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THE terrible fire which has just occurred in New Orleans, causing the destruction of nearly four million dollars' worth of property, and drawing probably six million dollars from the pockets of the people who pay insurance premiums throughout the country, calls to mind the fact that New Orleans has no proper building law, unless one has been adopted within a few years. If anything of the sort has been done, the enforcement of it must have been rather feeble, to make it possible for the careless disposition of a lighted cigarette to consume a large part of the town. Merely as a matter of legal interest, it would be curious to know whether the insurance companies, who have suffered heavy losses, might not get some of their money back from the owners of the property from which fire spread to the buildings in which they had an interest. It has been held, in other matters, that the laws of England, which were adopted as the common law of the States formed from English colonies, do not form part of the common law of Louisiana, Texas or the other States formed from Spanish or French colonies. Now the common law of most of our States, which relieves a man from responsibility for damage by fire spreading from his premises to those of his neighbors, is founded on an English Act of Parliament. No such statute was ever known to the French law, or, probably, to that of Spain. On the contrary, the French code, which embodies the common law as it existed in the time of Napoleon, expressly imposes that responsibility; and it would be a nice point for the lawyers to determine, whether the Code Civil forms part of the common law of Louisiana, or, if not, whether anything in abstract justice, which, as we take it, supplies such ingredient in the Louisiana common law as is not furnished by descent from the French law, entitles a man to arrange cotton bales, or construct buildings, in such a way that, if they take fire from a cigarette, they communicate fire to the property of other people.

THE National Board of Underwriters has recently sent to the President of the United States a communication, requesting him to call the attention of Congress, and of the country, to the heavy burden which lies upon our people through the enormous annual destruction of property by fire, and to make such suggestions or recommendations as he may think proper in regard to checking the waste. It is not to be expected that the President will promulgate a code of building-laws, but the underwriters think that if the attention of the public could be called in this impressive manner to the immense annual aggregate of loss, and the amazing carelessness which renders it possible, an inquiry into the simple means of preventing or diminishing loss would be started, which would bear good fruit. It is much to be hoped that the appeal may prove successful. Although Presidents do not care to meddle much with business that they think concerns other people, and a similar application was made some years ago without result, there seems to be no reason why, if simply calling attention to the facts will save the people of the United States any considerable part of the two hundred million dollars or so which they now spend on ash-heaps, the attempt should not be made.

AT a meeting of the Hamburg Architects' and Engineers' Society, a few weeks ago, the subject of workingmen's dwellings was brought up, and discussed in the sensible and intelligent manner which one would expect from such a company. One of the speakers, Herr Kümmel, had recently visited the Peabody houses in London, and the very similar Meyer settlement in Leipzig-Lindenau, and gave his impressions of them. The Peabody houses he had difficulty in finding. The Guide to the Health Congress did not indicate where they were situated, and, when he at last discovered the place, the houses themselves proved to be in the inner portion of a block, behind a row of business buildings. The exterior of the houses turned out not to be particularly beautiful, according to the notions of a German architect; and the stairways were rather dark; but the tenements themselves were remarkably airy and pleasant. He was very favorably impressed with the spirit of the tenants, who are evidently conscious of their good fortune in occupying such comfortable and well-managed habitations. The Meyer houses in Leipzig, unlike the Peabody mansions, occupy the street fronts of a block, and surround a large open pleasure-ground, with garden-plots and summer-houses for the tenants. In these houses the rents are collected weekly by the lady managers, after the so-called "Octavia Hill system." The whole establishment is well directed, and the rooms are in great demand, although it is a rare thing to have a tenant move away.

HERR KUMMEL mentioned instances where villages of small, independent houses had been recently built, in the neighborhood of large cities, which were rented to people of modest income, on a system by which a portion of the rent was applied as purchase-money for the house; but he expressed his opinion that this system was unsuited to the needs of workingmen, who could not spare enough from their scanty wages to make the weekly payments, and must content themselves with hiring tenements of two or three rooms, on the best terms they could. Even here, however, by building substantial houses, divided into tenements of this sort, collecting rent weekly, and forbidding sub-letting, much good might be accomplished. In endeavoring to reach this result, which associations or private individuals seem to attain with equal success, Herr Kümmel thought that certain principles should be observed, and a statement of these principles, printed in the form of a circular, was distributed among the audience. In general, the rules laid down in the circular agree with those adopted last year by the Convention of Berlin Architects, although, curiously enough, they were drawn up by Herr Kümmel, as the result of his own experience, some time before the Berlin Convention, and, in the press of other work, laid aside, to be brought out again only for his Hamburg address.

IN Hamburg and its sister city, Altona, Herr Kümmel finds that working people are, on the average, better lodged than they were a few years ago. In the new parts of the cities, where building has been carried on under strict laws, the tenement-houses are generally substantial, light and airy; but, in the older portions, many buildings are occupied by tenants which are unfit for any kind of habitation, and ought to be condemned and removed. This state of things is, of course, common to all large cities, and while, in the natural course of things, it will gradually cure itself, the process of amelioration might be greatly hastened by legislation which would enable the municipal authority to set a definite limit to the time during which any given building should be allowed to be inhabited. As to the newer buildings, Herr Kümmel finds

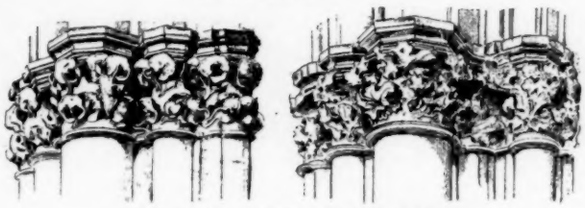
that, if anything, they are too good; that is, the rooms are too large, and there are too many of them to each tenement, for the best advantage of those who are to occupy them. In his opinion, everything possible should be done to keep the rents down to the lowest possible point. In most cases, a living-room, with a sink and cooking-stove, and a bedroom, are all that a married pair of German working people, without children, can afford to pay for. If they have children, the building should be so planned that they can have one additional bedroom when the children grow old enough to need it; and plenty of single rooms, with facilities for cooking, should be provided for unmarried men and women, and for married couples without children, whose income will not allow them to afford the luxury of a separate bedroom. Where the tenements consist of four rooms, as is very common in the newer houses, he finds that the tenants usually sub-let at least one or two of the rooms, or share their tenement with another family, or take lodgers, and crowding, quarrelling and domestic unhappiness too frequently result. Among the poorest people, even one room, if it is too large, will be shared with another family, or with lodgers. Moreover, the practice of making the tenements too large often leads to financial distress among the people who live in them. A man earning small wages, unable to find anything smaller and cheaper, hires a four-room tenement at a price which he cannot afford to pay. Before long, finding that he cannot pay his other bills and his rent, too, he tries to lighten the latter by sub-letting two of his rooms. This answers for a time, until, perhaps, his sub-tenants, or lodgers, leave him, or he loses his own situation, or both things happen at once, and still burdened by his heavy rent, which he is no longer able to pay, he sinks into the misery which, in Continental countries, attaches to a condition of hopeless bankruptcy. Obviously, the way for a man to avoid this is to hire only such a habitation as he can afford; but, if such habitations cannot be had, he is helpless.

IT is understood that the small, cheap tenements of one, two or three rooms, while they should be built in the simplest manner, ought to be arranged with the greatest care for the moral and physical health of their occupants. Herr Kümmel insists that every tenement should have its separate entrance from the common hall, its own water-closet and, wherever possible, its own independent water-supply; and he makes a rather novel observation, which, however, will find much commendation in this country, to the effect that it is not desirable to collect workingmen's tenements together in a certain quarter, but that it is better not to separate the dwellings of the different classes of citizens any more than is absolutely necessary. On the Continent, it is rather the fashion to collect great numbers of workingmen's houses together in "*cités ouvrières.*" Among us, there is not much temptation to do so; but some of the German manufacturing towns are growing with a rapidity unknown here, and the idea of planning immense districts of tenement-houses is one which is very likely to occur to land-speculators and municipal authorities. As to the relative advantages of tenements and single houses for poor people, Herr Kümmel, like all other persons of experience, prefers single houses; but, as he says, in most cases, owing to the cost of land near the centre of business, to live in a tenement is the only way in which a workingman can be within comfortable reach of his business, and can have his dinner at home with his family, and, usually, the only way in which he can have his children go regularly to good schools. Where cheap and quick transportation can be had, detached or semi-detached houses, on cheap, but dry and well-drained land, are very desirable; but, as he says, the transportation suited to the workingman's needs can only be had by railways; no tramway or omnibus communication is quick enough to answer his requirements. As to the way in which the small, single houses, if they can be made available, should be built and used, he says, as was before mentioned, that the plan of having them erected by associations, and sold to their occupants by means of small instalments, while very suitable for people of limited but sure income, is inapplicable to the case of workingmen, who can never tell when they may be thrown out of employment, and thus prevented from meeting their payments. Considering that, in our own great and growing city of Milwaukee, the average income of carpenters, who practise what is here, perhaps, of all mechanical trades, the best paid and the most in demand, is barely five hundred dollars, there must be a great deal of reason in this last observation, which is, so far as we know, a new contribution to social science. At the conclusion of his address, Herr Kümmel proposed that an association should be formed, similar to the People's Coffee-house and Restaurant Society, which already exists, consisting of representatives of the Government, of capitalists, builders, philanthropists and persons experienced in social science, together with representatives of manufacturing and business interests, to undertake the work of improving workingmen's dwellings in the district of Hamburg-Altona. This proposition was received with much favor, and it was voted that a committee of the Society should be appointed to confer with such persons outside of the Society as they might select, with the view to the establishment of such an association.

ALL architects and students who propose to travel abroad this summer should make a point of seeing the International Art Exhibition which is to be held in Munich, in the "Glass Palace," from June 1 to the end of October. The prospect is that all the arts will be brilliantly represented, but architecture is to receive special attention, and it is believed that the best collection of architectural drawings will be shown that was, perhaps, ever got together. Besides the works of living architects, it has been arranged with the heirs of Baron von Hansen, Baron von Ferstel, and Professor Semper, to show a full collection of the plans and sketches left by those great artists. The other arts will be shown by contributions from every part of Europe. The Princess Maria Paz, wife of Prince Louis Ferdinand of Bavaria, has taken great interest in having the work of her own countrymen adequately shown, and the exhibit of the new Spanish school of painting, one of the most interesting, yet least known, of all the European schools, will undoubtedly be a conspicuous attraction. Besides the Spaniards, the Polish artists have united to send an extensive exhibit, in charge of Herr von Wrotnowski, and similar exhibits, organized in some cases by Government authority, are to be sent from Denmark, Sweden and Hungary. The better-known schools of France, England and Italy will be well represented. The Royal Scottish Academy, the Royal Society of Painter-Etchers, the Société des Aquafortistes Française, and nearly every Fine Art Academy in Italy, has engaged space for an exhibit, and a collection will probably be sent from this country. Independent of any special exhibition, Munich is, as every tourist knows, one of the most interesting cities in Europe to the artist or architect. The painter finds there two or three splendid collections of old pictures, and a modern school of painting, whose fame has spread all over the world; while the sculptor can study, in the Glyptothek, the pediment group from Egina, and many other beautiful antique works, and, for the architect, wonders are spread out on every side. Whatever one may say of the architectural fancies of the last two kings of Bavaria, they have certainly made Munich a very instructive place to a professional man, and nowhere else in the world can certain effects of architecture be studied to such advantage. If we add to this, as we can with truth, that all tourists, whether of artistic taste or not, find Munich delightful, some on account of its picturesqueness, some for its fresh mountain air, some for its brilliant military displays, and some for the cheapness and comfort of living there, we are quite sure that, with the exceptional attraction offered by the present exhibition, the city will prove irresistibly attractive to all of our readers who are fortunate enough to be within travelling distance of it during the summer.

THE Italian Government is fortifying Selinunte, the ancient Selinus, on the southern coast of Sicily, and, in the course of the excavations, three sculptured metopes have been turned up. One of these shows a winged sphinx, seated on its haunches, and another represents Europa, carried away by the bull, which has a long, thick tail, arching over its head. What the signification of these sculptures can be, it would be difficult to guess. Selinus was founded in 626 B. C., by a colony from Megara, so that its original architecture was probably of the most archaic Doric style. Whether the three metopes just found belong to the earliest temples cannot be determined, but as none of them will fit the spaces between the triglyphs of any of the buildings of which fragments are still standing, it is probable that they date from a very early period in the history of the colony.

CAPITALS.[1] — VII.



Figs. 81 and 82. From the Cathedral of Nevers.

IN closing this brief sketch of the Gothic capital we will point out the alterations made in its decorations in the fourteenth century, and also in the fifteenth when it disappeared. It was the multiplication of the vaulting-ribs that led to this singular result. In the fourteenth century the capital was subdivided like the pillars themselves, the abacus was restricted and the whole was reduced to the insignificance of a mere ornamented bandeau. It can be examined in the accompanying cuts made from the Cathedral of Nevers (Figs. 81, 82, 83). Little more than an ornate ring here, it was destined to disappear at last, the mouldings of the arches becoming those of the pillar.

If we were discussing literature we might quote the famous line:

"At length Malherbe appeared, etc." Speaking of art we should rather say: "At length Rome reappeared!" But like those who have continued to mourn for "the confused art of our old romancers," we cannot help looking wistfully back to the architecture of the Middle Ages which, after a period of

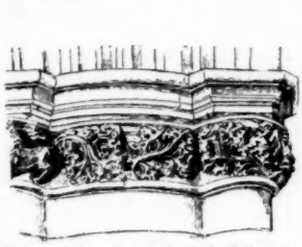


Fig. 83. From the Cathedral of Nevers.

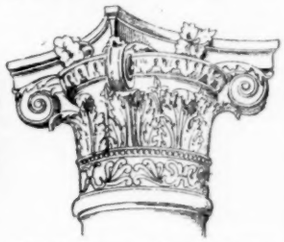


Fig. 84. From a Palace at Ferrara.

confusion and indecision reaching from antiquity down to the twelfth century, succeeded in creating a style so original and so full of force and beauty; a style which never became genuinely decadent, that is, it perished not through ignorance or neglect of principle, but because of the very exaggeration of this principle. It seems as though the world at the end of the fifteenth century was eager to abandon an art that had become over-refined and too complex; and when the artistic treasures of ancient times, of that Italy forced by the ephemeral conquests of Charles VIII and Louis XII, were revealed anew, their order, simplicity and pure beauty must have powerfully impressed artists weary of their own cold, geometrical work: it was like coming out of a gloomy vault, lighted only through stained-glass, into open day and fresh air.

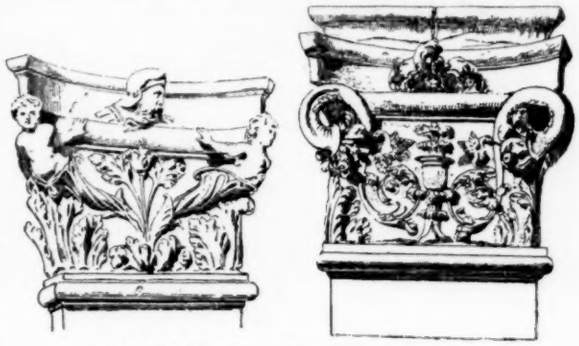
The revival of antique types, as every one knows, was both literary and artistic. But artists were not conscious that it was form alone that exercised a spell upon them; they, in reality, cared little for the true principles of ancient art, but hastened

Figs. 85 and 86. From the Palace of the Cancellaria, Rome.

to use it as a rich mantle with which to drape the monuments of traditional art. The period which witnessed the erection of the earliest Renaissance edifices will never be forgotten. Later

[1] From the French of Adrien Joigny, in Planat's *Encyclopédie de l'Architecture et de la Construction.* Continued from No. 849, page 5.

the more exclusive study of the antique led to a disdain for all that had survived from mediæval art and in the end swayed artists despotically. Italy had never been completely subjugated by the art of the Middle Ages and naturally it was here that the first attempt was made to resurrect ancient types. It must be admitted that this movement, which can be better understood in Italy than elsewhere, responded to a widely-felt need, for during the sixteenth century it spread throughout



Figs. 87 and 88. From the Chateau de Chambord.

Europe, creating in the different countries a style peculiar to each.

But, confining ourselves to the capital, we are especially struck with the absence of any guide to a judicious selection of examples to present to the reader. Caprice, fancy and individual taste have too large a share in these compositions; it is perhaps the first time that an art is seen developing without any fixed or, at least, clearly definable principles; it is perhaps the first instance of the establishment of an art independently of certain laws, of which we have as yet said little and which we term the laws of taste. We are, however, speaking particularly of the capital. We will content ourselves with the reproduction of a few specimens selected without any attempt at systematic classification or any effort to indicate the motive of our choice.

Figure 84 is copied from a palace in Ferrara; it is a sort of Composite capital lighter than the Classic type which is found reproduced in it with much freedom and grace. The volutes appear as plant stems springing from the vase which is crowned by an echinus sculptured with foliaged *rais de cœur*. The two pilaster capitals from the beautiful palace of the Cancellaria at Rome, from the hand of the celebrated Bramante, present a purely decorative arrangement of the volutes (Figs. 85, 86); they roll over in one direction or the other to suit the artist's fancy, and no longer spring from the astragal as in the regular antique compositions. Certain Roman capitals of second rank may have furnished the model for this ornamentation; the pilaster capital of the Temple of Mars Ultor reproduced above is of this family, but the type was generalized during the Renaissance with such profuseness and variety that the capitals in which it was adopted seemed to be new. The elegant capitals on the ground-floor of the façade of the Paris Hôtel de Ville, from their disposition

Fig. 90. From St. Eustache, Paris.

Fig. 89. From St. Pierre at Caen.

Fig. 90a. From St. Eustache, Paris.

and decoration, appear to be derived from examples similar to the pilaster capital of the first story of the Cancellaria. The volutes of the other pilaster were sometimes transformed into horns of plenty, from which issued fruits and flowers, and sometimes into dolphins, human figures, etc. The artist's fancy seemed inexhaustible in these modifications.

Fig. 91. From the Palace of the Institute, Paris.

We give, also, two pilaster capitals decorating the exterior chimneys of the Castle of Chambord (Figs. 87, 88). The next example belongs to the style of Normandy; it adorns the outside of one of the chapels of St. Peter's at Caen (Fig. 89). There

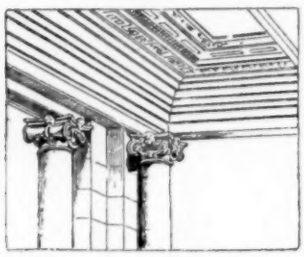


Fig. 92. From the Palace of the Capitoline, Rome.

Fig. 93. Bronze Capital from the Column of July, Paris.

were genuine schools in France. Orléans, Rouen, Dijon, Bourg, with its wonderful Church of Brou, Ferté-Bernard, etc., offer admirable specimens of sixteenth-century art. Our next cut is likewise of a pilaster capital; it is from the Church of Saint-Eustache, Paris (Fig. 90).

Pure Classic forms were, nevertheless, maintained, as the dome of St. Peter's at Rome proves; they reconquered their place when taste, weary of the profusion of the sixteenth century, demanded a return to the old simplicity. Between this last epoch, or that of Louis XIV, and the sixteenth century an intermediate transitional style had appeared; this was the period of Henry IV and Louis XIII. We cannot give illustrations of the capitals of these times; every one has seen the great palaces that they adorn.

We reproduce a pilaster capital from the Palace of the Institute at Paris, formerly the Collège des Quatre Nations, founded by Mazarin (Fig. 91). It is of robust aspect, with Composite volutes at the angles, and is crowned with a beautiful *fleuron*, the lower part of which envelops the central egg of the echinus; bouquets of foliage fill the interspaces. Similar compositions have, in addition, wreaths that appear to be suspended from the volutes. In the Capitoline palaces at Rome, Michael Angelo had already employed Ionic capitals with two faces, which were enriched with wreaths looped so as to touch the astragal; the gorge beneath the curiously fashioned cousinets was decorated with roses (Fig. 92). These capitals were popular in France. Very beautiful specimens of them are to be seen in the gates of the Louvre. They often had four faces, and they were in vogue down to the end of the eighteenth century.

Modern architects have had the advantage of the teachings of every school of the past. In compliance with these, they have sought to communicate to the composition of their capitals

Fig. 94. From the Façade of the Court of Cassation, Paris.

Fig. 95. From the Winter Circus, Paris.

sometimes the freedom and grace of the Renaissance, sometimes the purity and nobility of Grecian art as they have learned to view it more intelligently and to understand it better, and sometimes the refined delicacy of the Pompeiian school. The art of every age has been drawn upon, and certainly the element of taste assumes great importance in the reconciliation of styles of such diversity. We present a few examples of modern capitals selected somewhat by chance, and without any critical comment. These include the rich bronze capital of the column in the Place de la Bastille, commemorative

Fig. 96. Stone Capital of a Pilaster from the Opéra-House, Paris.

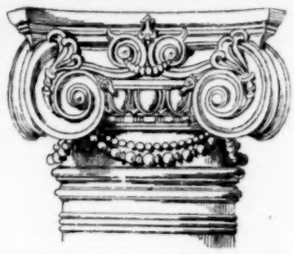


Fig. 97. Bronze Capital from the Loggia of the Opéra-House, Paris.

of the three days of July, 1830 (Fig. 93), by M. Duc, and the colossal capital supporting the architrave of the façade of the Court of Cassation at the Palais de Justice, by the same architect (Fig. 94). Executed as it were at the two extremes of the artist's long career, both bespeak a zealous reaching-out after the noble forms of that antiquity from which Roman art was to spring, but which better perpetuates the memory of Greek art.

The capital of the Winter Circus at Paris, of a naturally easier composition, recalls the fine Roman capitals, and especially that of the Temple of Castor and Pollux (Fig. 95). The next two examples, one representing a stone pilaster capital, and the other a bronze capital from the loggia of the façade of the Paris Opera-House, by M. Garnier, emphasize still more clearly the efforts of modern architects to reconcile the forms of antiquity, in their purity and nobility, with the freedom, the graceful fancy and even the exuberance of the Renaissance, as displayed at the period of its vigorous maturity (Figs. 96, 97). The beautiful Palace of Longchamps at Marseilles, by M. Espérandieu, exhibits some curious capitals, in which the traditional decorative forms are happily modified in a way to suggest by aquatic leaves and flowers the fact that the structure is built at the terminus of the canal from the Durance (Fig. 98). Lastly, we give a capital from the new Cathedral of Marseilles, by M. Vaudoyer (Fig. 99).

Many other examples of the period might be cited which are not less interesting than those given above, but it is time

Fig. 98. From the Palace of Longchamps, Marseilles.

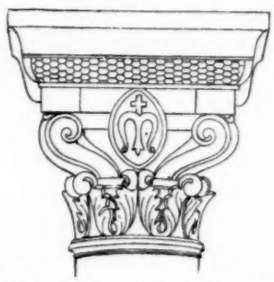


Fig. 99. From the Cathedral of Marseilles.

to bring this article to a close. For further study of the subject, the reader is referred to our discussion of the column as a whole.

Adrien Joigny.

Character of Water-wheel to be used at Niagara Falls. — A paper company at Niagara Falls finds it no easy task to decide how the terrific power from the 130 foot head of water which is to be at their disposal shall be utilized. At a recent conference of the officers of the company, about twenty wheels and methods of developing power were submitted to them, and all but three were immediately passed over as being wholly inadequate to the occasion. Most of the water-wheels made would crush like egg-shells beneath the force of a column of water falling 130 feet down a penstock. The wheels selected for further tests are to receive it at Holyoke, and when a decision is reached the company's architect will prepare plans for several ways of using the power. The contract for building a coffer-dam for the company has been let, and also for the tunnel and shaft. The tunnel will be 500 feet long and probably 10 by 12 feet in size. The shaft will have a depth of 140 feet, and will be 14 by 40 or 45 feet in size. — *Springfield Paper World.*

DISPOSAL OF SEWAGE AT LARGE INSTITUTIONS.[1]

SECTION OF CARRIER DITCHES

THE disposal of sewage at insane asylums, prisons, schools and hotels by irrigation or land-filtration, although not as yet very generally adopted in this country, has had sufficient use to demonstrate its entire efficiency and its superiority in all cases where the surrounding conditions are suitable. It is the most promising means for solving the very difficult problem which the gathering of a large number of persons in buildings beyond the reach of sewers always presents.

It must be more than ten years since the adoption of surface-irrigation for the disposal of the sewage of the Insane Asylum near Worcester, Mass. There most of the sewage is delivered at a considerable distance from the building and on gravelly land, but the arrangements include the necessary pipes and pumping facilities for irrigating the ground immediately in front of the administration building, where sewage, in its fresh state, is spread directly over the surface of a large, sloping lawn immediately adjoining the main-entrance drive, and within a very short distance of the windows of rooms occupied by both officers and patients. The disposal on both tracts seems to be without offence and entirely effective. The sentimental objection to such delivery of sewage on pleasure-ground almost adjoining the building would seem to be very great, but there is only the sentimental objection. Practically, all that is necessary is to screen out from the sewage paper and other matters which would show on the surface of the lawn. What remains to be delivered contains often less, and rarely more, than one part in two hundred of anything but pure water. Such a very dilute mixture may be treated practically as ordinary brook-water might be treated up to the time when it enters into a state of putrefaction, from which, and not from foreign substances as such, the real source of offence arises.

This point cannot be too strongly insisted upon. It constitutes the key-note of all successful sewage-disposal. Before putrefaction begins sewage has no offensive odor; after it begins to putrefy, it rapidly becomes both offensive and dangerous. Therefore, no system of surface-disposal can be entirely satisfactory from which the element of putrefaction is not eliminated. Even such small receptacles for retaining sewage as ordinary kitchen grease-traps, large catch-basins, cesspools and all possible seats of putrefaction should be regarded as inadmissible in any system of house drainage or sewerage of which the outflow is to be treated by surface irrigation or filtration.

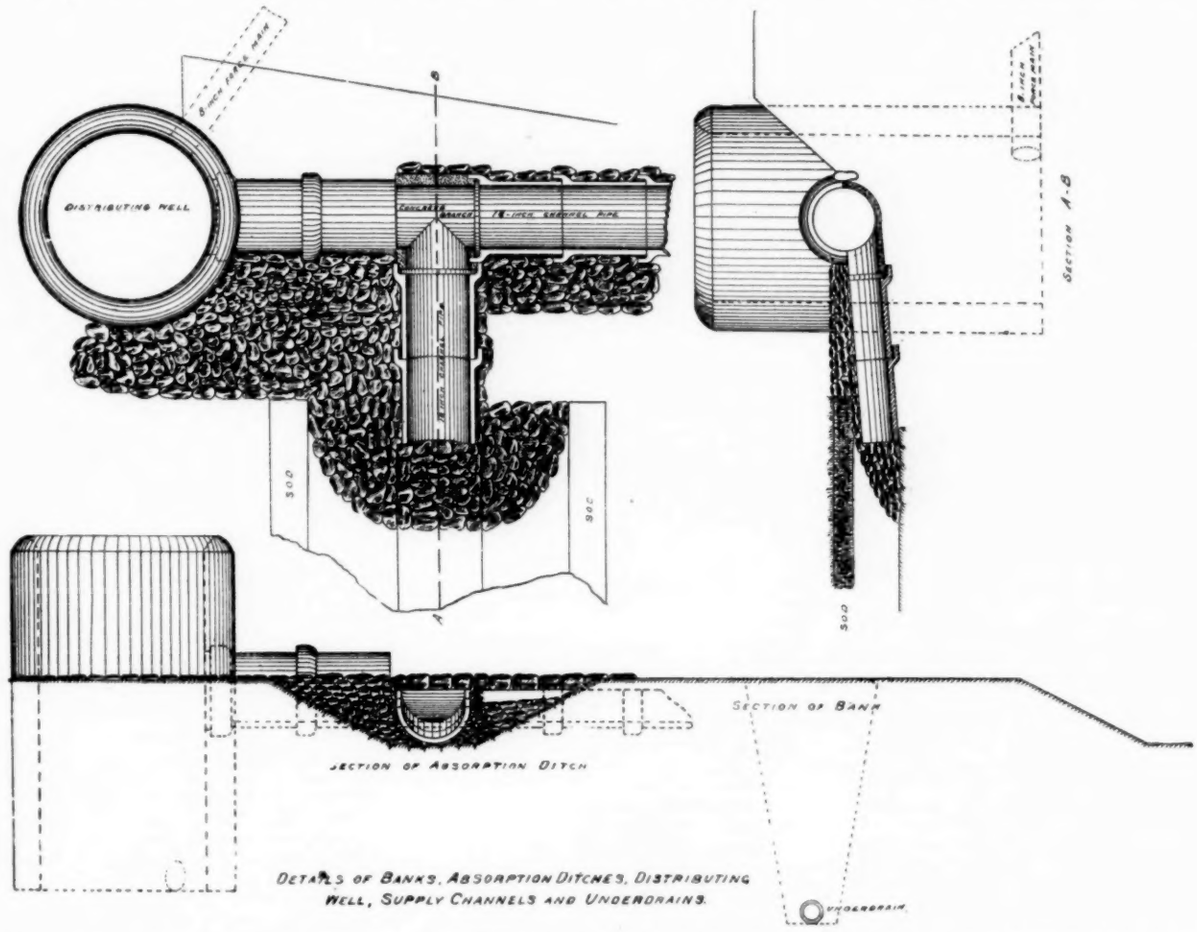
In the competition for the location of the Eastern Insane Asylum of Pennsylvania, the city of Norristown made a very strong and successful argument, based on the exceptionally good drainage facilities offered by a small stream, Stony Creek, flowing by the proposed site and through the city to the Schuylkill River. Soon after the occupation of the Asylum, a loud outcry was raised against the intolerable fouling of Stony Creek, and the writer was engaged to devise means for artificial removal. The details of the system adopted have already been extensively illustrated and described.

The sewage is received in an open reservoir 40 feet square and 7 feet deep. When this reservoir becomes filled, it is discharged by the operation of an automatic siphon. Toward the end of the discharge the walls of the reservoir are washed down by an automatic sprinkling pipe, and its floor is frequently washed with a hose. The outflow, amounting to about 75,000 gallons, is delivered through an 8-inch pipe which passes through a valley under a creek, and rises about 15 feet to a carrier running along the far side of the irrigation-field, from which it is delivered alternately over each of three sections into which the field is divided, several discharges being applied in succession to each section. The tank discharges three or four times in twenty-four hours. This system was first put in operation June, 1885. In June, 1887, the President of the Board of Trustees wrote:

"Since your system was put into operation at the hospital, every doubt has given place to a conviction that the problem of sewerage for public institutions has been successfully solved. It has been a success from the first and the Board of Trustees and the public are entirely satisfied with the results."

Up to the last accounts, 1889, the system was performing its work in a most satisfactory manner.

In 1889, the writer was engaged to provide for the disposal of the sewage of the Insane Asylum near London, Canada. The work involved the reconstruction of much of the plumbing-work of the establishment and the entire abandonment of the old system of outside drainage, which had been through combined sewers taking the



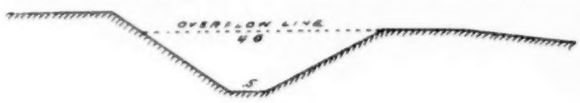
DETAILS OF BANKS, ABSORPTION DITCHES, DISTRIBUTING WELL, SUPPLY CHANNELS AND UNDERDRAINS.

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

roof-water and foul sewage of all the buildings to the head waters of a brook which passes through the city. To satisfy complaints that had been made as to the fouling of the brook, a rude sort of settling-basin had been established to hold back solid matters. This failed to correct the difficulty. In arranging the new work, this old system was left for the removal of roof and ground water only. The general arrangement of the improvement is shown on the full-page illustrations.

All of the buildings have their soil-pipes, kitchen-drains, laundry-wastes, etc., connected with a system of 6-inch sewers having tightly cemented joints and with carefully graded inclinations, leading to a central tank. Each branch of these sewers is provided at its head with an automatic flush-tank, preventing deposits in the sewers, and so preventing putrefaction. The central tank is 70 feet by 40 feet; its walls are 16 inches thick; its bottom is of concrete. It is covered by three longitudinal arches, 12.66 feet span, 12 inches thick. These arches rest on two longitudinal walls with arched openings. The floor of the tank is graded as shown, varying between elevation 31.9 and 32.3 respectively. Each section has a longitudinal drainage-gutter, with its upper end at 32.22 and its lower end at 31.98, 31.94, 31.90, with a cross gutter leading to a sump four feet in diameter with its bottom at grade 30.0. The bottom of this sump is hemispherical, and the suction of the pump is centrally located, having six inches space between its mouth and the bottom. This mouth should be bell-shaped, not straight as shown in the drawing. The elevation of the ground at this point is 47.5, making the surface of the floor of the tank about 15 feet below the surface. There are three man-holes at each end of the tank, with covers at the surface of the ground. At the receiving end of the tank, at the head of the central chamber, is a screening-chamber, reaching to the surface of the ground and with its bottom at elevation 34.4. The opening from this chamber into the tank is 8.33 feet wide, and it is provided with a screen carried into slots in the side walls 4.5 feet high in the centre. This screen is made of wrought-iron and galvanized. The vertical bars are of half-inch round iron, and the openings between them one inch wide. The top of this screening-chamber is covered at the surface of the ground with a hinged wooden cover.

The tank is intended to be filled to a depth of 5 feet or to the spring of the arches, to which height it has a capacity of a little more than 100,000 gallons. It is located near the main fire-stack of



SECTION OF DISTRIBUTING DITCHES

the establishment, adjoining which a basement pump house has been constructed, having its floor at such an elevation that when the tank is filled to the spring line, the sewage rises through the suction-pipe into the wheel of the centrifugal pump, filling it above its axis so that when the pump is started, the driving out of this water is sufficient to exhaust the pump of its air and establish a full suction. The pump is an 8-inch Webber centrifugal, with Westinghouse engines working directly on its main shaft. The suction is 10 inches in diameter and the force main 8 inches. As a provision against a possible failure of the pump, a 6-inch overflow is established at the top of the tank, which delivers into the main brick sewer of the old drainage system, passing near by.

As the tank is underground, artificial ventilation became necessary. This is accomplished through the man-holes, of which there are three at each end of the tank. Those at the end farthest from the pump are covered with open gratings. Those at the end nearest to the pump have tight covers. A 10-inch ventilator is taken from the side of each tight man-hole, and is carried to a junction chamber with a 15-inch ventilation-pipe connected with the chimney. There is thus maintained a constant current down through the perforated covers, through the whole length of each section of the tank, and out by the man-hole shafts, which are connected with the chimney.

The sewage is delivered to the tank by three 6-inch lines entering a screening-chamber built out from its end. Two of these sewers deliver at an elevation higher than the top of the tank; the other delivers at the level of the spring line, bringing drainage from cottages on somewhat lower land than that occupied by the main buildings. The screen is formed with an iron grillage, and is movable, so that it may be removed for cleansing when occasion requires. It is sufficiently open to admit all but the larger objects brought in by the sewage to the tank and pump. It is a great advantage of the centrifugal pump that it so beats and thrashes the sewage as to reduce nearly all of its solids to atoms. The force-main is an 8-inch spiral, riveted pipe leading from the centrifugal pump to the receiving-well at the absorption-field, 1,550 feet distant. This 8-inch force-main has a continuous rise from the pump to the receiving-well, and the pump has no valve, so that whenever pumping ceases the contents of the receiving-well and force-main flow back into the tank, thus obviating the possibility of freezing.

The field devoted to sewage disposal contains about thirty acres, level at its upper end and sloping gradually for the remainder of the distance to an open water-course.

The level portion of the field is laid off in ditches 8 feet wide at the top, separated by beds 10 feet wide. The ditches are in pairs, returning on each other. Under the bank between each pair is a deep underdrain of architectural tile. The soil is very light and sandy over the greater part of this tract, and thus far the removal of the purified sewage has been by underground soakage, even the descending effluent, which enters the tiles in the heavier portions in the ground, leaking out through their joints before the outlet is reached. The main outlet from the receiving-well (18-inch channel-pipe) runs across the end of the field, and has a branch to each of the ditches. It has a fall of 1 to 500. At its lower end it delivers into a distributing ditch, which, at its lower end, is connected by a carrier ditch with two other distributing ditches farther down the slope. The main outlet from the receiving-well is made of vitrified 18-inch pipes, split in halves. These half-pipes are connected by concrete channels with the ends of the parallel ditches (see detail drawings). There are gate-slots between the half-pipes and the concrete branch pieces, furnished with movable gates. By placing and removing these gates, the flow of sewage can be directed at pleasure into all or any of the parallel ditches. The connection between the concrete branch pieces and the ditches is made with two lengths of vitrified pipe (four feet). As the bottoms of the ditches are all in the same plane, and as the main outlet from the well has a fall, there will be a drop of varying height from the half-pipes into the ditches. At this point, and even where the drop runs out at the lower ditch, the bottom of the ditch is roughly but strongly paved, as shown, to check the flow and prevent the cutting of the bottom at that point. The absorption-ditches are eight feet wide at the top, two feet wide at the bottom and one-and-a-half feet deep. They are separated by beds ten feet wide at the surface. This level area, with its settling-ditches, may be used for intermittent downward filtration, and as the total capacity of the ditches is equal to twice the capacity of the tank, even were there no immediate filtration, the area is worked in two or three sections alternately. Two or four of these ditches at the lower side of the field may be used, if found necessary, as settling-ditches to deposit heavy matters before delivering the liquid over the surface of the irrigation-tract below. It has been found, however, that the churning of the sewage given by the pump makes such treatment unnecessary.

The capacity of the ditches of the level tract has proved in practice to be so great as to require little use of the distributing ditches in the field below; they are, however, useful for the irrigation of crops. These ditches have a fall of 1 to 500 and are used in the following manner:

If the flow through a distributing ditch is arrested at any point, as it may be by striking a wrought-iron gate into the earth, making a dam across it to above the top, the sewage will overflow for a greater or less distance above the dam, according to the volume of the current. If the dam is placed first at the lower end of the upper distributing ditch, it may overflow, for example, 200 feet above the dam. When the ground to be reached by this overflow has received a sufficient supply of sewage, the dam is placed about 200 feet higher up stream, and the overflow carried over the next section, and then, in like manner, over a third. Should the ground between the two ditches not be able to absorb all the sewage discharged upon it, the overflow will be caught by the lower one, and if its quantity is sufficient can have its distribution regulated by the placing of a dam there, as above.

The main outlet from the well is 400 feet long; the settling ditches have an aggregate length of 3,600 feet; the carrier and distributing ditches have an aggregate length of 3,100 feet; and the tile drains aggregate 6,600 feet. The outlet to the under drainage (six-inch tile) is six feet deep at the end of the upper bed, six and a half feet deep at the lower bed. The lateral drains are four-inch tile for the lower half, and three-inch tile for the upper half. The upper ends of these laterals are four feet below the surface of the beds, and they are carried on a true grade to the six-inch outlet pipe. To indicate the care that the successful construction of such work calls for, it may be stated that in the construction of the level (filtration) tract 4,000 stakes were set to both grade and line, 1,000 to line only and 1,000 to grade only.

This system was put in operation in July, 1889, and has worked ever since, in the most satisfactory manner. The Superintendent of the Asylum, wrote as follows (January 2, 1891):

"Our sewage disposal works, put in in the early part of 1889, have been a complete success; neither snow, frost, nor anything else has so far interfered, materially, for a single day with their operation and I consider that the problem of sewage disposal is solved here for all time."

George E. Waring, Jr.

A Danish Legend. — In a church on one of the Danish islands it was the custom of the men, on walking up to the altar and coming back again, to bow at a certain spot to the women sitting on one side of the aisle. No one could tell why. Last year it so happened that a layer of plaster was removed from the wall on the women's side, and a picture of the Virgin Mary was brought to light, which had evidently been the original cause of that reverential custom — a custom which was continued for a period of 400 years, long after its significance had been forgotten. — *Veststesvigs Tidende.*

COMPARATIVE MUNICIPAL BUILDING LAWS. — VI.

[*Note:* — In these tables bracketed letters invariably refer to preceding passages in the same column.]

Partition-Walls.

Boston: — *Brick Buildings.*
a. Exceeding 30′ wide,
b. Shall have brick partition walls,
c. Not more than 25′ apart,
d. Not less than 12″ thick, carrying floor-beams,
e. Except Dwellings, Tenements, Stations, Stables and Public Buildings. Such partitions shall run from front to rear the full height of building, with thickness four inches less than corresponding external walls, provided thickness shall not be less than 12″ where beams are carried.
f. Wooden partitions in any manner supporting floor-beams or rafters, shall be placed directly over each other, upon wall or metallic girder and head and foot against each other as much as possible.
[See "*Columns*" and "*Girders*".]

Baltimore: —

Brooklyn: — *Buildings* (*a*), shall have floors and roof supported on partition-walls, of brick from front to rear not less than 8″ thick, or of stone, or of girders supported by sufficient columns of brick, stone or iron or of wood if approved by the Commissioner. Partitions not more than 30′ apart and when extending more than 35′ above street level, not less than 12″ thick if of brick. Partitions may be 40′ apart if the walls in stories above are supported on sufficient iron girders not more than 15′ apart resting on lateral wall. (*Does not apply to buildings devoted to public assemblies*).

Charleston: — *Tenement Buildings.* Partitions same as party-walls.

Chicago: — *Business Buildings.* Interior walls of the same thickness as rear walls. No floors nor roofs carried on scantling partitions.
g. Plank or board partitions not to aggregate more than 350 square feet in one story.

Cincinnati: — } Division-Walls shall not be less than two-thirds the thick-
Cleveland: — } ness of party or external walls of the same length and height.
h. Scantling partitions shall not be employed as supporters of any floor or roof (*except in private residences.*)
Bearing Walls more than 12′ high minimum thickness 9″.

Denver: — *Brick, Tenement or Lodging House.*
(*a*). Shall have brick partitions,
(*c*). *Carrying floor-beams*, not less than 8″ thick.
(*e*). But read 13 for 12. Partitions may be of stone.
In Buildings not over 125′ wide, (*g*), girders or iron beams and columns may be substituted for masonry partitions.
Floor timbers shall not rest upon wooden partitions, except at one end in dwelling-houses.

Detroit: —

District of Columbia: —

Kansas City: — *Brick Buildings.*
(*a*). Shall have masonry partitions,
(*c*). Not less than 13″ thick.
(*e*). Read 13 for 12. Partitions may be of stone.
(*f*). For "metallic girder" read "girder".
Building not more than 100′ wide, (*g*).
Main partitions supporting floor beams or rafters of a brick building shall be placed over each other, shall rest directly on a wall or girder, and shall head and foot against each other, as far as practicable.

Louisville: — *Business Buildings.* Upper two stories 12½″ thick and descending each two successive stories increased 4″ in thickness.
(*g*).
Scantling partitions not to support any roof or floor except in dwellings.

Memphis: — No floor beams shall be wholly supported on wooden partitions.

Milwaukee: —

Minneapolis: — (*f*). For "metallic girders" read "girder or hard pine capping."
(*g*); (*h*).

Nashville: —

Newark: — *Other than Dwellings.*
(*a*), (*b*), (*c*), less than 30′ high, minimum thickness 8″; greater height minimum thickness 12″. Or such partitions may be of iron or wooden girders on iron or wooden posts, or of stone.
Tenements and Flats with Stores below, hall partitions shall be built of brick to second floor beams.

New Orleans: —

New York: — *Dwellings, Apartments and Hotels.* Floor-beams must rest on stone or brick walls not more than 26′ apart, or on iron girders carried upon piers of masonry when the walls are not more than 33′ apart, provided the clear span of the beams does not exceed 26′ or provided an 8-inch partition supports the beam within 5′ of the centre. (Such 8″ walls shall not exceed 50′ high.)
Stores, Warehouses, Factories, exceeding 25′ between walls, shall have partitions of brick, or of girders on iron or wooden columns or piers of masonry, not more than 25′ apart. Walls less than 25′ apart, more than 60′ high, with front, rear or cross walls less than 40′ apart, interior walls may have thickness diminished according to judgment of Superintendent, provided minimum thickness 12″ is increased below.
Iron girders and columns or piers of masonry may be used over rooms having a clear span of more than 26′.
Beams shall in no case rest on stud partitions.
8″ brick, and 6″ and 4″ hollow tile partitions may be built with maximum heights respectively, 50′, 36′ and 24′, and maximum horizontal length 75′ unless strengthened with cross-walls, piers or buttresses. All such walls carried on proper foundations or on iron girders and columns or piers of masonry.[1]

Omaha: — *Business Buildings.* One story building, 8″ thick. Three story buildings, all 12″ thick. Higher buildings, to have the upper two stories 12″, and descending each succeeding two stories increased 4″, except seven story building only 20″ above foundation.
(*f*). For "metallic girder" read "girder."

Philadelphia: —

Pittsburgh: —

Providence: — (*f*), for "metallic girder" read "girder or hard-pine capping."

St. Louis: — Same as Party-Wall.

San Francisco: — *Stores, Warehouses or Factories more than 25′ wide.* Wooden partitions or girders shall not be more than 27′ apart. Brick walls may be 92′ apart, when iron or wooden girders are used in place of wooden partitions.
Cross-walls may be 4″ less in thickness than bearing-walls of same story, but not less than 12″.

Wilmington: —

[1] All fore and aft stud partitions and such other main partitions as may be required by the Superintendent of Buildings, in cellar or lowest story, shall have solid stone or brick foundation walls under same, built to top of floor beams or sleepers, sill partition to be of locust, unless brick walls are built 5″ higher than top of beam. Girders supporting first tier of beams in dwelling-houses shall be supported by brick piers or iron or locust piers on proper foundations.

Special Cases Requiring Increased or Diminished Thickness of Walls.

Boston: — *a. Brick buildings wider than 25′, without partitions of brick or of girders on columns, the full height of building and from front to rear.*
b. Increased thickness of external and party walls four (4) inches for every additional 25′ of width.

Baltimore: —

Brooklyn: —

Charleston: —

Chicago: — *e. Outside walls carrying trusses.* Height, 15′ to 25′. Minimum average thickness, 16″.
Height, 25′ to 45′. " " " 20″.
" over 45′. " " " 24″.
d. Walls more than 100′ long, without cross-walls of equal height; increase thickness, 4″.
Front and rear walls supporting girders shall be thickened by pilasters 8″ projection, 24″ face, at each support.
12″ *Division-Walls* shall have 4″ brick ledges to receive bearing of joists and rafters.
f. When height of wall is greater than for which permit was granted.

Cincinnati: — (*g*), *External, Party or Division Walls being bearing walls* shall have thickness increased 4½″ if recesses or openings exceed half area of wall.
If the centre of any external or party wall is not more than 25′ distant from the centre of any other external or party wall to which it is tied by the beams of any floor or floors other than the ground-floor or the floor of any story formed in the roof, the length of such wall is not to be taken into consideration in considering its length.

Cleveland: — (*g*).

Denver: —

Detroit: —

District of Columbia: — *Walls laid stretcher bond*; minimum thickness, 13″. *Walls of irregular rubble-work* one-quarter thicker.

Kansas City: — (*a*); (*b*).

Louisville: — *Outside walls carrying trusses.*
Height, 15′ to 25′. Minimum average thickness, 17″.
" 25′ " 45′. " " " 21½″.
" over 45′. " " " 25½″.
(*d*); (*f*).

Memphis: — (*a*). Increase side walls 4½″ for every 5′ or part of 5′ greater width except otherwise provided.
All Party-Walls to have 4½″ projection necessary to carry floor-joists.

Milwaukee: — *Party or Division Walls not more than 12″ thick* to have 2″ brick ledges to bear joists. (*c*); (*d*).
Walls of rubble stone or faced with stone increase thickness 4″.

Minneapolis: — *Buildings wider than 50′, without partitions of brick or of girders and columns, running from front to rear*, increase *external walls* 4″ for every additional 50′ or part thereof.
(*c*); (*d*).
Bearing-walls over 125′, without cross-walls or buttresses of height of outside walls, increase 4″.
Party or Division Walls not more than 12″ thick to have 3″ brick ledges on both sides to bear joist. Corbelling to be done in not less than 6 courses, well bonded into wall.
Rubble walls, one-quarter thicker than specified thickness, and not less than 18″.
Buildings raised, thickness according to judgment of Inspector.

Nashville: —

Newark: —

New Orleans: —

New York: — *Bearing-walls more than 25′*[2] *apart* increase thickness 4″ for every 10′ or fraction thereof clear span if more than 25′.
Buildings more than 100′ deep, without cross-wall or proper piers or buttresses, increase thickness of side or bearing walls 4″ for every 100′ or part thereof more than 100′ deep.
Bearing-walls faced with face-brick laid in running bond increase thickness 4″.

Omaha: — (*a*); (*b*); (*d*); (*f*).
Outside walls carrying trusses.
Height, 15′ to 25′. Minimum average thickness, 16′.
" over 40′. " " " 24″.

Philadelphia: —

Pittsburgh: —

Providence: — (*a*),
(*b*). [Partitions not specified to be of full height.]
Bearing-walls over 90′ long, without cross-walls or buttresses of equal height, increase thickness 4″.
Walls may be 4″ thinner than required by tables if floor-joists rest on corbelling 6 courses high, well bonded, provided wall is not less than 12″ thick.

St. Louis: — (*d*); (*f*).
Buildings wider than 35′, without partitions of brick or of girders and columns, from front to rear, increase thickness of wall 4″ for every 10′ or part thereof exceeding 35′.
Outside walls carrying trusses.
Height, 15′ to 25′. Minimum average thickness, 17″.
" 25′ to 45′. " " " 21″.
" over 45′. " " " 25″.

San Francisco: — *Outside walls of churches, schools, theatres, foundries, machine-shops and buildings of public character* to have such piers or buttresses as may be judged necessary by Board of Fire Wardens.
(*f*).
Brick foundation walls, without cross-walls, shall be strengthened by piers 2′ 4″ wide, projecting 8″, not more than 16′ apart.
Front or rear walls carrying joists or timbers shall be 4″ thicker than otherwise provided.
Brick buildings more than 100′ deep, without cross-walls or proper piers, shall have side or bearing walls increased 4″. Piers with faces aggregating one-quarter length of wall, and with 4″ projection, may be used for same purpose.

Wilmington: — *Outside walls carrying trusses.*
Height, 15′ to 25′. Minimum average thickness, 17″.
" 25′ to 40′. " " " 21″.
" over 40′. " " " 26″.

Compiled by H. A. PHILLIPS.

[To be continued.]

[2] [26′ clear span where iron partitions are over.]

ON THE OLDER FORMS OF TERRA-COTTA ROOFING-TILES.[1]—III.

ITALY.

THROUGHOUT Italy, the usual covering for house roofs is the normal tile (*imb.*). The tiles vary somewhat in size. In Pavia and Ravenna the tiles are quite large, and in section somewhat angular. In Verona, the tiles appear quite long. Photographs of Parma, Milan, Pavia, Bologna and other cities reveal minor peculiarities in the manner of tiling. In some cases courses of imbrices are close together, and the tiles are often crowded in the courses from eaves to ridge. There is no alignment of the tiles, as in Chinese, Korean and Japanese tiling, and the work always seems slovenly done.

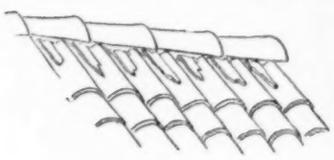


Fig. 41.

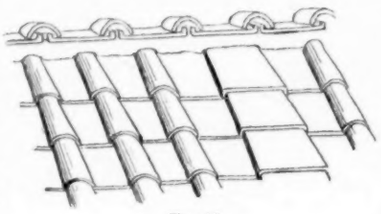


Fig. 42.

In Verona, fragments of tiles are inserted in the interspaces between the ridge-tiles and their junction with the roof-tiles, as shown in Figure 41. At Certosa and Milan rows of imbrices with their concave faces uppermost are placed between the rows of imbrices in their normal position. In other words, after the roof is tiled in the ordinary way, an additional layer is put on in an inverted position between the rows of imbrices. The roofs are low pitched and this extra layer probably offers an additional security.

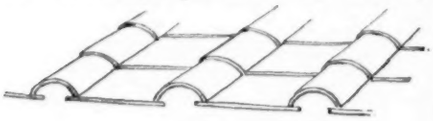


Fig. 43.

Beside the normal tile there is often seen a broad flat tile with lateral edges turned up accompanied by a semi-cylindrical imbrex. This tile is used in Rome, Florence, Sienna, Pisa, Ravenna and doubtless in other cities of Italy. An examination of a large series of photographs shows it to be more common in central Italy. On the roof slopes the broad tegula may be seen in certain courses used as an imbrex (Fig. 42).

This broad tile bedded in stucco is also used as a ridge-tile as shown in the last figure (Fig. 42). This tile is a direct survival of the ancient Roman tile which in turn has been derived from the Greeks, unless both Greeks and Romans were indebted to the Etruscans for it. The modern tile is much smaller and thinner. It is often represented in the pictures of old Italian masters (Fig. 43. From a painting by Botticelli in Dresden Gallery).

A modern tile, probably interlocking, quite small in size, but made somewhat after the style of the tile last described is occasionally seen. The tegula tapers much more abruptly and is used as an imbrex.

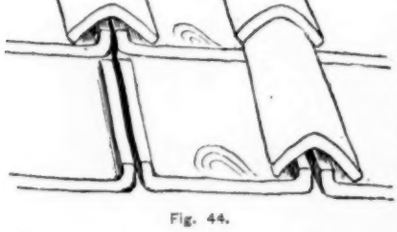


Fig. 44.

ANCIENT ITALY.

The ancient Roman tile consists of a large flat rectangular tegula with lateral edges turned up, and a narrow semi-cylindrical or angular imbrex; both tegula and imbrex being heavy and massive.

At the antiquarian museum at Zurich are a number of ancient Roman tiles, these have the lateral edges abruptly turned up; the imbrex is angular in section (Fig. 44). On the exposed and lower edge of the tegula are a few curved marks as if made by the fingers. As these marks are seen on similar Roman tiles at the Royal Antiquarian Museum at Brussels and elsewhere, it would seem to be a special furnace-mark of the maker, or possibly to indicate the lower end of the tile. On the under surface of each tegula, enclosed in a rectangular panel, is impressed the Roman characters LXXIC. This was the mark of the 21st Legion, showing that the Roman soldiers were accompanied by tile-makers, as well as by those pursuing other trades. At the museum last named are some ancient Roman tiles resembling those mentioned by Graeber in the memoir previously alluded to. In these tiles the turned edges differ slightly from those figured by Graeber, the lower corners were recessed, however, to fit on the tile below, and the turned edge ceased within a short distance of the top of the tile (Fig. 45). There were no perforations for pegs or nails to hold the tile to the roof as is described in similar tiles figured by other authorities.

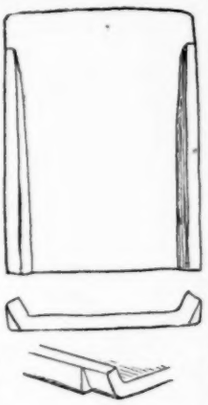


Fig. 45.

In the ancient cemetery of Marzabotto near Bologna, the contents of which have been figured and described with great fidelity by Count Gozzadini, a number of terra-cotta roofing-tiles were found. These were made after the flat Roman pattern, but were remarkable not only for their massive size, but for certain structural peculiarities, not seen in the typical Roman form. The tegula measured 1.07 metres in length by .80 centimetres in width (Fig. 46 A). In some examples the upper inferior margin was turned at right angles, and this was strengthened by a thin brace as shown in the fragment (Fig. 46 D). On the superior surface of the tegula a rounded knob was present (Fig. 46 E). This was perforated for the admission of a bronze nail having a thin concavo-convex head (Fig. 46 F) which conformed to the shallow and lenticular knob on the tile, by this device the rain was more thoroughly excluded. The imbrices varied in length, the longest being .82 centimetres in length, with a width

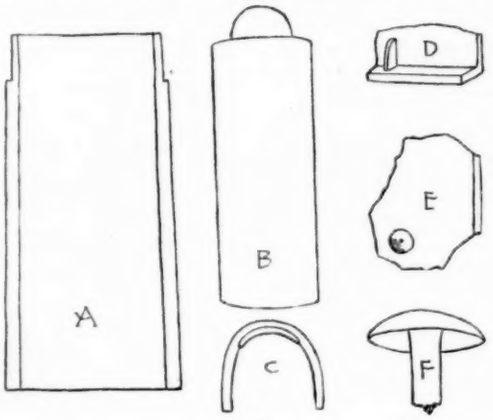


Fig. 46.

of .28 centimetres and a height of .26 centimetres (Fig. 46 B. C. The drawings as published do not show these proportions). Many of these fragments show traces of polychrome decoration on their exposed surfaces.

Concerning the age of the Marzabotto cemetery, George Dennis in his "*Cities and Cemetries of Etruria*" (Vol. II p. 543), says "we may safely refer the antiquities found at Marzabotto to the latest days of Etruscan independence, north of the Apennines, which came

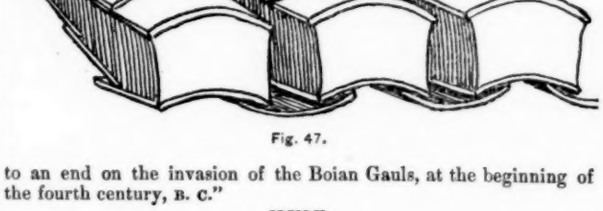


Fig. 47.

to an end on the invasion of the Boian Gauls, at the beginning of the fourth century, B. C."

SICILY.

The normal tile (*imb.*) is the common form throughout the island. In one old building at Palermo, the tiles are crowded together, from the ridge to the eaves. At Taormina the eaves-tiles are pointed with plaster.

SPAIN.

In this country the roofing-tiles everywhere seen belong to the normal tile (*imb.*). These are usually semicircular in section and

[1] Continued from No. 849, page 7.

much larger than the forms farther east. At Burgos the tiles are crowded on the roof, at the eaves the ends of the tiles are pointed with plaster. At Granada a similar treatment of the eaves-tiles is seen. In one portion of the Alhambra light and dark tiles are arranged on the roof in such a way that a clearly marked zigzag pattern is carried out. In another and older portion of the Alhambra the tiles instead of being roundly curved in section are somewhat angular. At the eaves the imbrices are doubled and between the upper and lower imbrex, separated by the

Fig. 48.

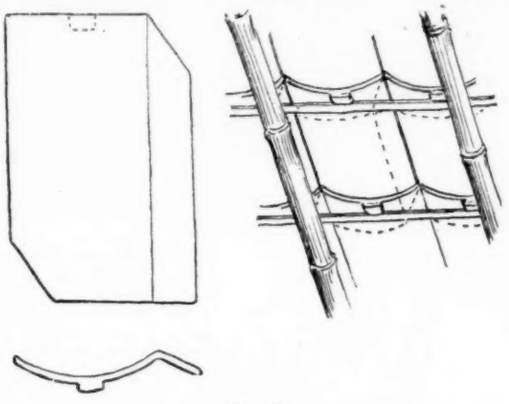


Fig. 49.

space equal to the width of a tile, a mass of white stucco or plaster is interposed. As there appears no break in the alignment of the tiles from the eaves to the roof, the lower course of eaves-tiles probably rests horizontally on a projecting cornice, the plaster diminishing in thickness backward for a few courses as shown in Figure 47. An evidence that this is so, is shown in an end view of another portion of the building where a cornice or shelf projecting below the eaves has settled by the weight of plaster and tiles above.

Fig. 50.

At Seville, Alcazar and other places the courses of tiles are slightly separated at the eaves and the spaces enclosed by the tiles are filled with white stucco, as shown in Figure 48.

In a picture of the Church of S. Maria de l'Antigua at Valladolid, Spain, published in the *American Architect* for December 10, 1887, the typical Spanish tile is shown.

The tower of this church seems to be covered with a pointed flat tile.

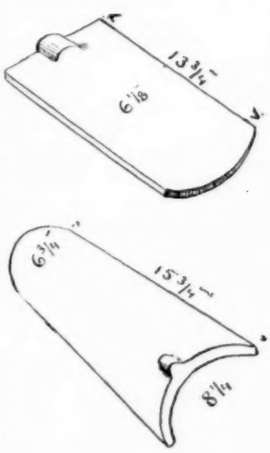


Fig. 51.

MEDITERRANEAN BORDERS.

A rapid examination of a collection of photographs of places bordering the Mediterranean, from the Isle of Rhodes to Tangiers shows the universal use of the normal tile (*imb.*). A picture of the mosque of Tangiers shows a wall, or a house with unperforated wall, having a very steep pitched-roof covered with somewhat smaller tiles than those cited from Spain. The ridge is covered with the ordinary ridge-tile elevated to a considerable distance above the roof, the interspace apparently filled with white stucco or plaster, giving it an appearance in the photograph, of a high and narrow vertical ridge. The tiles are very unevenly laid, and it will be noticed that in photographs of Spain, Italy and other countries bordering the Mediterranean the tiling seems always to have been done in a slovenly manner. This appearance is probably due, in many cases, to the buildings being old and the tiles having been thrown out of alignment by the wind and other agencies. The thorough and accurate way in which the Asiatic roofs are tiled stands out in marked contrast to the loose manner of tiling of western nations using the normal tile.

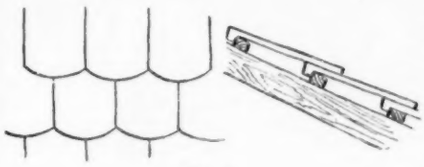


Fig. 52.

MEXICO.

I am indebted to Mr. Sylvester Baxter and Mr. Denman W. Ross for photographs and descriptions of the roofing-tiles of this country. Mr. Baxter observed on some roofs a large flat tile either plain or corrugated, the corrugations being quite near together. These were usually coated with a golden green glaze. Around the City of Mexico and in the high table-lands the normal tile (*imb.*) was used. Photographs of buildings at Orizaba, taken by Mr. Ross, show a large tile identical with the Spanish form. Mr. Baxter observed that in some cases the lower tile was painted white on the upper surface, white lead being apparently used, and presumably to make the roof water-tight. He also observed a large flat tile with upturned edges and semi-cylindrical imbrex. A similar form to this has already been described from Central Italy, and, as before remarked, is a survival of the ancient Roman tile. The modern form is much thinner. The tiles bordering the eaves differ in no respect from the others, though the under course of tiles may be laid double.

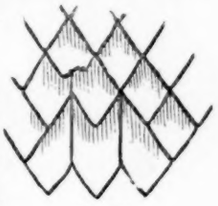


Fig. 53.

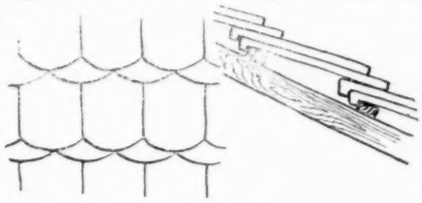


Fig. 54.

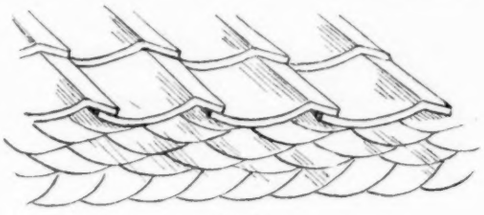


Fig. 55.

Chili, Peru and other South American countries have the normal tile (*imb.*) and this runs up on the west coast to California.

BELGIUM AND HOLLAND.

The pan tile is the dominant form in these two countries. That it was also the common form a few hundred years ago is shown in pictures of the old Dutch masters.

In Holland, one may often see roofs thatched half-way down and tiled the rest of the way to the eaves. In the better class of houses in the country the entire roof is tiled. At Utrecht, large, slightly-bent tiles are used for ridge and hip. The pan tile is often made with a square opening in it in which glass is fitted. The tiles are often glazed either red, gray or blue. In Belgium, they appear either black or bright red. On very old churches the normal tile (*imb.*) is seen.

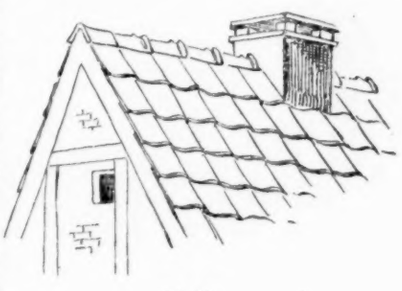


Fig. 56.

It is interesting to observe that in those portions of Germany bordering on Holland and Belgium the German flat tile is supplanted in a measure.

The pan tile, or *pannen tegchel*, as it is called in Holland, evidently originated in Holland or Belgium. In England, it retains the Dutch name *pannen*, Anglicized to pan. It is also called the Fleming tile. In Poland, it is called the Holland tile.

NORWAY, SWEDEN AND DENMARK.

The pan tile is in universal use in these countries. In Norway, away from the larger cities, wooden shingles painted red form the

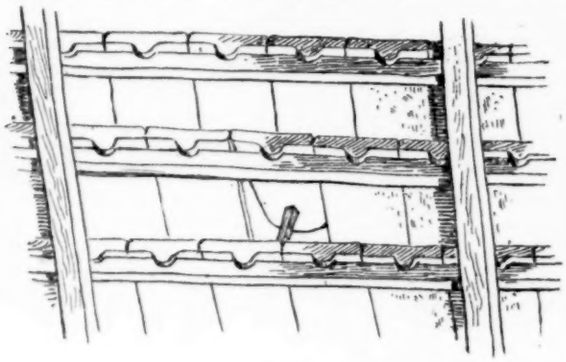


Fig. 57.

ordinary roof covering. The pan tile is often a bright brick-red in color, or glazed a dark brown. The red-painted wooden roofs would seem to be an imitation of the red tiled roof. In Christiania, an old house with the date 1662 was covered with pan tiles. In Bergen, the pan tile is commonly seen.

Mr. Ipsen informs me that in Copenhagen the normal tile (*imb.*) is sometimes found on old churches, and is commonly known by the name of monk tile; this name indicating that in Denmark, as in Germany, this form of tile was introduced by the monks from the South.

JAVA.

At Buitenzorg and other towns in the interior of Java a pan tile is seen, used more for the covering of the wide piazza roofs than for that of the house roof itself. The tile is well made, very light and thin, and having a length and breadth respectively of 28 centimetres by 18 centimetres. The covering edge is flat, and not curving, as is usual. The upper edge of the tile has a nib which holds it to the battens fixed to bamboo rafters (Fig. 49).

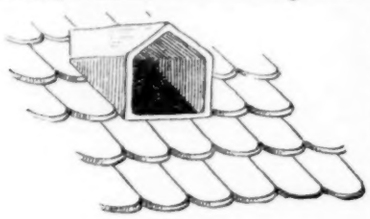


Fig. 58.

I do not recall seeing an eaves tile with turned margins.

There are many Chinese in Java, and their buildings present the type of the Southern Chinese. On these buildings the normal tile (*imb.*) probably occurs, but I made no note of this matter during my visit there. The pan tile has probably been introduced by the Dutch, or possibly by the English before the Dutch. Figure 50 is reproduced from a photograph showing the appearance of Java houses after a shock of earthquake. In this is shown the light structure of the roof supporting the tiles.

GERMANY.

Throughout Germany the flat tile is the common form. When the lower border of this tile is slightly rounded it is called, in certain portions of the county, "beaver-tail" (Fig. 51A). In Berlin the lower border of the tile is usually rounded (Fig. 52), in Weimar it is square at the end, in Nuremberg it is pointed (Fig. 53). Occasionally the tiles are laid in a double layer as shown in Figure 54. The flat tile not only

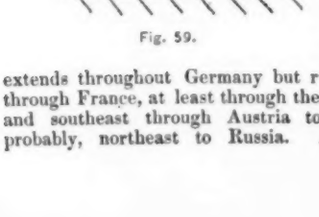


Fig. 59.

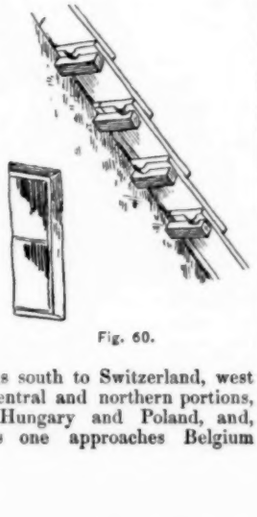


Fig. 60.

extends throughout Germany but runs south to Switzerland, west through France, at least through the central and northern portions, and southeast through Austria to Hungary and Poland, and, probably, northeast to Russia. As one approaches Belgium and Holland, the home of the pan tile, this tile frequently takes the place of the flat tile, as seen at Dusseldorf, Bonn, Cologne, Bremen and Hamburg. This tile is commonly red or glazed black. The pan tile is also occasionally seen farther south. At Freiburg it is known by the name of "Jumping hound," from its fancied resemblance, at the eaves, to the movements of jumping hounds. In the country around Bremen and Hamburg the roofs are often thatched,

Fig. 61.

but in these cases a square area about the chimney — which looks odd thrust up through a thatched roof — is covered with pan tiles. In many of these pan-tiled roofs the eaves, ridge and ends of the roof are often finished with a few courses of slate, as shown in Figure 55. In Bremen a heavy ridge-tile of the ordinary form is used (Fig. 56).

In very old buildings throughout Germany, usually on old churches and convents, the normal tile (*imb.*) is often seen. Professor Virchow informed me that this tile was introduced into Germany by monks, from the Rhine, in the twelfth century. As before remarked, this tile is known as the monk tile in Copenhagen.

The appearance of a flat tiled roof, as seen from within is shown in Figure 57, sketched in the attic of an old house in Nuremberg. Here the manner of propping up a tile with a stick, for the purpose of letting in light is shown: this is done for light and not for ventilation, as the roof is sufficiently ventilated by the loose adjustment of the tiles. Other means for admitting light to the attic are shown in Figures 58 (Freiburg) and 59 (Weimar). These hoods or dormer windows are made out of a single piece of terra-cotta, they are secured to the roof by a broad flange around which the tiles are fitted.

Figure 60 shows the manner of finishing the end of a roof, the battens upon which the tiles are hung project through the wall and the tiles are cut longitudinally to continue the alternate adjustment of tiles to the edge.

At Nuremberg the flat tile is everywhere seen. Figure 61 is reduced from a photograph of Nuremberg houses showing how deftly the tile is handled in covering dormer windows and various projections. In some cases the lower border of the tile is rounded, in others pointed. Other forms of tile are seen in this picturesque old city. On the old Roman tower of the castle may be seen a large, thick, coarsely made semi-cylindrical tile, being much larger at the upper end, measuring .51 centimetres in length, and a width at its widest end of .15 centimetres. This tile has a thick nib to hold it to the battens. The spaces between the tiles were thickly plastered though greatly out of repair, as gleams of light were coming through various chinks. Figure 62 shows the appearance of this tile from within the roof, while the appearance from without is shown in Figure 63. This sketch is taken from the castle wall tower which is supposed to be nearly 400 years old. The ridge is seen covered with ordinary semi-cylindrical tiles, while a single course of tiles next to the ridge shows the roof-tile used in the form of an imbrex. All the interstices were thickly plastered. The tile was accounted the oldest form used in Nuremberg, and may be regarded as the normal

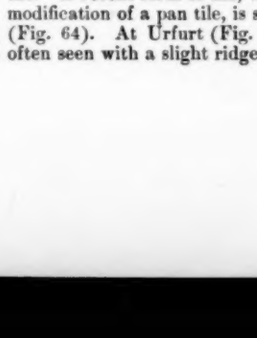


Fig. 62.

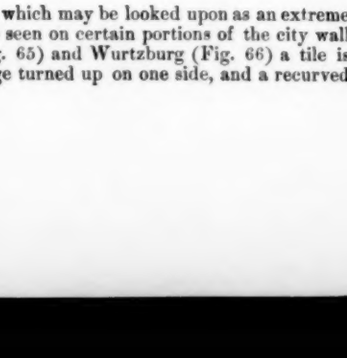


Fig. 63.

tile. A recent form of tile, which may be looked upon as an extreme modification of a pan tile, is seen on certain portions of the city wall (Fig. 64). At Urfurt (Fig. 65) and Wurtzburg (Fig. 66) a tile is often seen with a slight ridge turned up on one side, and a recurved

edge on the opposite side which laps over the slight ridge on the next tile. This form is certainly a modification of the pan tile, and curiously enough laps to the left, as in the case of the Japanese pan tile. At Hildesheim old houses are covered with a similar form of tile lapping to the left.

POLAND.

I am indebted to Mr. J. Adamowski for information concerning the roofing-tiles of Poland. An architect friend of his, Mr. Kozlowski, of Czenstochowa, writes that the most common form of tile in Poland is the flat tile with rounded end, differing in no respect from the ordinary German tile, and usually laid in a double row, as shown in Figure 54. The dimensions, in English inches, are 7 by 14.

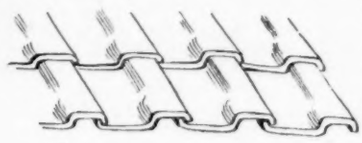


Fig. 64.

The pan tile lapping to the right is also seen in old buildings and churches. It is no longer made in Poland. This tile is known by the name of Holland tile, and its introduction to Poland may have been by way of the Baltic.

RUSSIA.

An examination of photographs and numerous inquirers show that the tiled roof is not common, but, when seen, it is composed of the flat tile. Dr. Berlin, a Russian physician, and her brother, stated to me that formerly an angular tile, in form like the ridge-tile, was used as a roofing-tile. These tiles were placed in rows running from the ridge to the eaves, no under tiles being used. The tiles were simply

Fig. 65.

Fig. 66.

bedded in cows' manure. Repeated questioning failed to modify this statement. It is recorded that in other regions in the East it is customary to plaster the house with manure.

Photographs from the Caucasus show the normal tile (*imb.*) in use.

EDWARD S. MORSE.

[To be continued.]

BETTER WOOD CONSTRUCTION.[1] — IV.

STRUCTURAL NOTES.

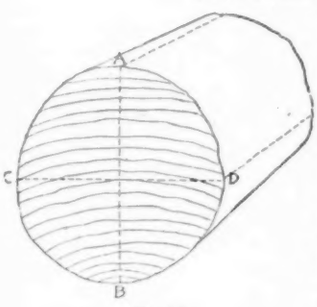


Fig. 14.

THE building world was considerably amused when Mr. DeCoppet Berg, in "*Safe Building*," laid down the law that lumber cut from the log with the sides of the boards approximating to a diameter of the log (quarter-sawn) will not only not warp, but will not shrink. Everybody wished that the assertion might make fact of itself; but alas! lumber continues to shrink across the grain to this day, no matter how it is cut. We are, indeed, now and then shocked to find that a cross-grained piece has found its way into work and has shrunken endwise. Mr. Berg's statement was of value, however, in leading to a better knowledge of the fact that "quarter-sawn" lumber shrinks less than "rift-sawn."

The following will indicate the proportion of this shrinkage in two varieties: Three cylinders were carefully turned from green wood — one from oak, two from white pine. The piths or centres of the trees were not included in the cylinders. The oak, in losing .254 of its weight by drying, shrank in diameter on the radial line, or, as quarter-sawn boards would be cut, .0166; while at right angles to this, or as rift-sawn lumber is cut, it shrank .0389.

One pine cylinder lost .241 in weight, and in diameter, as quarter-sawn, .0111, while as rift-sawn it lost .0388. The third sample, about half being sappy, lost nearly .14 in weight; in diameter, as quarter-sawn, almost exactly .01, and as rift-sawn .0334.

Quarter-sawing would appear, from the above, to benefit the pine rather more than the oak. I would like to have tried samples of other woods with the above, but could not readily obtain them unseasoned. Without actual trials, it would seem that all lumber is not improved in a like degree by quarter-sawing. I have seen Southern pine floors cut in that way which shrank very badly after laying. I have heard it repeatedly said that California redwood was absolutely permanent across the grain, but shrank endwise. Such work as has come under my own observation, however, shows that this variety behaves just as other woods do, except that it loses very little by shrinkage.

In the article "Building," "*Encyc. Britan.*," 9th edition, an old author is quoted as giving the shrinkage of a rift-sawn board as .14, and one quarter-sawn from the same log at .03¼. This would appear to have a "lost-art" flavor, for we could hardly find lumber in our time which would shrink one inch in seven. The author of the article seems to have instituted some tests on modern resinous timber, however, in which the quarter-sawn boards shrank .007, and the rift-sawn .0375. In both these cases, the difference between the loss of width suffered by the samples is relatively greater than in the measurements taken on my cylinders. This is largely accounted for by the fact that the rift-sawn boards used by them contained a larger percentage of the new growth than did the quarter-sawn, which would not be the case in the measurements taken on the cylinders. The centres of the lines of measurement taken on the cyinders were in each case equidistant from the centre of the tree. The value of quarter-sawn lumber is now so well established that often one finds lots of flooring on the market evidently from logs sawn in the usual way, but from which every piece that could pass as quarter-sawn has been removed.

When timbers are exposed as in the so-called "mill construction" and reliance is placed on their size to resist fire for a sufficient time to admit of its being controlled, the resistance may be further increased by selecting a variety of timber not easily burned. The

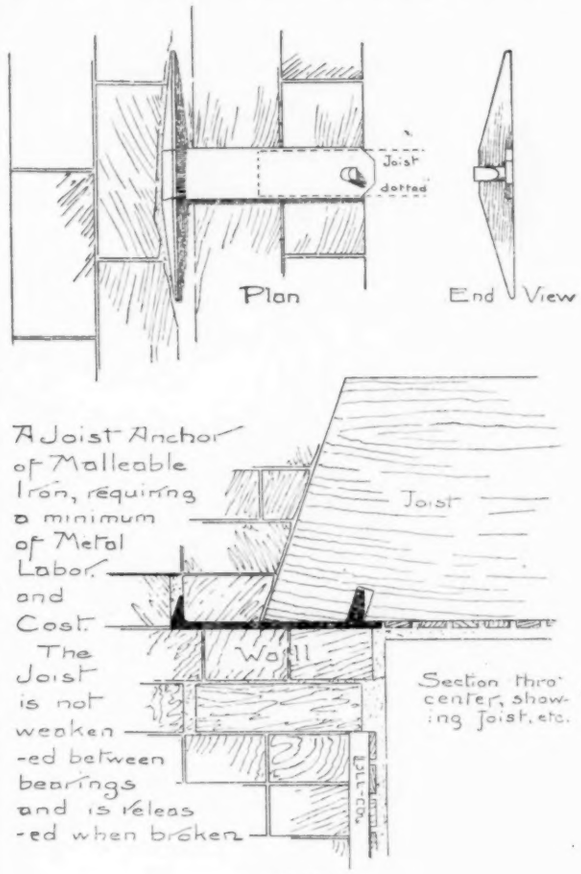


Fig. 15.

resinous timbers are, of course, quite inflammable, and in general soft woods will burn more readily than hard, while among these last there appears to be a choice. Of northern-grown hard woods which commonly find their way into the fuel pile, none of those available for building seems so reluctant to burn when dry as white oak. This quality in connection with its great strength and resistance to forms of decay, render this variety especially valuable for open-timber work.

Coating timbers with oil or varnish adds to their inflammability, but no other course seems to present itself where finish in the natural grain is desired. Colors may, of course, be applied with some vehicle which, while not containing oil will still render the coating adhesive, and such coating may be made somewhat of a protection against fire. Some authorities, however, object to any coating until the timber is thoroughly dry, on the ground that the coating favors the development of dry-rot.

The anchor suggested in Figure 15 came of an idea set in motion by a discussion of the question of joist anchorage during a revision of a building ordinance. The anchoring strength of the one shown would

[1] Continued from No. 846, page 174.

be the shearing strength *with the grain* of 15½ square inches, or about double the area available to the forms which notch the lower edge. The form here shown would also anchor more strongly than the other in proportion to its area.

A modification of this might be used for anchoring thicker timbers with advantage. Cast-iron plates of the proper form for anchorage might be made upon which as many pins might be cast for entering the under side of the wood as the width of the beam demanded.

F. G. Corser.

PENSIONS FOR FRENCH WORKINGMEN.

ALMOST interesting and novel scheme relating to that great social problem known as the labor question is soon to be discussed and passed upon by the French Parliament. This projected step toward the happy adjustment of current differences between capital and labor is the establishment by national law of a system of pensions for workingmen.

The German Reichstag has already passed a law creating a pension for German laborers who may reach the age of 70. The annual pension provided by the German law ranges from $18 to $42 per annum, according to the investment of the recipient. One-third of the capital necessary to produce this pension is supplied by the workman in the form of a daily saving of 1 or 2 cents from his wages; one-third is contributed by the employer, and the remaining third by the State.

The law proposed by the French Government is more liberal in its provisions for the comfort of work people in their old age. The minimum pension proposed is $60 per annum, while the maximum is double that amount, or $120. The age at which the pension is available is reduced to 55 years. The Government proposes to furnish two-thirds of the pension, while the remaining third is to be paid from the investments of the laborer and his employer, which shall be made daily during a period of thirty years.

In Germany the law compels workmen to participate in the pension scheme. In France the participation, so far as labor is concerned, is a matter of choice with the individual workman. It is the employer alone who has no voice in the matter. If the workman decides to avail himself of the opportunity to secure an annuity for himself after his fifty-fifth year, the employer will be forced to contribute one-sixth of the capital necessary to pay the employé an annual income of $60 or $120 a year.

The proposed French law rests on this financial basis: It supposes the workman to labor two hundred and ninety days each year and to make a daily saving of 1 or 2 cents for his personal contribution toward the desired annuity. The employer, of course, pays much more. At the end of thirty years these sums, capitalized at 4 per cent, will give the workingman an annual pension of $36 to $72. The State, by contributing its two-thirds, will raise these amounts to $60 and $120, respectively.

The success of this law from a financial point-of-view seems to rest on the ability to lend the combined daily savings of the employer and employé made for this purpose at 4 per cent. The difficulty will be to get so high a rate of interest. Neither French *rentes* nor real estate securities pay 4 per cent. The Government must make good the difference.

In the course of twenty years, the sums put into the hands of the Government by the workingmen for investment would be enormous. All classes of honest labor would hasten to avail themselves of the law and to profit by it. How, then, could the State employ the millions of dollars that would be rolling into its coffers in such a way as to produce the necessary interest? I can see no promise of safe investment for such large sums at a rate so high as 4 per cent. The material development of Europe is largely achieved. There are no great railway lines to build, no important tunnels to dig, no large and expensive bridges to construct, no long and costly canals to cut, and no great navies or lines of steamships to create and equip. All these things have been done, and further expansion in known and given lines will be gradual, and not attended by vast outlays of money. South American investments are not taken into consideration in the discussion of this question, as they are believed to be too risky. The rate of interest already shows signs of a decline toward 2 or 2½ per cent, a rate which is believed by most European economists to be the normal and permanent one.

It is difficult to estimate the magnitude of the sum which this law will put into the hands of the Government for investment after it has been in operation twenty or thirty years. It is said by the projectors of the law that the total sum will be $300,000,000. Other authorities equally good say the total sum, when the law is fairly in operation, will in less than twenty years amount to $600,000,000, a figure representing half the value of all the cultivated lands in France.

The ultimate dangers of the law seem to be very great from a financial point-of-view. Then, of course, there are the subsidiary questions concerning the application of the law in a practical way, such as the expense of collecting the investments of the workmen and the cost of maintaining the enormous system of book-keeping that will be required. And, finally, the statesmen and political economists hostile to the law make the objection that it will not be a panacea for the ills and evils which arise from the struggle between capital and labor. The argument of the thinkers in opposition to the law on this point is that there will be hundreds and even thousands of dissolute, idle, shiftless, and drunken workmen who cannot or will not avail themselves of the privileges of the law. They either will not or cannot make the daily sacrifice which the small savings called for demands; consequently there will remain the discontented, grumbling, disorderly class of workmen, who will continue to make trouble, foster strikes, and create class hatreds. The industrious workman of sober mind and habits is peaceful and contented, for the most part, at the present time. It is the restless, improvident spirit, having nothing to lose and everything to gain, who changes his habitation two or three times a year, who is the real agitator and promoter of most of the current difficulties between capital and labor.

A special commission has been appointed to consider and report amendments to the proposed law establishing pensions for working people. It will commence active work early in 1892, and its proceedings and the subsequent debates in Parliament will be observed with unaffected interest by the people of all civilized nations who understand the importance and significance of all legislation bearing on the labor question.—*Francis B. Loomis, Commercial Agent at St. Etienne.*

Safe Loads, in Pounds, for Yellow Pine Struts.

Computed from the formula $1000 - 10\frac{l}{d}$. l = length in inches d = smaller diameter in inches. This is approximately the same with a factor of safety of 4½, as the Formula $4250 - 43.3\frac{l}{d}$, which was obtained by plotting all experiments obtainable, on full-sized sticks, made with the Government Testing Machine at Watertown Arsenal and represents the average of all the lowest breaking weights in each set of tests.

J. H. Stanwood, Mass. Institute of Technology, 1891.

Size	6 Ft.	8 Ft.	10 Ft.	12 Ft.	14 Ft.	16 Ft	18 Ft.	20 Ft.
4×4	13 100	12 200	11 200					
4×6	19 700	18 200	16 800					
4×8	26 200	24 300	22 400					
4×10	32 800	30 400	28 000					
4×12	39 400	36 500	33 600					
6×6	31 800	30 200	28 800	27 400	25 900	24 600		
6×8	42 300	40 300	38 400	36 500	34 600	32 600		
6×10	52 800	50 400	48 000	45 600	43 200	40 800		
6×12	63 400	60 500	57 600	54 700	51 800	49 800		
6×14	74 000	70 600	67 200	63 800	60 500	57 100		
6×16	84 500	80 600	76 800	73 000	69 100	65 300		
8×8	58 209	56 300	54 400	52 500	50 600	48 600	46 700	44 800
8×10	72 800	70 400	68 000	65 600	63 200	60 800	58 400	56 000
8×12	87 400	84 500	81 600	78 700	75 800	73 000	70 100	67 200
8×14	101 900	98 600	95 200	91 800	88 500	85 100	81 800	78 400
8×16	116 500	112 600	108 800	105 000	101 100	97 300	93 400	89 600
8×18	131 000	126 700	122 400	118 100	113 800	109 400	105 100	100 800
10×10	92 800	90 400	88 000	85 600	83 200	80 800	78 400	76 000
10×12	111 400	108 500	105 600	102 700	99 800	97 000	94 100	91 200
10×14	129 900	126 600	123 200	119 800	116 500	113 100	109 800	106 400
10×16	148 500	144 600	140 800	137 000	133 100	129 300	125 400	121 600
10×18	167 000	162 700	158 400	154 100	149 800	145 400	141 100	136 800
12×12	135 400	131 500	129 600	126 700	123 800	121 000	118 100	115 200
12×14	157 900	154 600	151 200	147 800	144 500	141 100	137 800	134 400
12×16	180 500	176 600	172 800	169 000	165 100	161 300	157 400	153 600
12×18	203 000	198 700	194 400	190 100	185 800	181 400	177 100	172 800
14×14	185 900	182 600	179 200	175 800	172 500	169 100	165 800	162 400
14×16	212 500	208 600	204 800	200 900	197 100	193 300	189 400	185 600
14×18	239 000	234 700	230 400	226 100	221 800	217 400	213 100	208 800
16×16	244 500	240 600	236 800	233 000	229 100	225 300	221 400	217 600
16×18	275 000	270 700	266 400	262 100	257 800	253 400	249 100	244 800
18×18	311 000	306 700	302 400	298 100	293 800	289 400	285 100	280 800
	6 Ft.	8 Ft.	10 Ft.	12 Ft.	14 Ft.	16 Ft.	18 Ft.	20 Ft.

PROPOSED NEW FORMULA FOR YELLOW PINE POSTS.[1]

BELIEVING that the formula of C. Shaler Smith given in Trautwine, gives too large values for yellow pine posts, and having the usual objection to the "step" formula, the writer, for his own information and use, has taken the trouble to plot the values of all the tests on *full size* sticks made at the Watertown arsenal and printed in the Government reports.

[1] Reprinted from *Railroad Gazette.*

From the drawing herewith the straight line formula

$$S = 5{,}000 - 43\tfrac{1}{3}\,\frac{l}{d}$$

was easily deduced, which represents the average of all the tests.

For the average of the *lowest* values in each set of tests the formula

$$S = 4{,}250 - 43\tfrac{1}{3}\,\frac{l}{d}$$

was found. The line representing this formula chanced to be parallel to the first one. With this latter equation as a basis, the working formula

$$S = 1{,}000 - 10\,\frac{l}{d}$$

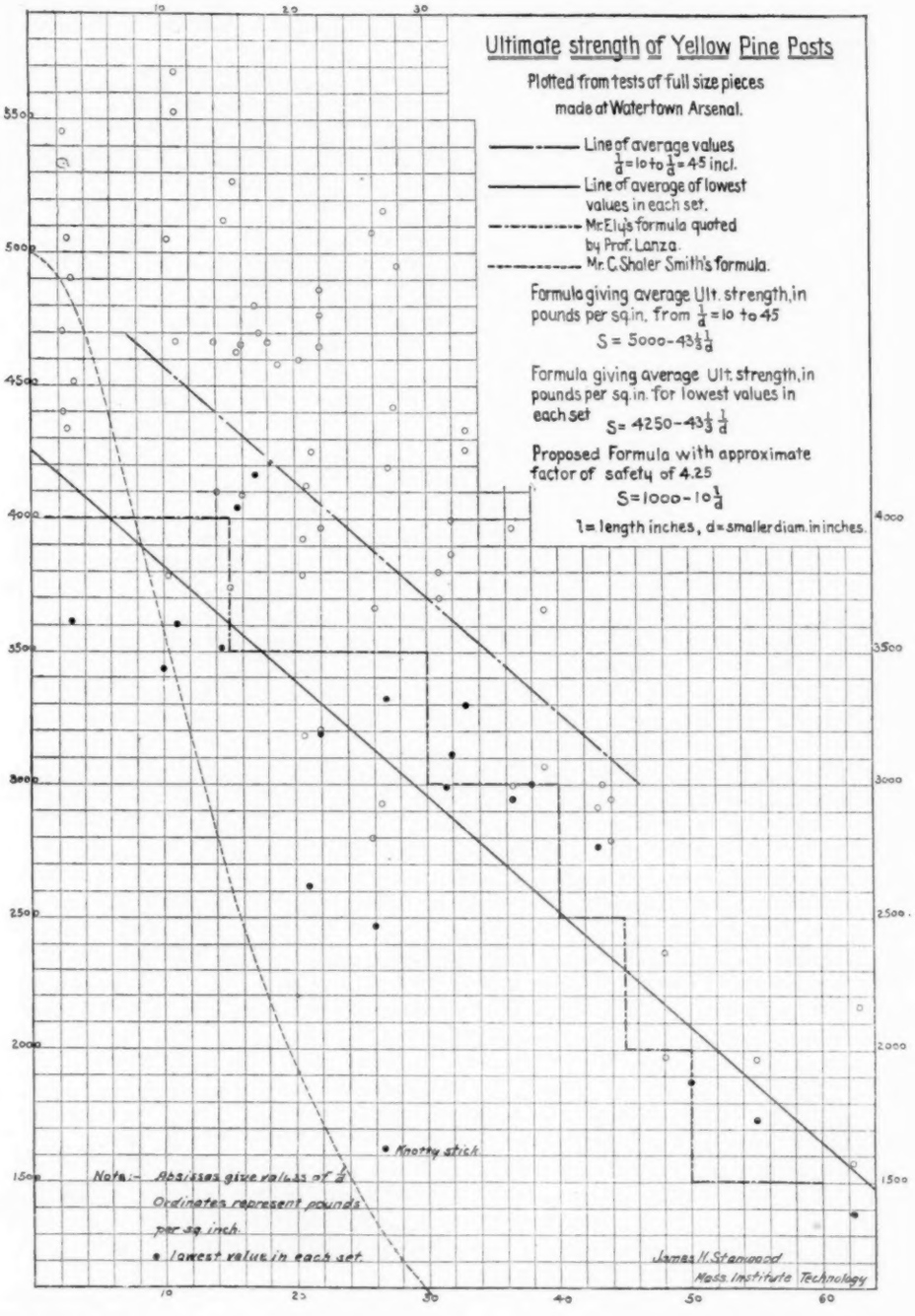
For sake of comparison the formulæ of C. Shaler Smith and Mr. Ely have been plotted.

For those who prefer not to depart from the strict column formula of the form

$$S = \frac{k}{1 + \frac{1}{a}\cdot\frac{l^2}{d^2}}$$

the following:

$$S = \frac{4{,}000}{1 + \frac{1}{2{,}500}\cdot\frac{l^2}{d^2}}$$



gives a factor-of-safety of 4.25 approximately. This very simple equation is easily memorized and by its use the safe load for a yellow pine post may almost instantly be worked out "in the head."

Any factor other than 4.25 may as readily be used.

The co-efficient of $\frac{l}{d}$ being one one-hundredth of the first term; thus

$S = 800 - 8\,\frac{l}{d}$ for a factor of 5 approx.

$S = 1{,}400 - 14\,\frac{l}{d}$ for a factor of 3 approx., etc.

may be used, which, if plotted, will be found to represent the average of the lowest values.

In each of the above formulæ

l = length in inches.

d = smaller diameter in inches.

From the expression

$$S = 1{,}000 - 10\,\frac{l}{d}$$

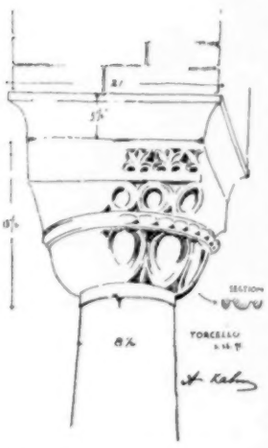
the table of safe loads has been computed.

Trusting that this will be of use to others, it is respectfully submitted to the profession.

Since making this drawing the recent experiments of Kirkaldy on wood columns of fairly large size have been applied to the proposed formula and found to agree quite well with it.

James H. Stanwood, S. B.,
Instructor in Civil Engineering, Mass. Institute Technology.

GROUND AIR AND HEALTH.



One of the most valuable services the *American Architect* ever rendered — because it was one of the earliest efforts at instructing the public in sanitary matters — was the publication in 1887, of the triangular discussion on house-drainage which took place between Col. George E. Waring, Jr., and Mr. James C. Bayles who played the parts of experts in sanitation and Mr. Henry R. Towne who took the rôle of the intelligent and inquiring householder.

This discussion is brought to mind by coming upon a letter in the *Stamford Advocate* which shows that Mr. Towne, notwithstanding his interest in hardware, has not forgotten to reason upon matters of sanitation as they presented themselves to him. As the incident has a general bearing, we give below Mr. Towne's account of it in full.

"The theoretical argument against the use of leaching cesspools is that the poisonous gases of decomposition, which inevitably are evolved within them, are carried through the surrounding soil into adjacent houses. This argument in turn rests upon the theory that the air which of course occupies the interstices in the soil, is subject to motion and currents in precisely the same manner as the air above ground, except that its movements are slower and less perceptible. The existence of these underground currents of air, if proved, involves the probability, if not the certainty, that the foul air of cesspools is carried toward and into adjacent houses. These facts have long been understood and accepted by all sanitary authorities, but as yet are not generally appreciated by householders.

"The following experience gives striking evidence that the views in question are justified and sustained by the facts. Two winters ago, during a spell of unusually cold weather, a strong odor of gas became noticeable in certain parts of my house. Prompt efforts were made to discover the supposed gas leak, but without success. The smell of gas still continued, and I incurred considerable expense in having the pipes within the house tested, uncovered and critically examined for leaks, but without discovering anything to account for the escape of gas, which still continued to pervade certain parts of the house to an extent which was not only very annoying, but prejudicial to health. While I was still endeavoring to solve the problem the odor of escaping gas was noticed in the street, near my front gate, and some workmen, sent there to investigate the cause, set fire to a current of escaping gas which came through an opening in the surface of the street, and which burned with a flame several feet in height. As soon as this flame was started the odor in my house disappeared, and it thus became demonstrated that its cause was a leak in the gas-main in the street. The Gas Company neglected for several weeks to repair the main. For some days the flame was allowed to burn night and day, but as it was apt to frighten passing horses some one extinguished it; immediately after, the odor of gas again became apparent in my house. Discovering this relationship between cause and effect I again lighted the gas where it escaped through the ground at the street, and insisted on having it kept burning until the Gas Company uncovered the main and stopped the leak.

"These facts tell plainly the story of what took place. The ground between my house and the street consists chiefly of loose and very open gravel. The thin surface of soil on top of it was frozen at the time so as to be comparatively air-tight. The cellar of my house is at least eight or ten feet above the level of the street surface, and in winter is of course heated. The warm air of the basement and lower floors of the house tends naturally to rise and must be replaced by other air flowing in through the cracks of doors and windows, and undoubtedly largely through the basement walls, although these are laid in cement mortar. The escaping gas at the street, being unable at first to find a vent through the surface of the soil, flowed with the underground currents of air, which latter were naturally drawn upward in the direction of my house by reason of its high location and the suction which exists in every heated house during the winter season, due to the rarefication of the air within the house, owing to its higher temperature relatively to the outside air. The workmen first sent to search for the cause of the faint odor of gas noticed in the street, drove some iron bars downward through the surface of the ground, and it was from one of these holes that the flow of gas occurred, the lighting of which produced the flame above mentioned. Whenever this flame was extinguished or became feeble I found that by freeing or deepening the hole with a crowbar the flow of gas would be increased, and the flame once lighted would be maintained. The upward draught of this flame undoubtedly neutralized the previous tendency of the escaping gas to flow toward my house and thus relieved me of the nuisance.

"We have here the clearest possible proof that the so-called 'ground air,' not only moves through the soil, but that it moves easily and through long distances, the interval between the street and my house being about 150 feet, or several times greater than the average distance between most houses and their cesspools. Unfortunately, the dangerous gases of decomposing organic filth are only faintly odorous, and, in many cases, cannot be detected by the sense of smell. Clearly if a cesspool had been located in the same position as the gas leak above referred to the foul gases from it would, in like manner, have been drawn into my house, although the fact would not have made itself manifest to the senses. Beyond question, also, the air of my house to-day, and whenever its inside temperature is artificially raised above that of the external atmosphere, consists in part, and perhaps largely, of 'ground air' which is drawn into the basement through its floors and walls. The same is true, at least during the winter season, with every artificially heated building. In each and all of these the air within the house consists in part of 'ground air' drawn from the adjacent soil, and, in many cases, undoubtedly drawn from a long distance. My own experience shows that the area from which the 'ground air' is drawn may easily cover a distance of 150 feet or more around the building. How many house are there in Stamford having within this distance of them one or more leaching cesspools? I believe that in every case where a leaching cesspool exists within 100 feet, and probably even a greater distance, of a heated building the gases from such cesspool are beyond doubt drawn into the building and distributed through it. The fact that more sickness does not result is due to the enormous dilution of these gases by the great volume of purer air which is carried in simultaneously. Except for this the evil would assert its power for harm so openly and seriously as to quickly cause a general abandonment of that utter abomination in any built-up community, the leaching cesspool.

"The average householder has an indistinct idea that a cesspool is not a desirable neighbor for his house, and hence locates it at as great a distance as he conveniently can. In doing this he is frequently apt to get it much nearer a neighbor's house than his own. Many houses in Stamford have located within less than 100 feet of them four, six and sometimes even more, leaching cesspools. The filth discharged into these is gradually saturating the soil and constantly enlarging the area of pollution. Fresh soil is one of the best known disinfectants, and for a long time it may suffice to neutralize this constantly increasing source of danger, but its capacity as a disinfectant has a limit. That limit has already been reached in some portions of the Borough, and is rapidly being approached in many others.

"Unless these facts are heeded before long, many households in our community will be visited by sickness, and doubtless some by death, resulting directly from this continued persistence in ignoring the laws of health.

"The needed remedy is a simple one, namely, the speedy connection with our public sewers of every house having a water-supply, and a simultaneous discontinuance of the use of leaching cesspools."

SOCIETIES

WASHINGTON ARCHITECTURAL CLUB.

Mr. Henry Bacon's Rotch scholarship drawings recently exhibited at the rooms of the Boston Architectural Club have been sent to Washington and will be exhibited there under the auspices of the Washington Architectural Club on April 5, 6, and 7.

THE ILLUSTRATIONS

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

WILSON HALL, BROWN UNIVERSITY, PROVIDENCE, R. I. MESSRS. GOULD & ANGELL, ARCHITECTS, PROVIDENCE, R. I.

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

SEWAGE-DISPOSAL FOR THE INSANE ASYLUM NEAR LONDON, CANADA. DEVISED BY MR. GEORGE E. WARING, JR., SANITARY ENGINEER, NEWPORT, R. I.

For description, see article elsewhere in this issue.

"THE INN," WEST NEW YORK, N. J. MESSRS. WILMINGTON & PASCO, ARCHITECTS, NEW YORK, N. Y.

CATHEDRAL OF SS. PETER AND PAUL, INDIANAPOLIS, IND. MESSRS. RENWICK, ASPINWALL & RUSSELL, ARCHITECTS, NEW YORK, N. Y.

[Additional Illustrations in the International Edition.]

THE ROLANDSTIFTHAUS, HILDESHEIM, HANOVER.

[Gelatine Print.]

ALTDEUTSCHE HAUS, HILDESHEIM, HANOVER.

[Gelatine Print.]

BILLIARD-ROOM OF THE CHATEAU DE MEILLANT NEAR BOURGES FRANCE.

[Photogravure.]

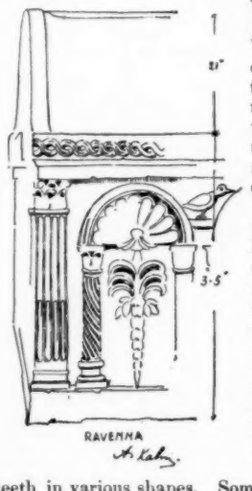
MAUSOLEUM OF THE SCALIGER FAMILY, VERONA.

THE monumental attraction for Englishmen in Verona is the tomb of Juliet, which, it must be confessed, does not increase the interest of Shakespeare's tragedy. If the trough were destroyed it would be no loss. The various monuments of the Scaliger family, although they are in a ruinous condition, are more worthy of historic romance. The Scaligers, in days when there were no laws for the preservation of the incompetent, rose to supreme power and held it. Their tombs in the public place have a general resemblance. There is a recumbent figure of the prince in death, and the structure is surmounted by a figure of him as a warrior. A similar arrangement was obnoxious to the Dean and Chapter of St. Paul's when it was proposed for the Wellington Monument.

DESIGN FOR PUBLIC LIBRARY, NEWINGTON, ENG. MR. ERNEST A. RUNTZ, ARCHITECT.

OLD BANQUETING HOUSE, KENSINGTON PALACE, LONDON, ENG. DRAWN BY A. M. PHILIPS.

RUINS OF ANCIENT COPAN.



LETTERS received by Professor Putnam from the men in charge of the Harvard expedition in Honduras, now investigating the ruins of the buried city of Copan, show that the excavations are being pushed forward with commendable speed, are turning out most interesting material, and that the results fully justify the expedition.

The work of uncovering these ruins, upon which the dust of many centuries have fallen, is now being conducted at the southern end of the main ruin near the large pyramid. Here several tombs have been unearthed from beneath a mass of débris. The tombs themselves are constructed from cut stone, and in them were found fragments of skeletons almost wholly decayed. Enough of them, however, are left to show some important facts, Among the fragments were some skulls which indicated a custom of filing the teeth in various shapes. Some of the teeth were drilled, and in the holes so made were set green and blue stones.

There is in the Peabody Museum a skull from Yucatan which shows the filing of the teeth in a similar manner. The upper teeth are filed so as to make a single sharp point with shoulders, and the lower teeth are filed in the shape of two or three saw-teeth. It is interesting, says Professor Putnam, to find this practice also occurring in Copan, as it indicates a people having similar customs with the people of Yucatan.

A small mound near the centre of the ruins, on the banks of the River Copan, was at last accounts being explored, and here skeletons were discovered, but without any ornamentation of the teeth. This apparent difference in the manner of burial between those found in the tombs and in the mounds may be explained, perhaps, by the fact that the latter seem to be better preserved, and may belong to a later people; but all this is conjecture, and nothing will be known for a certainty until the excavations are carried further and the report of the winter's work is made.

The city of Copan is about two miles long, and all about it are fragments of ruins. Great monoliths covered with glyphs of all sorts have been erected in many places about the city. Some of them, long ago fallen in the dust, are some distance from the main ruins. The sides are covered with grotesque figures of feathered serpents, human heads, mostly of the Indian type, dragons with human faces, and circles and lines. In front of these huge, carved stones are usually what are supposed to be large altars. Some of the great figures of human heads found were evidently used as incense-burners.

Moulds are being made of the large monoliths about the ruins, so that casts of the large and singular carvings can be set up in the Peabody Museum at Harvard. Many pieces of interesting sculpture have been found, of which photographs have been taken, as well as of the monoliths and portions of the buildings showing carvings.

The exploring-party are all well. Their letters show that the work is of great importance to America from an archæological standpoint and the necessity for continuing the excavations for the full time given by the Government of Honduras — ten years. This is necessary that the story of the old ruins may be told in all its details, says Professor Putnam. The Honduras officials who have visited the place and looked over the work are much pleased with the results so far. The President of the country has written Professor Putnam also to say that he will be pleased to give all the assistance possible toward making the Honduras exhibit at the World's Fair as perfect as may be.

The great temple is the point of greatest interest. Here were celebrated all the religious rites of this strange people, and here, perhaps, human beings were offered up in sacrifice to their gods. One of the most interesting parts of the temple is the inner chamber, as it is called. On the face of the step below the doorway leading to this are hieroglyphics composed of the characteristic faces, dots, lines and serpents. Over the doorway and about the sides are fantastic figures crawling through a number of letters, or figures, shaped like the letter S laid on its side. On the lower part of the sides of the doorway a figure like Atlas supports the other forms. No one has yet interpreted the meaning of these inscriptions. The language of the people is yet to be unfolded to the world. The problems and the life of those days remain for some philologist to restore to the present and make the stones of Copan tell the wonderful story of its rise, progress and decay. The work of Harvard College will do much to bring this about.

There have been very diverse opinions about Copan and its antiquity. The German scholar, Dr. Julius Schmidt, claims that the ruins at Quirigua are older than those at Copan, and that they are, in fact, the oldest on the American continent. He looks upon it as reasonable to suppose that the sculptors of Palenque, Ococingo, Copan and Quirigua were all of the race of the Mayas. The monoliths are, he says, both at Copan and Quirigua, of a religious character, and have altars in front of them, plainly pointing to sacrifices to the persons represented on the monoliths. Schmidt regards the low-relief figures as the oldest. The stones for these great monuments and buildings were quarried in the mountains two miles away.

Col. Juan Galindo says that Copan was a colony of Tultecos or Toltecs. He believed in his day that the American Indians were the most ancient people on the face of the globe and pointed to the fact that they were worn out and their vitality was exhausted in support of his theory. In saying that Copan was a colony of the Toltecs he was following tradition. He gives the dimensions of the famous temple upon which attention has been concentrated largely in the past, as 750 feet long north and south and 600 broad from east to west. More than fifty years ago Galindo called attention to the wonderful field for investigation in excavating these ruins upon which Harvard College has just now entered.

Prof. Cyrus Thomas, in an article some time ago, took the ground that the Mayas who built Copan were sprung from the Mexicans. He supported his theory by a comparison of the codices of the two countries, which were the calendars by which they reckoned time. The points of agreement are so many that he concludes they must have had a common origin, and, from all the evidence he submits, that the Mayas were more likely to have got their ideas from the Mexicans than *vice versa*. The Mexican symbols, he thinks, never could have grown out of the Maya hieroglyphics, while the latter might have grown out of the former. He is not, however, considered an authority by the best archæologists.

It is one of these codices of the ancient Maya nation or people which Professor Putnam hopes to discover in the ruins at Copan. When the Spaniards conquered the country many of them existed, but they destroyed many, a very few being saved by some of the band, who saw their value from an ethnological standpoint.

Stephens, who visited the country of Honduras some sixty years ago, took the ground that the ruins are not nearly as old as they were then reputed to be, and thought they were the work of the Toltecs or their ancestors. At the present time, however, with all the new light of recent years, it is the common opinion of archæologists and ethnologists that the ruins of Copan are the oldest on the American continent. It was an early opinion, before the time of Stephens, that the ruins of Copan and other ancient cities in Central America were remains of a people descended from the Egyptians. This was because the sculpture resembled that of the ancient ruins in Egypt in some particulars. The investigations of the last century have thoroughly dispelled that idea, however, and to-day it is probable that the work of these great temples and monuments covered with undeciphered hieroglyphics was done by the ancestors or predecessors of the Toltecs, or by the Toltecs themselves. There seems to be a general opinion to that effect among the authorities on this subject.

A theory held among theologians at one time was that these grand ruins were the remains of some of the lost tribes of Israel. — *New York Times.*

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.*]

BOOKS ON LANDSCAPE-GARDENING.

New York, N. Y., April 3, 1892.

To the Editors of the American Architect: —

Dear Sirs, — Having noticed in your paper an inquiry with regard to books upon landscape gardening, I venture to say that a much more extensive list of such books than the one referred to in your answer as having been published in the *American Architect* in January 1888, has since appeared in another journal. It will be found in Volume III of *Garden and Forest*, in the number for March 11, 1890.

Very truly yours, M. G. Van Rensselaer.

"SAFE BUILDING."

To the Editors of the American Architect: —

Dear Sirs, — I am constantly asked whether the second volume of "*Safe Building*" is out yet or not. Would it not be well to insert in the *American Architect* a notice prominently stating that it is out?

Yours very truly, Louis De Coppet Berg.

[In accordance with the above, we would state that Volume II of "*Safe Building*," completing Mr. Berg's valuable work, is now issued, and can be obtained from the publishers, Messrs. Ticknor & Co. — Eds. American Architect.]

NOTES AND CLIPPINGS

How Prairie Fires may be Extinguished. — Whoever heard of killing a horse or an ox as the first step to be taken toward putting out a prairie fire? What dweller in the Dakota has not heard of it? For it is frequently done by the settlers of the new northwest, where prairie fires are a greatly dreaded menace to life and property. It was the chief of a once important tribe of Indians who remarked, upon completing a sight-seeing tour through the principal cities of the East, "Good, heap good; not so good as a prairie fire!" One who has never seen a prairie fire has missed one of the grandest sights. To the beholder who knows that no loss of life or property will result from it, such a spectacle presents a picture of grandeur sometimes too awful to be really beautiful. If there were a policeman on every railroad locomotive in the Dakotas to act as spark-arrester, the number of prairie fires would no doubt be almost as great as it is now. The prairie grass of that region does not remain green until killed by the frosts of autumn, but ripens as do the small grains. It is plumply filled with an oily substance very nutritious for grazing purposes and highly inflammable. The exceedingly meagre rainfall and the entire absence of dews in the greater portion of those States serve to put the grass in the best possible condition for making a fierce, quick fire, when aided by the strong winds that almost constantly blow over these prairies. Every dweller in the great northwest is more or less familiar with prairie fires. They have often at nightfall seen their lurid lights in the distant horizon, or by day their huge volumes of smoke rising and blending with the clouds, and many are even familiar with the consuming march of the flames themselves. Probably the first intimation the settler receives of an approaching fire comes from the falling of burned particles of grass that have been carried long distances by strong air currents. Later on smoke may be seen on the distant horizon, which increases in volume and blackness until the whole sky may be darkened, or, if the night be coming on, the flames will light up the whole landscape, and their glow will be reflected above. The wise Dakotan has his farm or ranch protected by firebreaks. These are usually made by plowing two strips, a few furrows wide and several rods apart, and burning the grass between. There is but little likelihood of putting out a Dakota prairie fire during the day, as the wind, which is almost invariably blowing, and which the fire seems to greatly increase in force, never lulls till the coming of night. Then, though there is no dewfall in that region, the fire burns less fiercely, and may be at times entirely extinguished. The most successful method of putting out a fire, and one frequently employed, is to kill a horse or cow, and splitting the carcass, drag it along the fire-line and over the flames, which are thus extinguished. This is done by attaching long wire-ropes to two limbs of the carcass, to each of which is hitched a horse on which is an experienced rider. One of these horsemen rides on either side of the line of fire, and by skilful reining they draw the body of the dead animal directly over the flames. Sometimes a fresh hide weighted down with pieces of iron fastened to it is used instead of the carcass of an animal. By this method a line of fire twenty miles in length may be extinguished in one night. Men on foot usually follow after the horsemen and put out any fire that may remain after they have passed. The scene presented by such a company of fire-fighters is extremely weird, and one which a beholder is not likely to forget. Fortunate it is if those interested complete their work before the coming of dawn, for if they do not the rising of the wind may send the fire leaping over the area of country they have labored to save, and blackened plains and the smouldering heaps that mark the sites of former ranches and homesteads will tell the oft-told story of the Dakota prairie fire. — *Fire and Water.*

Coal-tar for Waterproofing. — The use of coal-tar for waterproofing masonry is recommended by a French technical journal. For surfaces exposed to the air it is advised to apply from one to three coats boiling hot. Its durability is increased by adding a small proportion of india-rubber dissolved in benzine. If the color of the coating is objectionable it may be dusted with plaster-of-Paris before drying. Where surfaces are to be covered with earth a single coating of tar made thick by blazing is preferable. A small quantity, two or three gallons, is brought to a boiling temperature and lit at the surface. It is allowed to blaze and kept constantly stirred at the same time until the volume is considerably reduced and it becomes pasty on cooling. The product is spread as rapidly as possible with a large flat brush, which is dipped often to prevent cooling. A single coat applied in this manner adheres firmly to even the smoothest surface. — *Invention.*

An Ancient Treatise on Steam. — It is stated that an extraordinary archæological find has been made at Helsingfors, Norway, in the shape of an iron-bound chest of evidently very ancient date. On being opened a quantity of ancient ironwork was found and a manuscript, which on examination turned out to be a treatise on steam by a Gallican monk, named Suger, who died in 1152, after having held high office in France during one of the crusades. The ironwork, on being put together, turned out to be a model of a steam engine, with cylinders, pistons and other requisite parts complete. — *Invention.*

TRADE SURVEYS

Trade and manufacturing combinations have not been as numerous or as successful as circumstances seemed to indicate they would be three or four years ago. Public opinion was greatly stirred up at that time, and a vast amount of editorial comment was wasted in predicting a general consolidation of interests that should remain isolated. It was feared that competition was in danger of being crippled permanently, and that a new factor was about to be introduced into modern business affairs. For a while it looked as though the people stood in the presence of an actual danger, and that the laws which had governed competition were in danger of such a modification as would introduce an entirely new system of things. Combinations were entered into in all directions in all parts of the country, but, after all, it was merely experimental. There were certain necessities calling for larger aggregations of capital, but it was soon found that these aggregations were controlled by conditions and hidden, unwritten laws, that conserved factor of the underlying conditions of competition in the interests of the people. Within a year or so, quite a number of these combinations, however, melted away. It is probable that there will be a further decline in number, but that combination, as we have witnessed it lately, will entirely disappear is improbable. On the other hand, there are a number of advantages to be gained by the growth of combination and by the centralization of manufacturing capital and managements. Nor will it be necessary that legislation be invoked to protect the people, although its aid may not be without some advantage. The mighty combinations that are in progress are leading the business interests into a newer field, onto a higher platform, so to speak, into newer conditions where there are greater opportunities to accomplish results. The retail age is passing away; the evils perpetrated by middle-men are disappearing; competition, in reality, is increasing, but it is being placed under more rigid control. International trade and commerce is now introducing new factors. The centralization of monetary power, the decentralization of commercial control, the scattering of manufacturing activity, the building up of the highways and byways all over the world, the introduction of improved methods in localities where primitive methods have been exclusively followed in the past, are all introducing a new set of factors and agencies which are bound to have a revolutionizing effect, not only on the habits of the people, but upon methods pursued and upon the hand of results accomplished. The consuming-capacity of the masses is being increased steadily, and, when measured decade by decade, the real progress made will be observed clearly. Political economists have looked with some apprehension upon the extraordinary expansion of producing-capacity, but the consuming-capacity of the masses grows apace. One great drawback of recent years has been the problem of an equitable distribution. Agitations to that end began under socialism long ago, and have been followed by trade-union agitation, which developed into political agitation. All of these efforts have been beneficial in attracting attention to the importance of the problem of distribution. It behooves the best interest of society at large that the distribution of created wealth should be scientifically adjusted as soon as possible, to the end that healthy activity may be maintained and abnormal conditions avoided, such as the accumulation of wealth in the hands of a few. We cannot accept the assertion in this country that such an accumulation is practically possible. Where there are hundreds of millionaires and a rapid growth of wealth, there is a more rapid growth of smaller capitalists, and an infinitely greater growth of small possessions in the hands of the masses. Relatively speaking, millionaires are decreasing; there is a remarkable growth of wealth among the people, as is evidenced by reports of savings banks and financial institutions. Building and loan associations exhibit a remarkable growth and prosperity. The inducements to save are multiplying, and the habit of saving is becoming almost universal. The latest phases of the business situation show increasing strength in all sections, excepting the Far South and Far West. The expansion of business, as measured by clearing-house exchanges, has improved thirty-five per cent within a week. This sudden expansion is legitimate, and due to the anxiety of distributors generally to take advantage of the low prices. The present low range of prices will certainly stimulate trade and probably maintain activity throughout the second quarter of the year. It is pretty safe to assert that there will be no rise in prices or values, although some very creditable authorities cling to the belief that an advance in prices is probable within a few months. It is hardly worth while to borrow trouble upon this score. A vast volume of capital is awaiting opportunities for investment in almost every channel of activity. The particular point to which attention is called at this time is that a greater degree of control over production has been established within the past few years, not so much through mere organization on paper, although that has its value, but there has been established a control in commercial, manufacturing and financial circles which cannot be easily defined in words, but which, nevertheless, exists, and indirectly controls, directs and enlightens the powerful machinery behind these vast interests.

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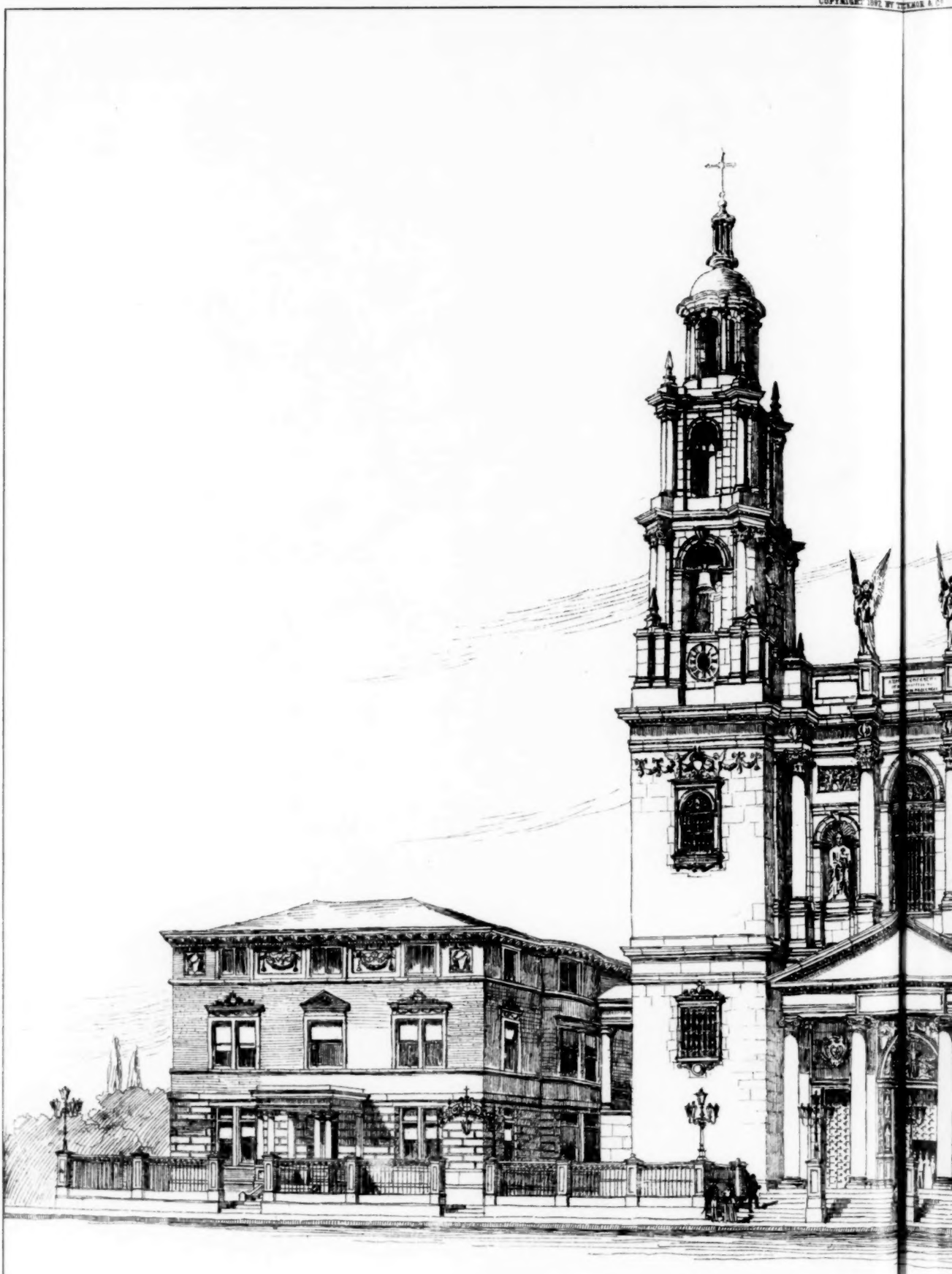

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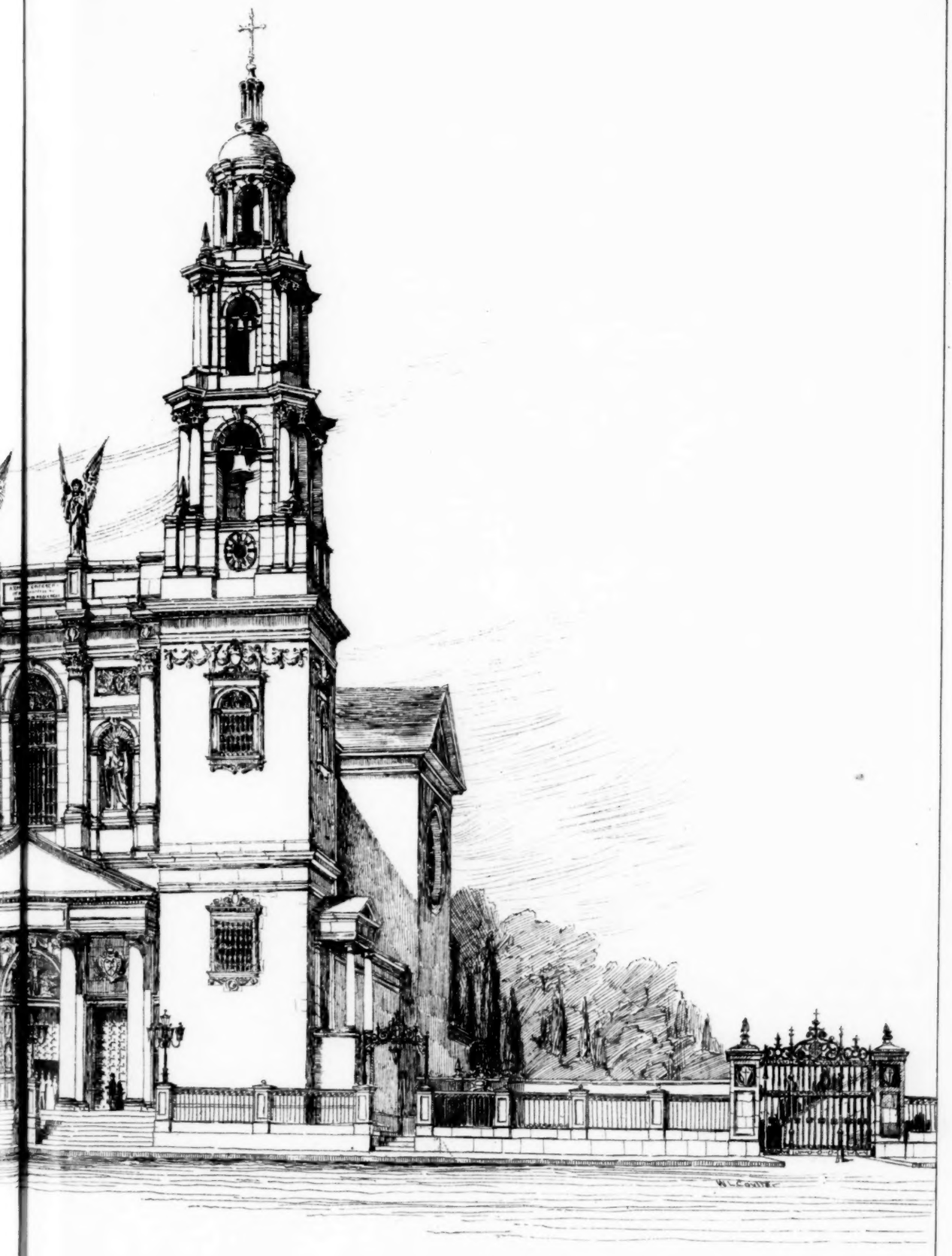

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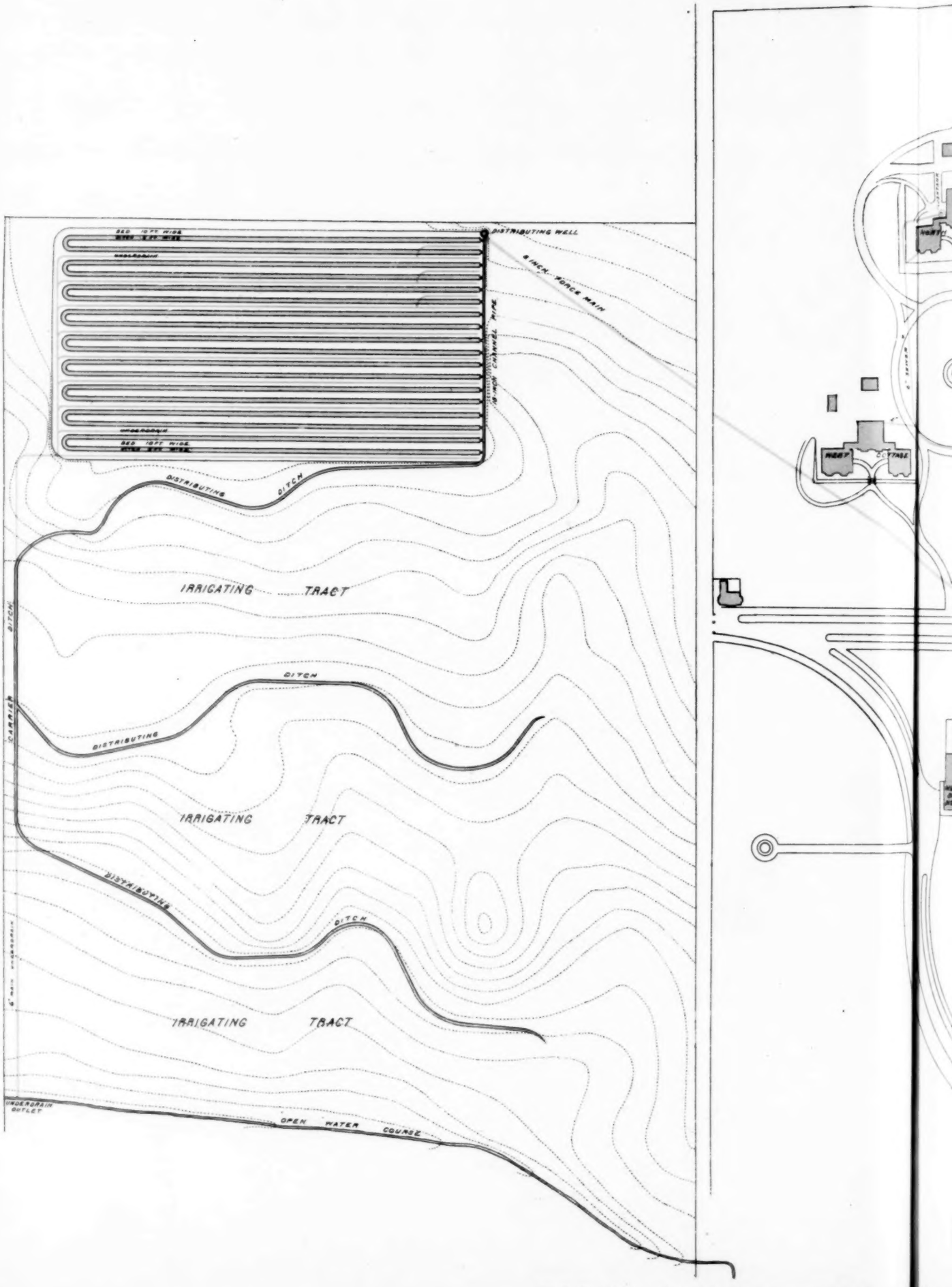

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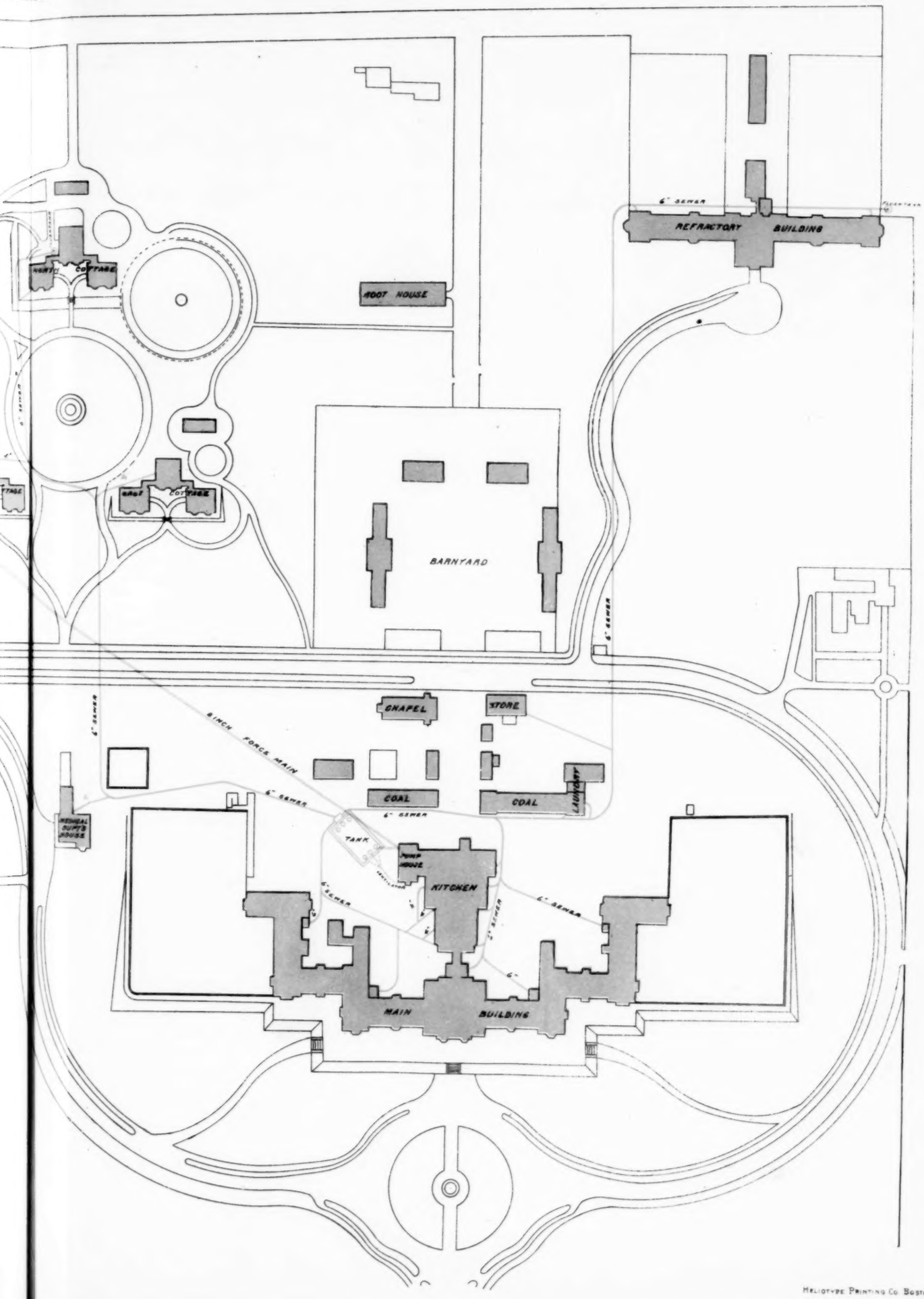

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