be driven into the centre of the rock of Gibraltar in the hope of finding a supply of fresh water. If water should not be found, the tunnel will be carried through and utilized to carry a drain through the rock from west to east, in order that the sewage now discharged into the bay may be carried to the east of the rock and thus cease to be a nuisance. — *Industries.*

TRADE SURVEYS

THE struggle for gold is entering a new phase; namely, that of threatening scarcity. The ratio of gold in the United States to that held by the banks of Europe has declined in six years from forty-one per cent to eighteen, according to a high authority. The continued export of gold from this side is occasioning our bankers more anxiety and even apprehension as to hurtful consequences in the near future. The banks of England, France and Germany have increased their gold holdings within twelve months from £112,000,000 in round numbers to £129,000,000, and they have only entered upon the struggle for gold, which threatens to interfere with certain well-defined and well-established laws of trade. As long as gold was dealt in as an ordinary commodity it took care of itself, but of late it has become an object of special attention, and is now being gathered in, regardless of the influence of the resulting scarcity upon the commerce of the world or the financial interests of the country from which most of it is drawn. Nothing else can be done at present than to call attention to the fact, and to emphasize the statement that legislative action of some sort will be forced upon the country before long. The struggle in progress proves what has long been foreseen; namely, the growing necessity for a larger volume of metallic money and of paper money based upon it. The volume of business is certainly satisfactory, the figures for last week showing an increase of seventeen per cent over the volume of same week last year. Crops promise above the average, excepting cotton. All trade conditions are favorable. Manufacturing interests still feel the necessity for guarding production. Margins continue extremely close. At present writing the iron-workers' difficulties are unsettled. There are no threatening troubles elsewhere. The wage-workers, as a class, are contented, being able to live at somewhat less cost than in former years. The agricultural and manufacturing interests are gradually getting into better balance. Late reports from Western banking and land-selling agencies show that there is quite an outflow of population to new lands. This outflow is not only to the West, but to the Southwest, but the drift to the Southern States has been checked this year, as well as railroad-building in the Southern States. At the same time, it is evident that there is a steady flow of population from the older to the newer States, and it is also true that little industries continue to multiply. Commercial authorities in Chicago and New Orleans are predicting an unusual increase in agricultural activity in the next two or three years for reasons like these. A great deal of the unoccupied farming land in the older States is now relatively far above the price of equal or better land in the newer States, which have within the past few years been opened up by railroad-building. Agriculturists, instead of remaining on this Eastern high-priced land, find it to their advantage to go farther West on cheap but good land, where railway facilities enable them to reach markets. While the cotton crop has been very large and cotton cheap, brokers and others high in authority in cotton say that within the next two or three years cotton-growing will increase very greatly, due to cheap lands, railroad construction and railroad facilities. This agricultural expansion is likely to occur for more reasons than given above; it is evident that the era of very low-priced land is near its end, and that in five or ten years a general increase in land values will occur. The present movement is in anticipation of that result. In some localities a speculative movement has also shaped itself, and large areas of land have recently been purchased, to be held for incoming settlers. Irrigation schemes are also multiplying, and, if the plans of syndicates, companies and engineers are successfully carried out, we will see in the next three or four years an expenditure of a vast amount of money in the arid regions, and the reclamation of a vast amount of land now valueless, or nearly so. This movement is deserving of closer study than it is likely to receive, because it means the laying of foundation for an expansion of manufacturing activity; it means a new era both in agriculture, manufacturing and mining, as well as in railroad-building. It also means an equalization in agricultural lands between the East and West. One obstacle to farming throughout the East has been the high price of farm land, but the movement now setting in will check the upward tendency in that direction, at least, and probably bring about a downward tendency through competition and the moving out of so many thousands of agriculturists. The business world has been disappointed with the developments of the month of June. Railroad traffic is all that could be wished. Freight rates have been reduced on a good many lines, and the tendency seems to be in the downward rather than in the upward direction; in short, the interests of consumers and of wage-workers throughout the country seem to be served and advanced involuntarily. A few years ago, legislation to protect the interests of the people was thought of, talked of and attempted, but within the past two or three years, through the operation of laws not written on statute books, there has been brought about a rearrangement of forces and the legislation of old-time competition, which is working great good to the people at large. There are, of course, a good many causes for complaint and great need for remedial agencies, but the trend of things is in the right direction.

S. J. PARKHILL & CO., Printers, Boston, Mass.

Fig. 1
Plan of Disposal Field

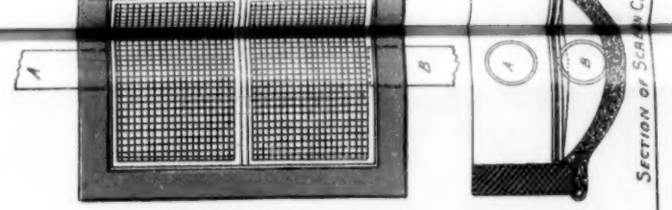
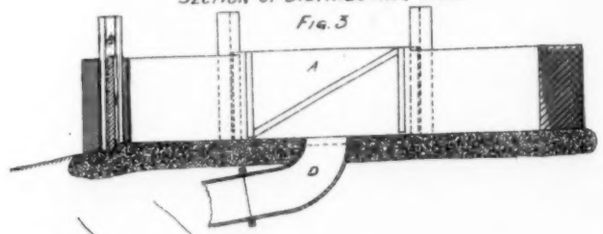


Fig. 5
Plan of Screen Chamber

Section of Screen C

Fig. 6
Section of Screen Chamber

Section of Distributing Well
Fig. 3



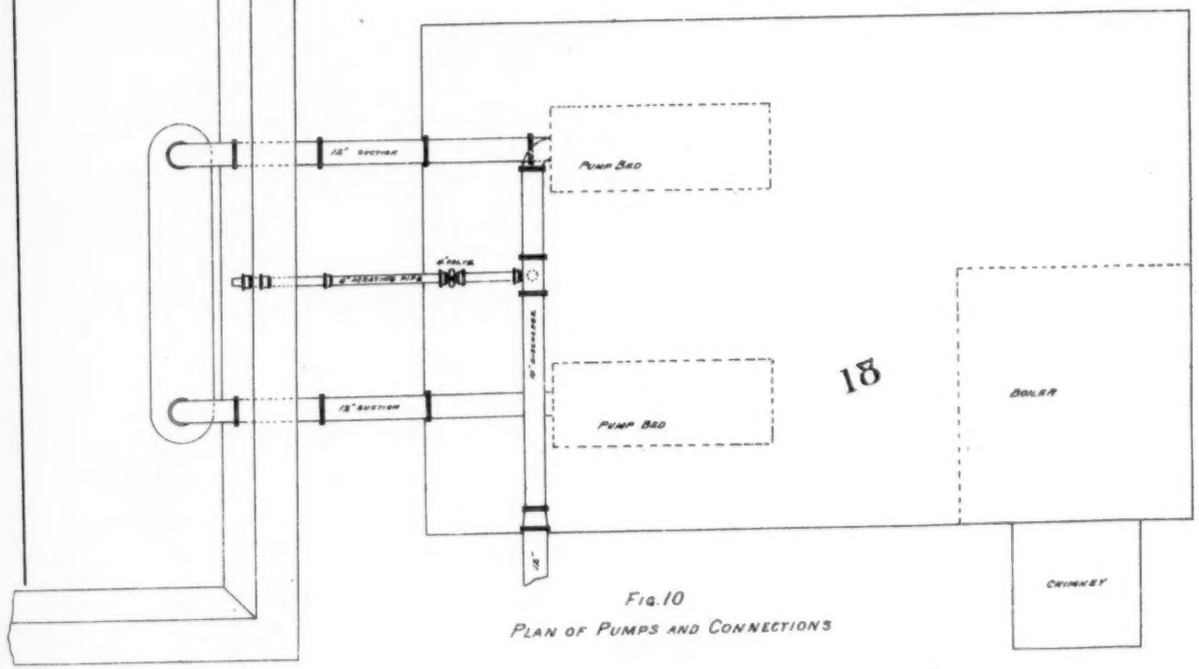


Fig. 10
Plan of Pumps and Connections

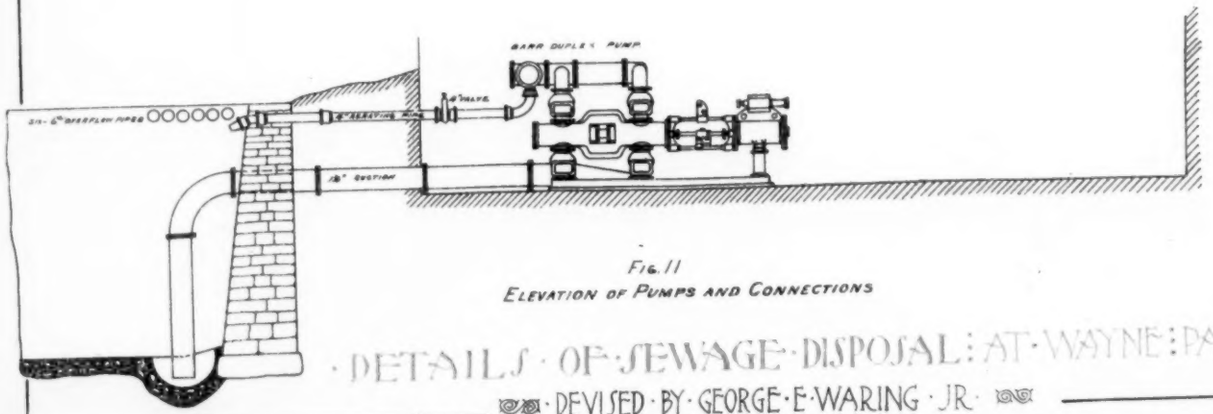


Fig. 11
Elevation of Pumps and Connections

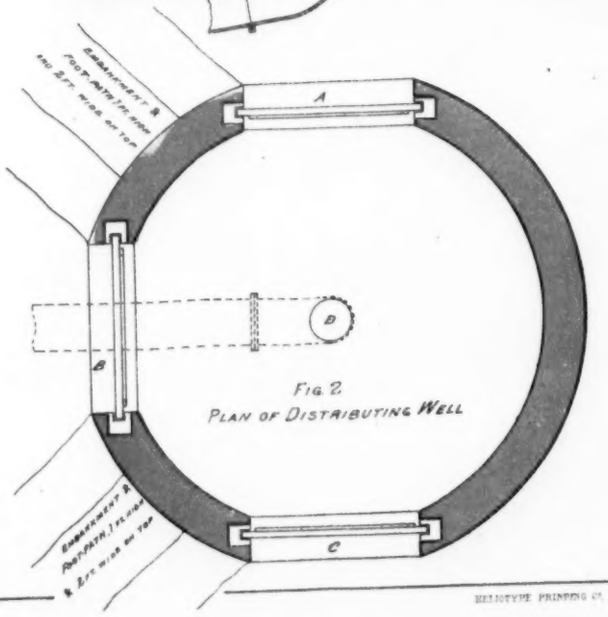
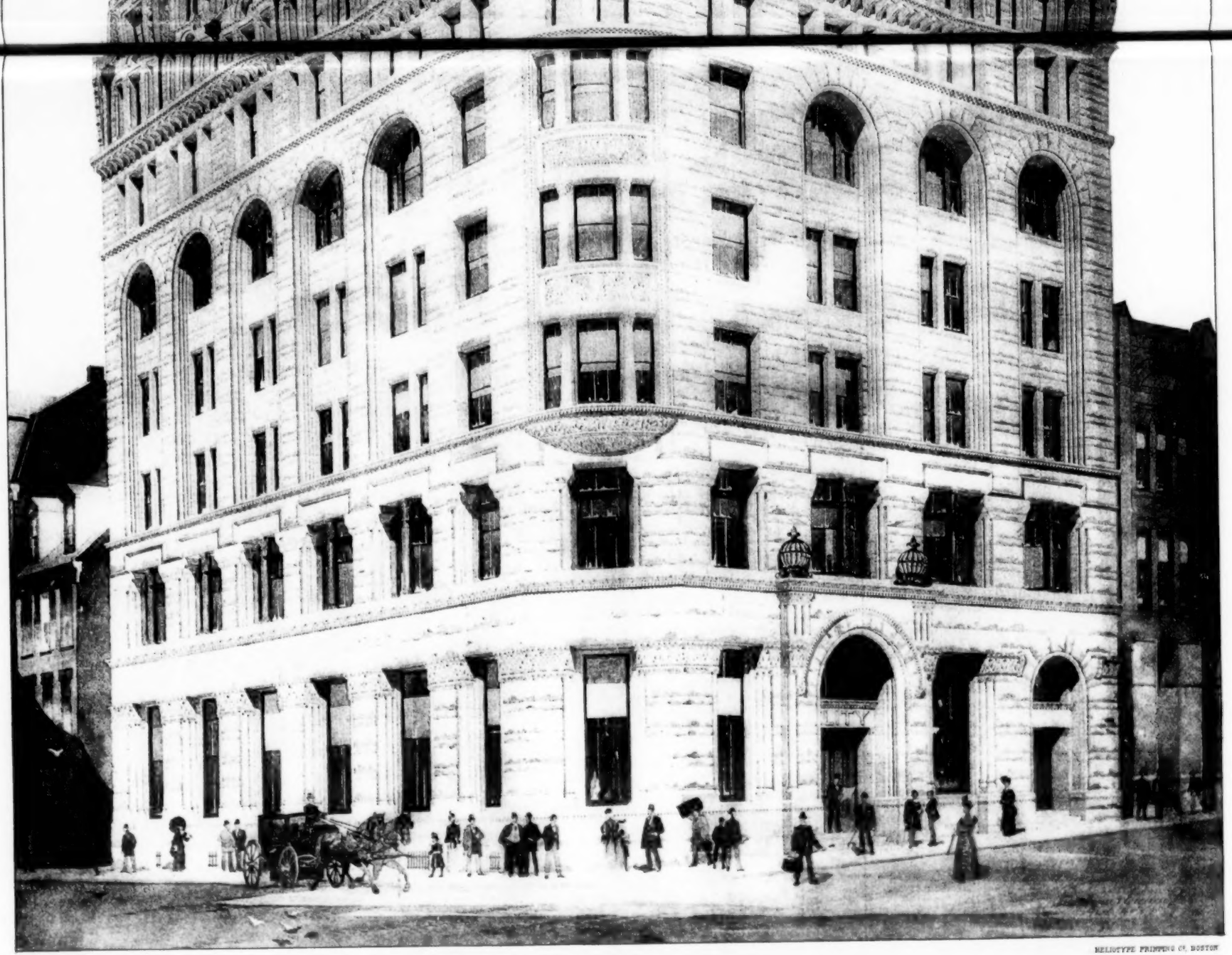


Fig. 2
Plan of Distributing Well

Details of Sewage Disposal at Wayne, Pa.

Devised by George E. Waring, Jr.

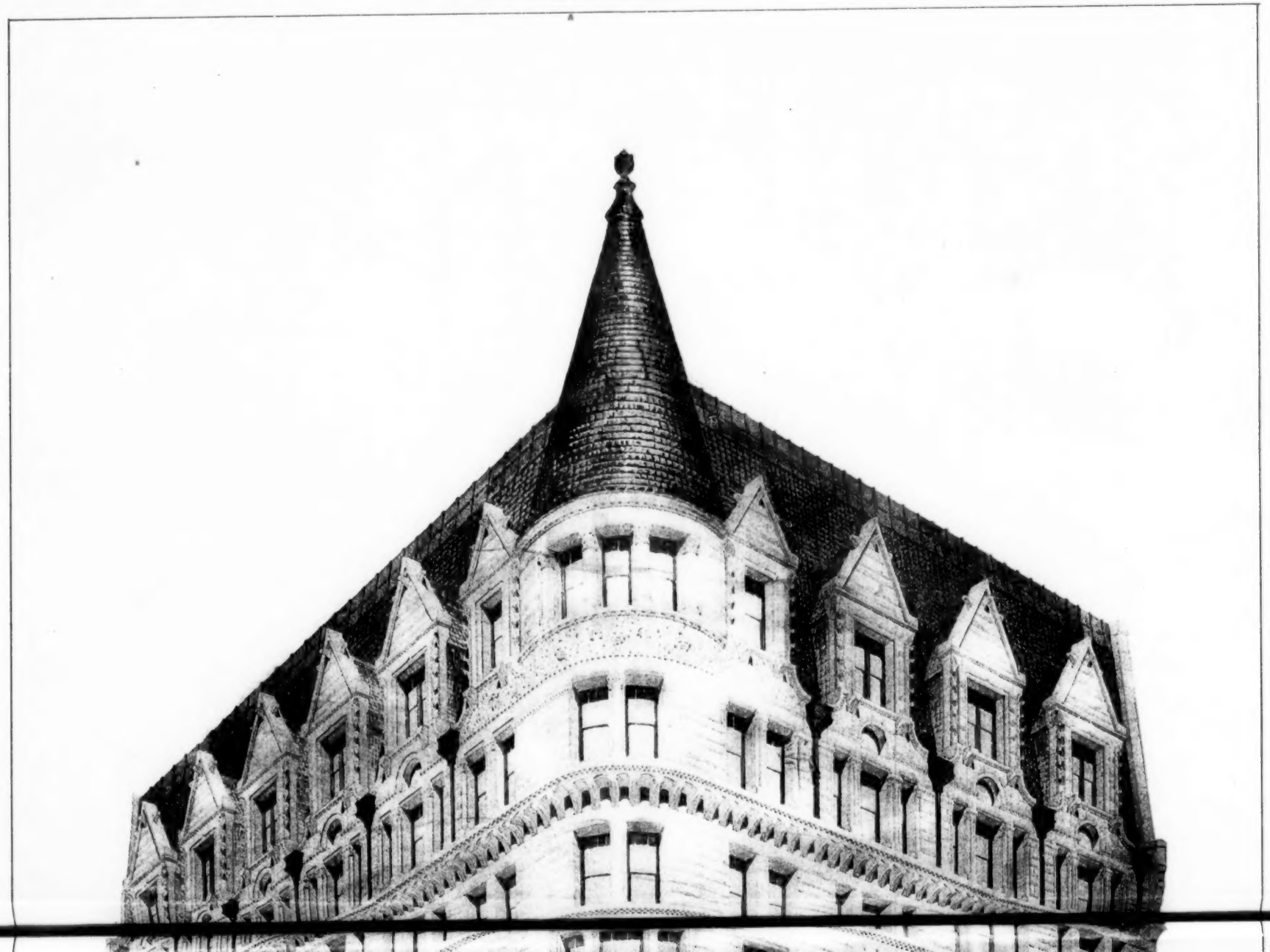
Heliotype Printing Co. Boston



HELIOTYPE PRINTING CO. BOSTON

THE · FIDELITY · BUILDING · BALTIMORE · MD ·

BALDWIN · & · PENNINGTON · ARCH'TS ·

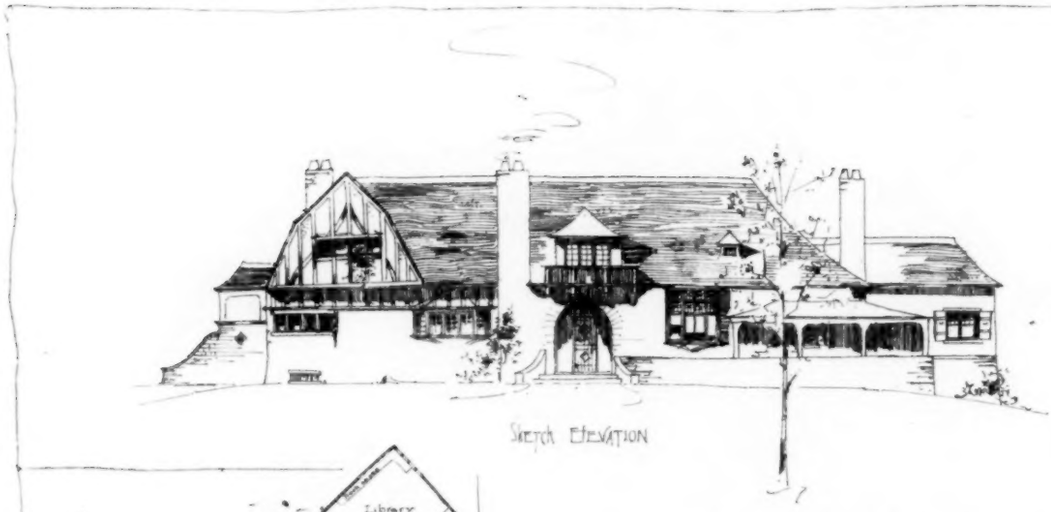


PERSPECTIVE VIEW OF THATCHED SHELTER
FOR
FRANKLIN PARK

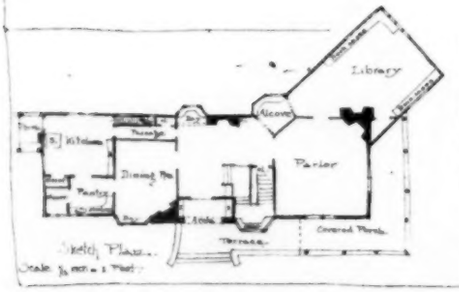
F. L. OLMSTED & COMPANY
LANDSCAPE ARCHITECTS

MAY 12 '92

E. M. WHEELWRIGHT
CITY ARCHITECT



Sketch Elevation



Sketch Plans.
Scale ⅛ inch = 1 Foot.

PROPOSED HOUSE TO BE BUILT AT LANSDOWNE
for Dr. James E. Garretson.

E. L. Simmons Architect
Phila.

HELIOTYPE PRINTING CO. BOSTON

THE GATEWAY · TO · EVERGREEN · CEMETERY

EDMUND · M · WHEELWRIGHT
CITY · ARCHITECT.

HELIOTYPE PRINTING CO. BOSTON